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## Editorial Note

According to Sir David King, the British Government's Chief Scientific Advisor, 'climate change is the most severe problem that we are facing today – more serious even than the threat of terrorism'.<sup>1</sup> The validity of this assessment is, of course, a matter of debate. Nevertheless, there can be no doubt that public, business and governmental concerns over climate change have been mounting around the globe, and that much of the recent evidence being reported in leading scientific journals, such as *Science* and *Nature*, is arresting – if not outright alarming.

Moreover, during the past six months or so the international news has been filled with reports of severe weather events, the release of official reports on the potential consequences (mostly bad rather than good) of global warming, and claims by leading climate scientists that they have been the subject of political interference and censorship. Such items have included:

- Confirmation that 2005 was the warmest year (since official records began), including the hottest year in Australia by a considerable measure – notwithstanding the absence of El Niño conditions;
- Evidence that the ocean current between Africa and the east coast of America, which drives the Gulf Stream, has slowed by 30% since a study 12 years earlier;
- An extremely active and protracted hurricane season in the Atlantic, including hurricane Katrina (which caused severe flooding in New Orleans) and hurricane Wilma – the most intense tropical cyclone ever recorded in the Atlantic basin;
- Claims by Dr James E. Hansen, a top NASA climate scientist, that the Bush Administration has tried to prevent him from speaking out on the issues of global warming since he gave a lecture in December 2005 calling for prompt international action to reduce emissions of greenhouse gases;
- Claims by Dr Graeme Pearman, the former head of the Division of Atmospheric Research in the CSIRO, that he and other senior climate scientists were actively discouraged by the Australian Federal Government from commenting publicly on climate change issues;
- The publication of a study in *Nature* providing evidence that living plants emit methane (one of around 30 greenhouse gases), thus reducing (albeit very marginally) the value of forests as carbon sinks;
- The publication of *The Revenge of Gaia* by the distinguished environmentalist Professor James Lovelock which argues that radical climate change is now largely irreversible (because of the lags in the global system) and that the world is on track for the first hot period it has experienced since the Eocene epoch commenced around 55 million years ago;
- The publication of a World Bank report – *Not If But When* – warning that climate change will have a huge impact on many Pacific islands; and

<sup>1</sup> Sir David King, 'Climate change science: Adapt, mitigate, or ignore?' *Science*, 303, 2004, pp.176-7.

- The publication of a major scientific report in Britain – *Avoiding Dangerous Climate Change* – warning that the threat posed by climate change may be greater than was previously thought.

In a foreword to *Avoiding Dangerous Climate Change*, the British Prime Minister, Tony Blair, claimed that:

It is now plain that the emission of greenhouse gases, associated with industrialization and economic growth from a world population that has increased six-fold in 200 years, is causing global warming at a rate that is unsustainable.

Currently, the precise magnitude and likely timescale of anthropogenic (or human-induced) global warming remains a matter of vigorous scientific debate; almost certainly, this debate will continue for many years. Nevertheless, as the evidence accumulates and scientific understanding improves, it is likely that there will be greater certainty regarding the nature, scale and scope of the climatic changes that the world will witness over the 21st century and beyond.

That said, the currently available scientific evidence appears to be pointing increasingly, and very solidly, in the same direction: namely, that climate change is happening; that it is occurring at an accelerating pace; and that if no action is taken to reduce greenhouse gas emissions, there is a high probability of a significant rise (perhaps of 3 degrees or more) in average global temperatures by 2100. Such a rise would yield severe – indeed, potentially catastrophic – ecological, economic and social consequences. On this basis, it is argued that concerted and effective international action is required – and urgently.

Such action is bound to entail costs. To quote a recent report by the Select Committee on Economic Affairs of the House of Lords – *The Economics of Climate Change*:

If climate change is as serious as most scientists claim ... then it is important to convey the complementary message that the action to tackle it will also have to be serious and potentially life-changing. It is better to be honest now than to shield the public from the economic realities inherent in the most pessimistic forecasts.

In the interests of encouraging debate over the scientific and policy issues associated with climate change, the IPS, in collaboration with the School of Earth Sciences at Victoria University, is organizing an international conference on *Climate Change and Governance: Critical Issues for New Zealand and the Pacific* – to be held at Te Papa on 28-29 March 2006. It seemed appropriate, in this context, to devote significant attention to such issues in *Policy Quarterly* (PQ). Accordingly, four of the six articles in this issue deal with various aspects of climate change.

First, Professor Peter Barrett (one of New Zealand's most distinguished geologists) puts projected global warming in perspective by comparing it with climate fluctuations in the geological past. The greenhouse gas emission rate from human activity has increased in the last few decades, and CO<sub>2</sub> levels will soon be higher than at any time in the last 25 million years. He argues the consequent projected changes in climate, along with other human-induced stresses on the global ecosystem, threaten to destroy civilization as we know it by the end of this century.

In a second contribution, Dr Sean Weaver provides an introduction to the basics of climate science, including a discussion on the recent concern over possible ‘tipping points’ (i.e. non-linear changes). He concludes his discussion with a brief analysis of the issues surrounding adaptation and mitigation.

In the third article, Murray Ward critically assesses the recent interdepartmental ‘Review of Climate Change Policies’ and the decision of the Labour-led government in December 2005 to abandon the long-awaited carbon tax (due for implementation in 2007). In so doing, he raises some serious concerns about the assumptions underpinning parts of the Review and poses important questions about the future direction of New Zealand’s climate change policies.

The fourth contribution, by Associate Professor Ralph Chapman and Ken Piddington, takes the form of a review of two recent, important reports on New Zealand’s energy future: *A Sustainable Energy Future for New Zealand by 2050* (produced by the New Zealand Business Council for Sustainable Development) and *Future Currents* (produced by the Parliamentary Commissioner for the Environment). The authors regard both reports in a generally favorable light, but highlight many issues requiring further analysis.

The final two contributions to this volume of *PQ* address issues far removed from the science and politics of climate change. In both cases, however, the wellbeing of the family is of central concern.

The first piece, by Marcel Lauzière, discusses the importance of strong families for the nurture and development of children – and, more generally, the maintenance of a well-functioning society – and considers the role that the state can play in fostering vibrant and resilient families. In this regard, he outlines and reviews the effectiveness of some of the policies that have been introduced in New Zealand and elsewhere in recent decades to nurture and support families (such as SKIP, Family Start and Early Start).

The second piece, by Paul Callister and Judith Galtry, tackles the controversial topic of paid parental leave. After outlining the policy debate in New Zealand on this subject since the 1970s, the authors discuss how policy may develop in the future and why it might be justified for the state to contribute to the costs of such leave.

Two final matters: first, I am delighted to announce that Associate Professor Robert Gregory has agreed to assist me with the task of editing *PQ*. He will be responsible for the next issue, and we will alternate responsibilities from then on. Second, please note that feedback to the editors and members of the Editorial Board is always welcome.

**Jonathan Boston**  
Co-Editor

# Will Unchecked Global Warming Destroy Civilisation by Century's End? What Three Degrees of Global Warming Really Means<sup>1</sup>

Peter Barrett

A temperature change of 3°C is something we experience wherever we are on earth every day - in fact a typical daily change in most places is more like 8 or 9°C. In the past few years scientists have become concerned because global temperature has risen 0.6°C. So why the fuss?

In November 2004 at the annual Royal Society of New Zealand's awards dinner I said that if we ('first world' countries) continue on our current path, a warming of this magnitude would risk 'the end of civilisation as we know it by the end of this century'. This seems like an absurd claim, but the words reflect my judgement from the perspective of three decades of research into the last 40 million years of past Antarctic climate. My key point, though, was that this gloomy prospect is not inevitable if we respond to the problem now. Let me explain.

Geologists now know a great deal about changes in climate on a range of timescales. For example, we know the earth has cooled around 4°C over the last 40 million years (see Figure 1). We also know this long-term cooling trend has regular fluctuations every 40,000 or 100,000 years superimposed on it, and these have been almost as large (in fact larger in the last million years or so) (see Figure 2). We are also learning from climate research that after 1,000 years of stable climate, a 40-million-year decline in temperature may be largely reversed by the end of this century (see Figure 3). Firstly, I'll outline the basis for this assessment, and then briefly review the disastrous consequences of such a warming according to environmental scientists.

An international group of hundreds of leading scientists and other experts nominated by governments around the world<sup>2</sup> concluded in 2001 that if current trends in greenhouse gas emissions continue unchecked to 2100, when CO<sub>2</sub> is projected to be double pre-industrial levels, we could expect global temperature to rise somewhere

between 1.4 and 5.8°C. A workshop sponsored by this group, the Intergovernmental Panel on Climate Change (IPCC), concluded in 2004 that improved modelling studies were converging on 3°C<sup>3</sup> as the most likely temperature rise for a doubling of CO<sub>2</sub> levels. This means that by the end of the century, if greenhouse gas emissions continue to rise unchecked, there is a 50-50 likelihood that temperatures will be *at least* 3°C warmer – a huge risk if the consequences are serious.

Such a rise is not far short of the 4°C that would return the earth, in an instant of geological time, to its climate around 40 million years ago, long before even our ancestral genus *Homo* evolved a mere 6 or 7 million years ago. Forty million years ago the earth was very different from the one we know today. Large mammals had yet to evolve, India had not yet collided with Asia to form the Himalayas, Antarctica was free of ice and covered with beech forest, and global sea level was 70 metres higher. In ten human generations (from 1900 to 2100 AD) we will have largely completed the reversal of the global cooling trend that took place naturally over 20 million generations.

1 This article is reprinted from *Pacific Ecologist*, 11, December 2005, with the editor's permission.

2 The Intergovernmental Panel on Climate Change (IPCC) was established under the aegis of the United Nations Environment Programme and the World Meteorological Organization in 1988. It accepts only peer-reviewed publications for consideration as evidence. The IPCC is made up of governments, not scientists. However, scientists write the reports that the IPCC approves, following a rigorous multiple peer-review process. IPCC was established to provide governments and the wider community with carefully considered reports on the changes being widely perceived in regional and global climate in the 1980s, and possible links with increasing greenhouse gases in our atmosphere. It has published reports thus far in 1990, 1995 and 2001, and another is due in 2007. These documents with increasing certainty the influence of human-induced greenhouse gas pollution on the earth's atmosphere and climate. Their reports can be downloaded from [www.ipcc.ch](http://www.ipcc.ch). The summaries for policy makers are especially useful.

3 See note 2.

Fortunately, we have yet to feel the full effects of the current level of greenhouse gas pollution. Even the unstable regions of the Antarctica's ice cover (e.g. the West Antarctic Ice Sheet, which would raise sea level 6 metres if it all went into the sea) are likely to take at least decades to respond. However part of the delay in warming is from 'global dimming',<sup>4</sup> with attendant cooling from atmospheric pollution by smoke and dust. But this delay in global warming will be short-lived because improvements in pollution control are restoring clear skies.

Other news is also not good. Arctic warming is accelerating, causing thinning of the floating ice that covers the Arctic Ocean, and melting of glaciers and large areas of permafrost, causing many adverse ecological and environmental consequences.<sup>5</sup> Mid and low latitude glaciers are also mostly retreating, despite a misleading report to the contrary which was exposed by *Guardian Weekly* columnist George Monbiot.<sup>6</sup>

Furthermore, the Antarctic ice sheet is turning out to be more responsive to regional temperature changes than most of us expected, not only through collapsing ice shelves in the Antarctic Peninsula, but also with satellite measurements showing huge ice streams draining the Pacific sector of the West Antarctic Ice Sheet faster by a factor of 10, resulting in sea level rising another 0.18 mm/year.<sup>7</sup> This is only partially balanced by the increase in snowfall in East Antarctica (resulting in a sea level rise of 0.12 mm/year). Continued warming will only increase the rate of global sea level rise through further Antarctic melting. This is additional to the rise in sea level from the upper layers of the ocean expanding from the global warming of the last few decades<sup>8</sup> - further proof that the rise in global temperatures shown in Figure 3 is real.

Other consequences around Antarctica are a freshening of the Ross Sea from increased melting,<sup>9</sup> and a decline in sea ice extent of 20% since the 1950.<sup>10</sup> Sea ice is one of the main forces driving the global ocean heat conveyor belt that moderates temperatures on the earth's surface (and also delivers oxygen to maintain life in the deep oceans). If the polar regions lose their sea ice, and melting ice from Greenland freshens the North Atlantic, then the Gulf Stream that now warms north-west Europe will slow and this region will cool by several degrees.<sup>11</sup>

But what would be the consequences of these changes? The global situation has been reviewed recently in a

report prepared for the G8 group of countries entitled *Meeting the Climate Challenge*,<sup>12</sup> and released in January 2005. The report identifies just 2°C (and an atmospheric CO<sub>2</sub> level of 400 ppm (parts per million), which is 43% above the pre-industrial level of 280 ppm) as the danger level for global warming. It is worth noting that the earth has not experienced such a high CO<sub>2</sub> level in the last 25 million years.<sup>13</sup> The report spells out the likely consequences:

Beyond the 2°C level, the risks to human societies and ecosystems grow significantly. It is likely, for example, that average temperature increases larger than this will entail substantial agricultural losses, greatly increase numbers of people at risk of water shortages, and have widespread adverse health impacts.

The report goes on to say: '[This] could also imperil a very high proportion of the world's coral reefs and cause irreversible damage to important terrestrial ecosystems, including the Amazon rainforest.' It concludes:

Above the 2°C level, the risks of abrupt, accelerated, or runaway climate change also increase. The possibilities include reaching climatic tipping points leading, for example, to the loss of the West Antarctic and Greenland

4 Wild et al. (2005) 'From dimming to brightening: decadal changes in solar radiation at earth's surface', *Science*, 308, pp.847-50; Pinker et al. (2005) 'Do satellites detect trends in surface solar radiation?', *Science*, 308, pp.850-54.

5 ACIA (2004) *Impacts of a Warming Arctic: Arctic climate impact assessment*, Cambridge: Cambridge University Press, <http://www.acia.uaf.edu>.

6 Monbiot, G. (2005) 'Junk science', *Guardian Weekly*, 10 May, <http://www.monbiot.com/archives/2005/05/10/junk-science/>

7 Thomas, R. et al. (2004) 'Accelerated sea level rise from West Antarctica', *Science*, 306, pp.355-8.

8 Barnett, T.P. et al. (2005) 'Penetration of human-induced warming into the world's oceans', *Science*, 309, pp.284-7.

9 Jacobs, S.S. et al. (2002) 'Freshening of the Ross Sea during the late 20th century', *Science*, 296, pp.386-9.

10 Curran, M.A. et al. (2003) 'Ice core evidence for Antarctic sea ice decline since the 1950s', *Science*, 302, pp.1203-6.

11 <http://www.cru.uea.ac.uk/cru/info/thc/>.

12 International Climate Change Taskforce (2005) *Meeting the Challenge*, <http://www.stabilisation2005.com/outcomes.html>.

13 Pearson, P.N. and M.R. Palmer (2000) 'Atmospheric carbon dioxide concentrations over the past 60 million years', *Nature*, 406, pp.695-9; Royer, D.L. et al. (2001) 'Paleobotanical evidence for near present day levels of atmospheric CO<sub>2</sub> during part of the Tertiary', *Science*, 292, pp.2310-3.

ice sheets (which, between them, could raise sea level more than 10 metres over the space of a few centuries), the shutdown of the thermohaline ocean circulation (and, with it, the Gulf Stream), and the transformation of the planet's forests and soils from a net sink of carbon to a net source of carbon.

All of this is coming at a time when the earth's ecosystems are already stressed by destructive development practices and an over-populated planet. A review entitled *The Millennium Ecosystem Assessment*,<sup>14</sup> carried out under the aegis of the United Nations Environment Programme, was released in May 2005 after four years work by 1,300 scientists. It begins with the recognition that the human species, while buffered against environmental changes by culture and technology, is fundamentally dependent on the flow of ecosystem services. It was barely noticed by the media, but its conclusions touch us all.

- First, approximately 60% (15 out of 24) of the ecosystems examined are being degraded or used unsustainably, including in terms of fresh water, capture fisheries, air and water purification, and the regulation of regional and local climate, natural hazards and pests.
- Second, it is established, though evidence is incomplete, that ecosystem degradation is increasing the likelihood of unexpected changes in ecosystems, with serious consequences for human well-being. Examples include: disease emergence, abrupt alterations in water quality, the creation of 'dead zones' in coastal waters, collapse of fisheries and shifts in regional climate.
- Third, the harmful effects of the degradation of ecosystem services are being borne disproportionately by the poor, and are in places the main factor causing poverty and social conflict.

These problems will be exacerbated by global warming.

The situation is in fact worse than these reports describe, simply because of the time lag of several years in the results being reported and disseminated. We have only a few years left, maybe ten at most, to change societal attitudes towards progress before we have 'lit the fuse' for inevitable environmental catastrophe in later decades. As Ronald Wright explains, it is the Victorian notion of progress through economic growth and exploitation of resources (with only immediate costs considered) that

is fast leading us to environmental crisis and collapse.<sup>15</sup> The UN Framework Convention on Climate Change of 1988 was a start, and the Kyoto Protocol, which came into effect only this year, continues, albeit slowly, in the right direction. The G8 meeting in July 2005 has at least agreed there is a problem.<sup>16</sup> Both developed and developing countries sorely need an immediate and sustained focus on political and economic mechanisms for returning us to the 1990 CO<sub>2</sub> emission levels sought by the Kyoto Protocol. Even if this is achieved it will take decades for atmospheric CO<sub>2</sub> levels to decline.

Despite the scale of the global warming problem, we have good reason to be optimistic. Technological developments in the last few decades have brought about huge efficiencies in capturing renewable energy from wind, sun, waves and tides. The over-consumption of oil, that most convenient of all transport energy sources, has to be addressed, but the answer there is easy to see in improved public transport and lighter, more efficient cars. Pressures to move in this direction are increasing, with air pollution in cities and the rising cost of extracting oil as demand outstrips supply. 'Hubbert's peak' approaches and it becomes increasingly expensive to deliver. Unfortunately, nuclear power is not a cost-effective substitute for oil or coal, for reasons explained by Peter Bunyard.<sup>17</sup>

At the same time, many people in the developed world have become weary of the consumerism of the last few decades and the ill health that follows from fast lives and fast food. After achieving an energy-intensive lifestyle that has led the rest of the world in atmospheric pollution, we are discovering through film, television, museums and antiquities the pleasures and achievements of successful societies of the past. Of course, many past societies have failed, but, most importantly, ours is the best equipped of all to learn from those successes and failures, as anthropologist Jared Diamond has recently observed.<sup>18</sup> If we really deserve the name we have given

14 Millennium Ecosystem Assessment Synthesis Report, 2005, <http://www.millenniumassessment.org/en/Products.Synthesis.aspx>.

15 Wright, R. (2005) *A Short History of Progress*, New York: Carroll and Graf Publishers.

16 [http://en.wikipedia.org/wiki/31st\\_G8\\_summit#Global\\_warming](http://en.wikipedia.org/wiki/31st_G8_summit#Global_warming).

17 Bunyard, P. (2005/6) 'Taking the wind out of nuclear power', *Pacific Ecologist*, 11, pp.51-7.

18 Diamond, J. (2005) *Collapse: how societies choose to fail or succeed*, London: Penguin.

Figure 1: Temperature over the last 80 million years based on the deep-sea isotope record.<sup>20</sup>

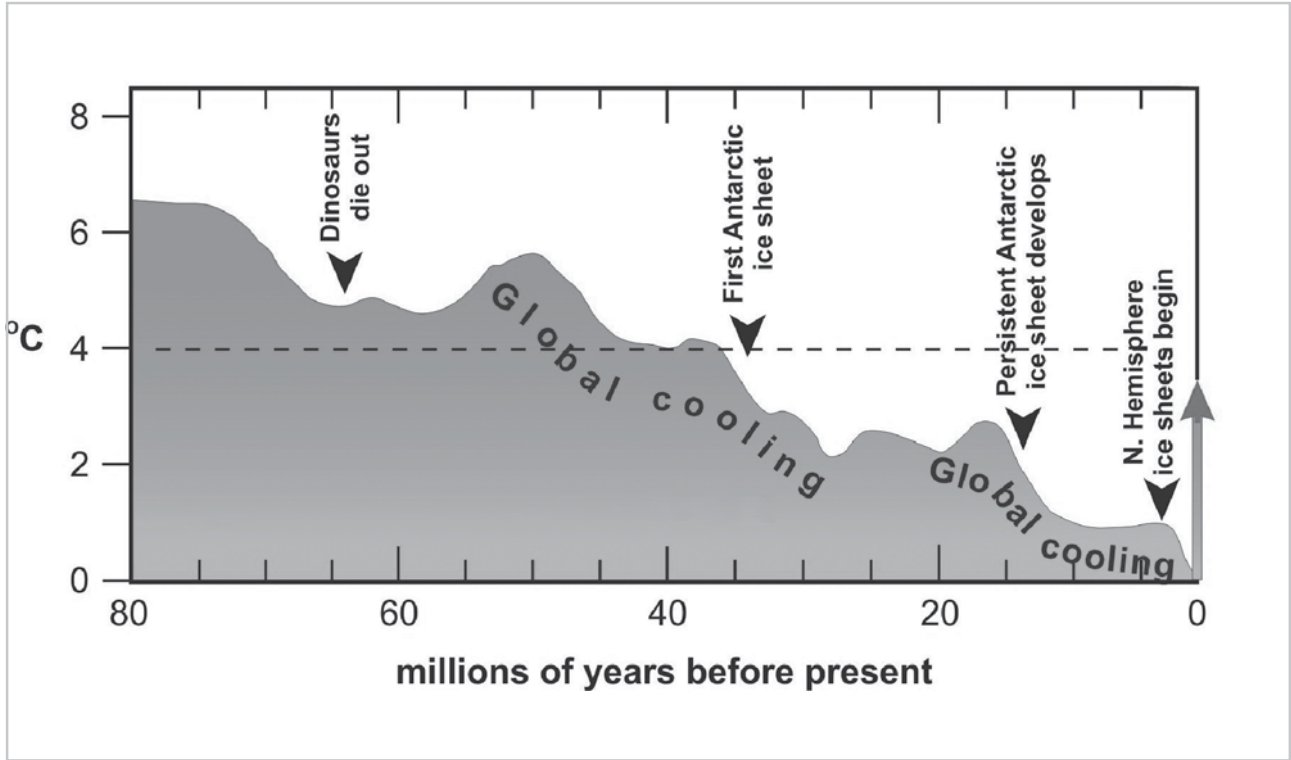
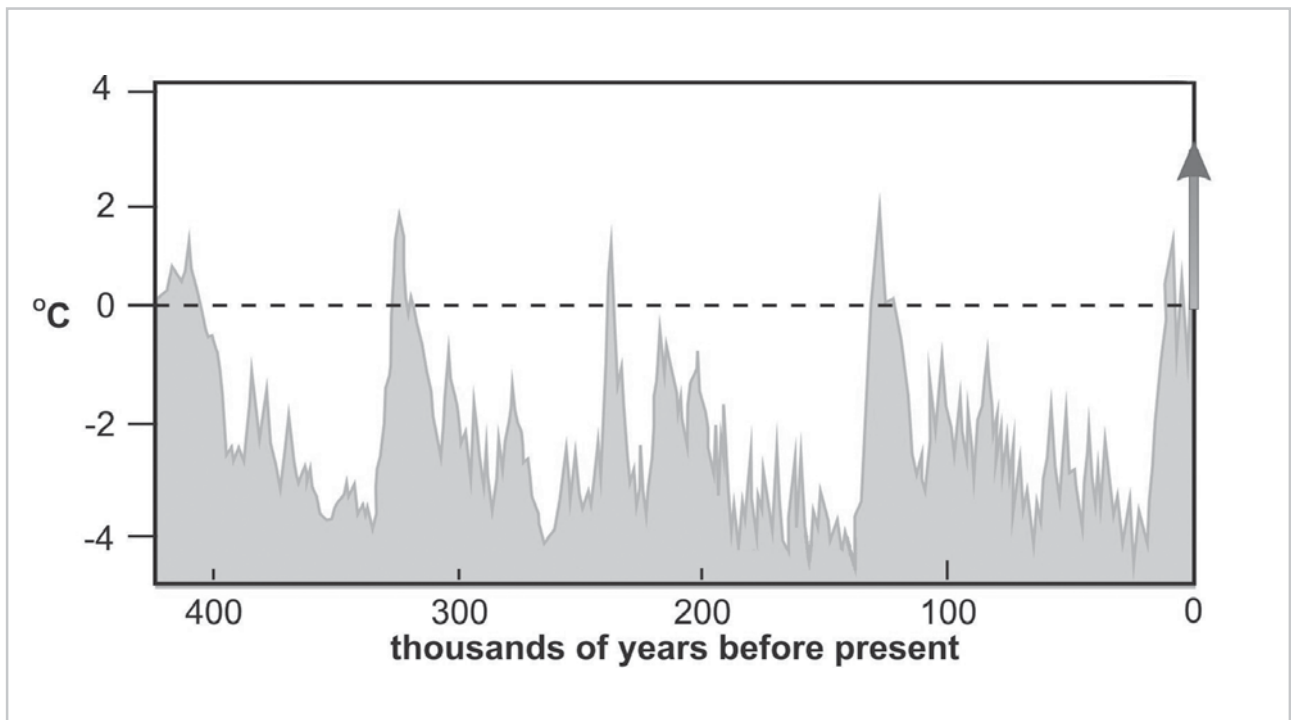
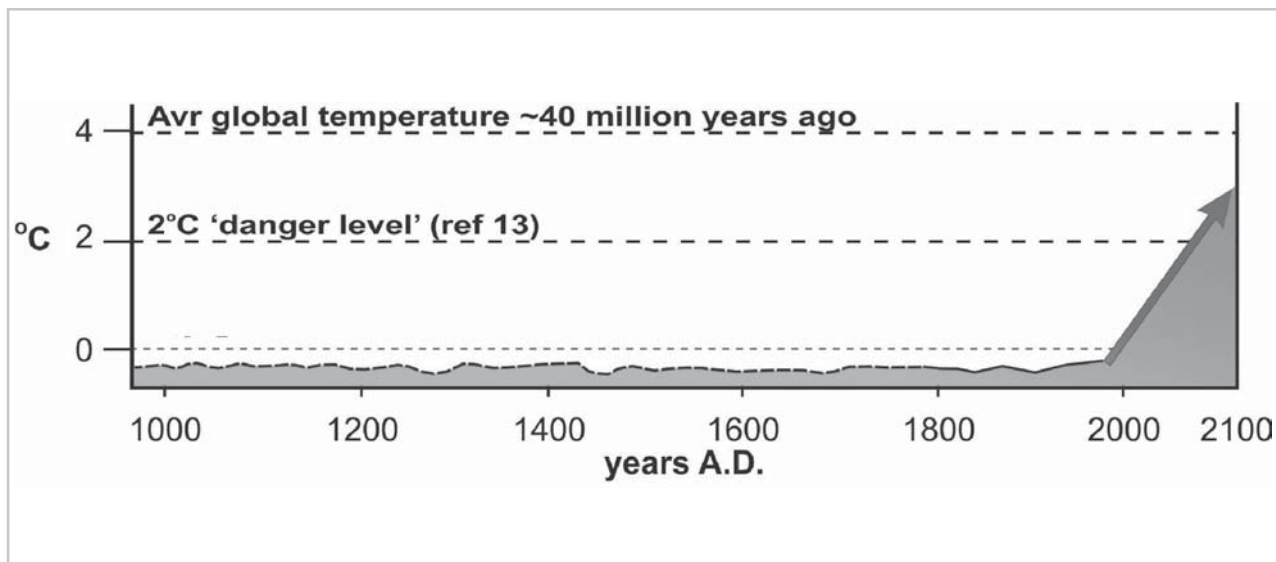


Figure 2: Temperature over the last 400,000 years, based on oxygen isotope measurements from ice cores at Vostok Station, Antarctica.<sup>21</sup>





**Figure 3. Temperature over the last 1,000 years based on high resolution 'proxy' data from both hemispheres.<sup>22</sup>**



ourselves - *Homo sapiens*, or 'wise man' - the developed world (and the developing world, which has yet to reach our level of excess) will succeed in maintaining all of our societies, and our civilisation, by adapting to a low energy lifestyle and reducing the current level of atmospheric pollution. Some regions and cultures will do it better than others, but the prospects for all societies becoming truly sustainable in a stable global environment will increase with commitments to that goal at all levels.

The Kyoto Protocol, with all its limitations or deficiencies, is currently the only international collective commitment. The agreement, and those who are working to advise on and implement it, deserve our support - not as the answer in itself, but as an umbrella for progress in the right direction.

Figures 1-3 show changes in average global temperature compared with today's average on three different timescales. The average projected increase for the doubling of CO<sub>2</sub> levels, which is expected by the end of this century on current projections, is shown as an arrow at the right of each diagram.<sup>19</sup>

Note: The measured range of temperature from glacial to interglacial in Antarctic ice cores is in fact 10°C, reflecting enhanced polar sensitivity to temperature change, but is scaled here to 5°C to correspond with the known temperature difference in average global temperature between glacial and interglacial climate.

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19 Kerr, R.A. (2004) 'News Focus - three degrees of consensus', *Science*, 305, pp.932-4.

20 Crowley, T.J. and K. Kim (1995) 'Comparison of longterm greenhouse projections with the geologic record', *Geophysical Research Letters*, 22(8), pp.933-6.

21 Petit, J.R. et al. (1999) 'Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica', *Nature*, 399, pp.429-36.

22 Mann, M.E. and P.D. Jones (2003), 'Global surface temperatures over the past two millennia', *Geophysical Research Letters*, 30(15), p.4.

# A Scientific Backdrop to Climate Change Policy<sup>1</sup>

Sean Weaver

## Introduction

Never before in history have we known so much about the earth and our interactions with it. Science has been a great investment, and now scientists the world over are sending a solemn warning: we are changing the climate, and the threat this poses to the economy and society is significant. These threats are not merely a marginal concern. They relate to the natural resource backbone of economic and political life.

This paper offers an introduction to basic climate change science for policy makers. Presenting this backdrop helps to set a context for policy development by exploring the bigger-picture issues that policy makers will need to address in coming decades. In the process, it signals how climate change has an impact on a wide range of policy frameworks, necessitating an integrated policy response.

This scientific story is built on what is now a broad consensus in the climate science community. This consensus is based on an understanding that:

- climate change in general is a natural feature of the global climate system and always has been;
- climate change is a function of the dynamic interrelationship between many components of the climate system (including greenhouse gas concentrations); and that
- if humans change any combination of those components, we have the ability to influence the climate system.

The consensus can be boiled down to the following:

- Climate change is currently happening.
- Humans are a significant causal factor.

- Climate change poses a substantial threat to the economy and society.
- We will need to invest in strategies to cope with climate change (adaptation).
- We can lower the scale of impacts by reducing greenhouse gas emissions (mitigation).

Policy makers need to have confidence in the information guiding their decisions. The source of confidence for this consensus is to be found in the peer-reviewed climate science literature. This literature is so vast that in 1988 the United Nations established a scientific review and advisory body on this topic: the Intergovernmental Panel on Climate Change (IPCC). Every six years the IPCC publishes an interdisciplinary scientific review and assessment that summarises the latest climate change research in three broad categories:

1. scientific basis;
2. impacts, adaptation and vulnerability; and
3. mitigation.

The latest is the Third Assessment Report (2001) – a 3,061-page synthesis by over 1,000 authors and expert reviewers of over 11,000 peer-reviewed scientific studies. Over 10,000 scientific studies have been published in the peer-reviewed literature since then, which adds to the material for the Fourth Assessment Report due out in 2007. The result of this review process is a captivating story that is exceedingly relevant to policy makers the world over.

## Sea level rise

Sea levels are rising globally. They rose by between 10 cm and 20 cm over the last 100 years, are currently rising at 1.8 mm/yr (ten times faster than the rate observed for the last 3,000 years), and are forecast to rise by between 20 cm and 80 cm by the end of the century (IPCC, 2001a). This is due to thermal

<sup>1</sup> The author would like to thank Jo Campbell, Jonathan Boston and Mike Gavin for useful comments on an earlier version of this article.

expansion of the oceans as they warm (a consequence of global atmospheric warming), and also because large volumes of ice that have been on the land for many thousands of years are melting and transferring some of this volume to the sea.

During ice ages sea levels drop because a large proportion of global precipitation falls as snow and stays on the land rather than running into the sea. This snow accumulates over many thousands of years, forming glaciers and ice sheets. Global sea levels during the last glacial maximum (around 20,000 years ago) were about 125 metres below current sea levels. As the climate warms during interglacials (such as the one we are experiencing now), this ice melts (flowing into the sea as water) and the proportion of precipitation that falls as snow declines. This raises sea levels. If the warming levels off, sea level rise will slow or cease, as has been the case for the last few thousand years. But with current global warming we can expect additional sea level rise as indicated above.

The source of water contributing to current sea level rise includes the huge ice sheets of Greenland and Antarctica. If the Greenland Ice Sheet melted completely it would add about 6 vertical metres to global sea levels. In Antarctica there are two ice sheets – the West Antarctic Ice Sheet (representing about 6 metres of global sea level), and the huge East Antarctic Ice Sheet (about 60 metres of global sea level). It would take thousands of years for these ice sheets to melt completely, even if global mean temperatures became warm enough to render them unsustainable – in the same way that it takes a while for a block of ice to melt once we have taken it out of the freezer. But as the melting progresses, more and more water runs off, adding to the volume of the oceans. There is also a risk that large chunks of ice sheets can break up and slide quickly into the oceans, which is a regular feature of ice sheets when they become unstable in a warming climate. This could raise sea levels suddenly long before the ice melts, in the same way that the level of a liquid in a glass rises when we put ice in a drink.

The British Antarctic Survey now indicates that this is a possibility for the West Antarctic Ice Sheet (Tirpak et al., 2005). Currently, 75% of the glaciers on the Antarctic peninsula (adjacent to the West Antarctic Ice Sheet) are in retreat (Rapley, 2005), and in 2002 the huge Larsen B Ice Shelf<sup>2</sup> (3,250 km<sup>2</sup> in area and 220 m thick) disintegrated. This is consequentially leading to a two- to six-fold increase in the speed of glaciers at

their terminus, which are now moving more quickly into the sea in the absence of this ice shelf barrier (NSIDC, 2002). In 1995 the 1,600 km<sup>2</sup> Larsen A ice shelf collapsed, followed in 1998 by the collapse of the 1,100 km<sup>2</sup> Wilkins Ice Shelf. In the last 50 years some 13,000 km<sup>2</sup> of ice shelf have collapsed in this region (Rapley, 2005). Current data also show that the Greenland Ice Sheet is melting faster than expected: the area of surface melt by the end of the 2002 season had broken all known records (NASA Earth Observatory, 2003). It is currently estimated that a global mean temperature increase of 2.7°C would surpass a threshold triggering the melting of the Greenland Ice Sheet (Tirpak et al., 2005). Sea ice in the Arctic is also in rapid decline. In September 2004, at the end of the summer melt, the extent of the sea ice was 13.4% less than average. Similar declines were observed in September 2003 (12% less than average) and in September 2002 (15% less than average) (NASA Earth Observatory, 2004). Some models predict a complete disappearance of Arctic summer sea ice by 2070 (NSIDC, 2004). In addition, the majority of the world's glaciers are in retreat, according to the World Glacier Monitoring Service.

## Global warming

Global mean surface temperature has risen by 0.7°C since 1900, and is projected by the IPCC to rise by between 1.4°C and 5.8°C above 1990 levels by 2100 (IPCC, 2001a). It is important to remember that we are talking about mean temperature for the global climate system (i.e. the mean of all temperature gauges all over the world) and not merely regional or seasonal variation in the weather. Furthermore, warming is unevenly distributed around the world – an average warming of 2°C globally may translate into 10°C of warming at the poles. To get an idea of the scale we are looking at: the last time the earth's mean surface temperature was 3–4°C warmer than today was around 34 million years ago, when Antarctica was 15°C warmer and was covered in forest (Barrett, 2001).

Current warming is attributed to a combination of

2 An 'ice shelf' is connected to land but floats on the sea (e.g. the Ross Ice Shelf over the Ross Sea in Antarctica). An 'ice sheet' is located entirely on the land; the only ones currently in existence are the Greenland Ice Sheet, the East Antarctic Ice Sheet and the West Antarctic Ice Sheet. The Greenland Ice Sheet is about 3 km deep at its summit.

natural and human-induced influences, the latter arising predominantly from an increase in atmospheric CO<sub>2</sub> concentrations.

## Greenhouse gas concentrations

The atmosphere is made up of two major gases (nitrogen, 78%, and oxygen, 21%), with the remaining 1% made up of a large number of trace gases. A small number of these trace gases are known as ‘greenhouse gases’ due to their ability to re-emit infrared radiation reflecting from the earth’s surface, acting as a form of insulation. This is due to the way their molecular structure interacts with infrared radiation. The natural greenhouse gases include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrogen oxide (NO<sub>2</sub>) and water vapour (H<sub>2</sub>O). These greenhouse gases contribute to the natural greenhouse effect that keeps the earth’s climate considerably warmer than it would be otherwise. If the earth had no greenhouse gases the global mean surface temperature would be about -19°C. With natural greenhouse gases we get a global mean surface temperature of about 14°C (a 33°C difference), which is much more suitable for life. If greenhouse gas concentrations increase, the mean surface temperature increases accordingly (IPCC, 2001a; Kump et al., 2004).

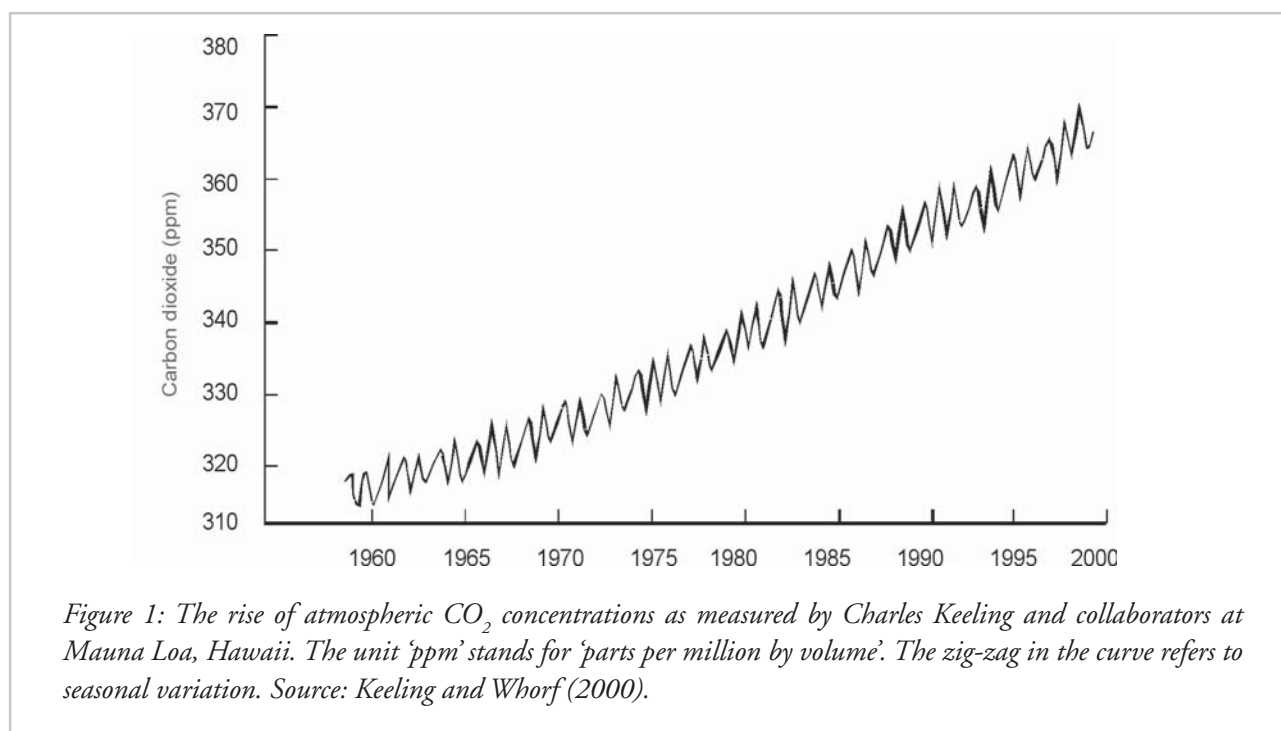
Atmospheric CO<sub>2</sub> concentrations have increased from 280 ppm (parts per million) in 1750 (IPCC, 2001a) to 374.9 ppm in 2003 (Blasing and Jones, 2005). This is an increase of over 30%. These levels are rising because of two global processes associated with economic development since the industrial revolution:

1. the transformation of large volumes of fossil carbon (e.g. coal, oil, natural gas) into atmospheric CO<sub>2</sub> from burning these fuels; and
2. the transformation of large volumes of living carbon (e.g. wood, soil carbon) into atmospheric CO<sub>2</sub> as a consequence of widespread deforestation.

About half of these CO<sub>2</sub> emissions are reabsorbed by the biosphere (predominantly the oceans), leaving about half of all that is emitted behind in the atmosphere (IPCC, 2001a). As the volume of CO<sub>2</sub> emissions has increased, atmospheric CO<sub>2</sub> concentrations have increased. One of the best examples of this global trend is the ‘Keeling Curve’, which shows a steady increase in atmospheric CO<sub>2</sub> concentrations from 1958 to the present (see Figure 1).

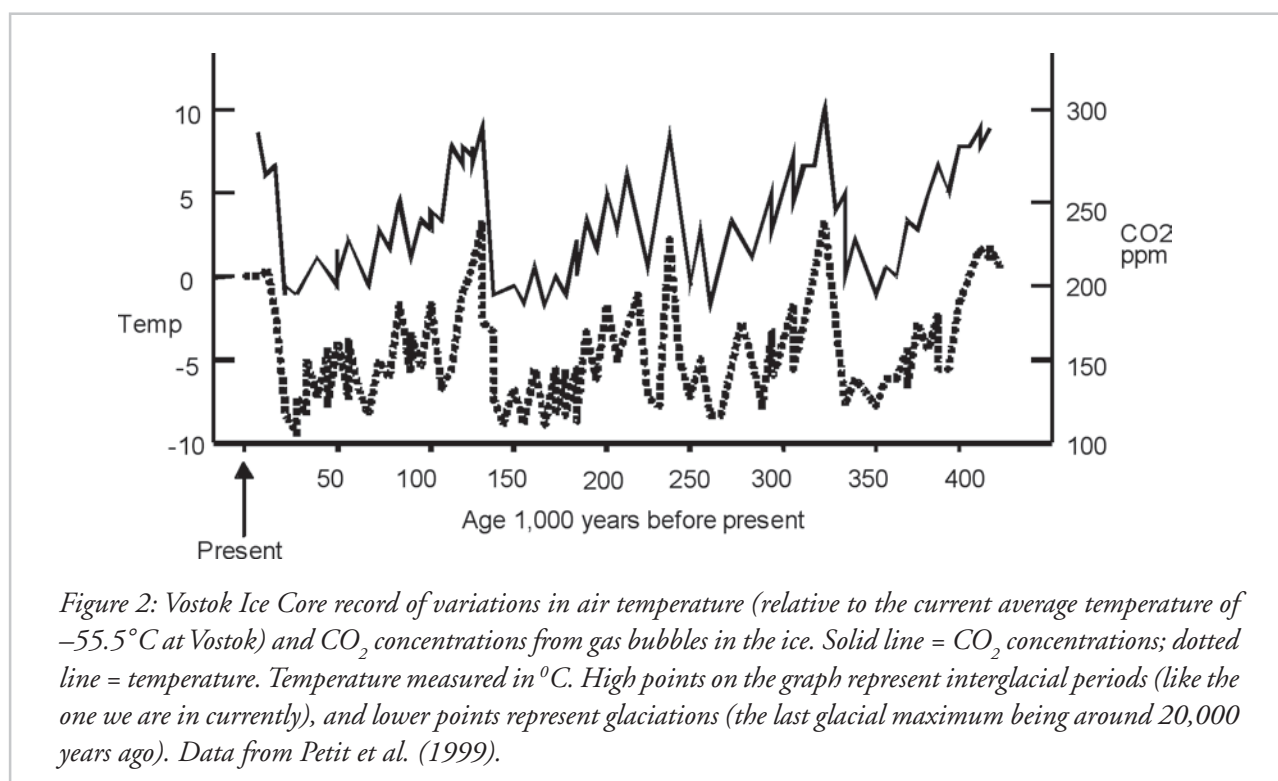
As indicated above, global warming is one of the consequences of rising CO<sub>2</sub> levels. Another consequence is an increase in the acidity of the oceans. More atmospheric CO<sub>2</sub> means more absorption of CO<sub>2</sub> by the

**Figure 1. The ‘Keeling Curve’ of atmospheric CO<sub>2</sub>**



*Figure 1: The rise of atmospheric CO<sub>2</sub> concentrations as measured by Charles Keeling and collaborators at Mauna Loa, Hawaii. The unit ‘ppm’ stands for ‘parts per million by volume’. The zig-zag in the curve refers to seasonal variation. Source: Keeling and Whorf (2000).*

**Figure 2. Vostok Ice Core record of past climate**



*Figure 2: Vostok Ice Core record of variations in air temperature (relative to the current average temperature of  $-55.5^{\circ}\text{C}$  at Vostok) and  $\text{CO}_2$  concentrations from gas bubbles in the ice. Solid line =  $\text{CO}_2$  concentrations; dotted line = temperature. Temperature measured in  $^{\circ}\text{C}$ . High points on the graph represent interglacial periods (like the one we are in currently), and lower points represent glaciations (the last glacial maximum being around 20,000 years ago). Data from Petit et al. (1999).*

ocean, which leads to an increase in the amount of carbonic acid in the water. At the current rate of  $\text{CO}_2$  emissions, ocean surface water pH will be 0.4 units more acidic by 2100 – a level unprecedented for 20 million years (Turley et al., 2005). This has two adverse effects of concern to human society:

1. The rate at which the oceans are able to absorb  $\text{CO}_2$  declines.
2. The biochemistry of surface waters changes, causing:
  - a. coral bleaching (in combination with higher sea surface temperatures); and
  - b. disruption to marine food chains (particularly as plankton, shellfish and the eggs and sperm of fish have a low tolerance to changes in acidity). This can pose a significant threat to fish stocks and the fishing industry.

## Understanding the present by looking into the past

To understand the significance of this increase in  $\text{CO}_2$  concentrations, it is helpful to look at the record we have built up of past climate through analysing several different records of past climate:

- the instrumental record (since the late 17th century);
- historical records of past living conditions (a few thousand years);
- tree ring data from living and archaeological wood specimens (a few thousand years);
- sediments on land and in lakes (thousands and tens of thousands of years);
- ice cores (hundreds of thousands of years); and
- deep ocean sediments (millions of years).

Of particular importance is ice core research from large ice sheets in Antarctica and Greenland, which provide a record of both past temperature and past atmospheric composition. Ice is laid down in annual layers, a little like tree rings. Air bubbles trapped in ice layers (as snow is compacted) provide a sample of past atmospheric composition and enable us to reconstruct a record of past changes in concentrations of different gases. Stable isotopes<sup>3</sup> of oxygen in the ice can be measured in these

<sup>3</sup> An isotope is one of several forms of an element (e.g. oxygen) with the same number of protons as the normal form but a different number of neutrons, giving it a different atomic weight. Unstable isotopes are radioactive, whereas stable isotopes are not.

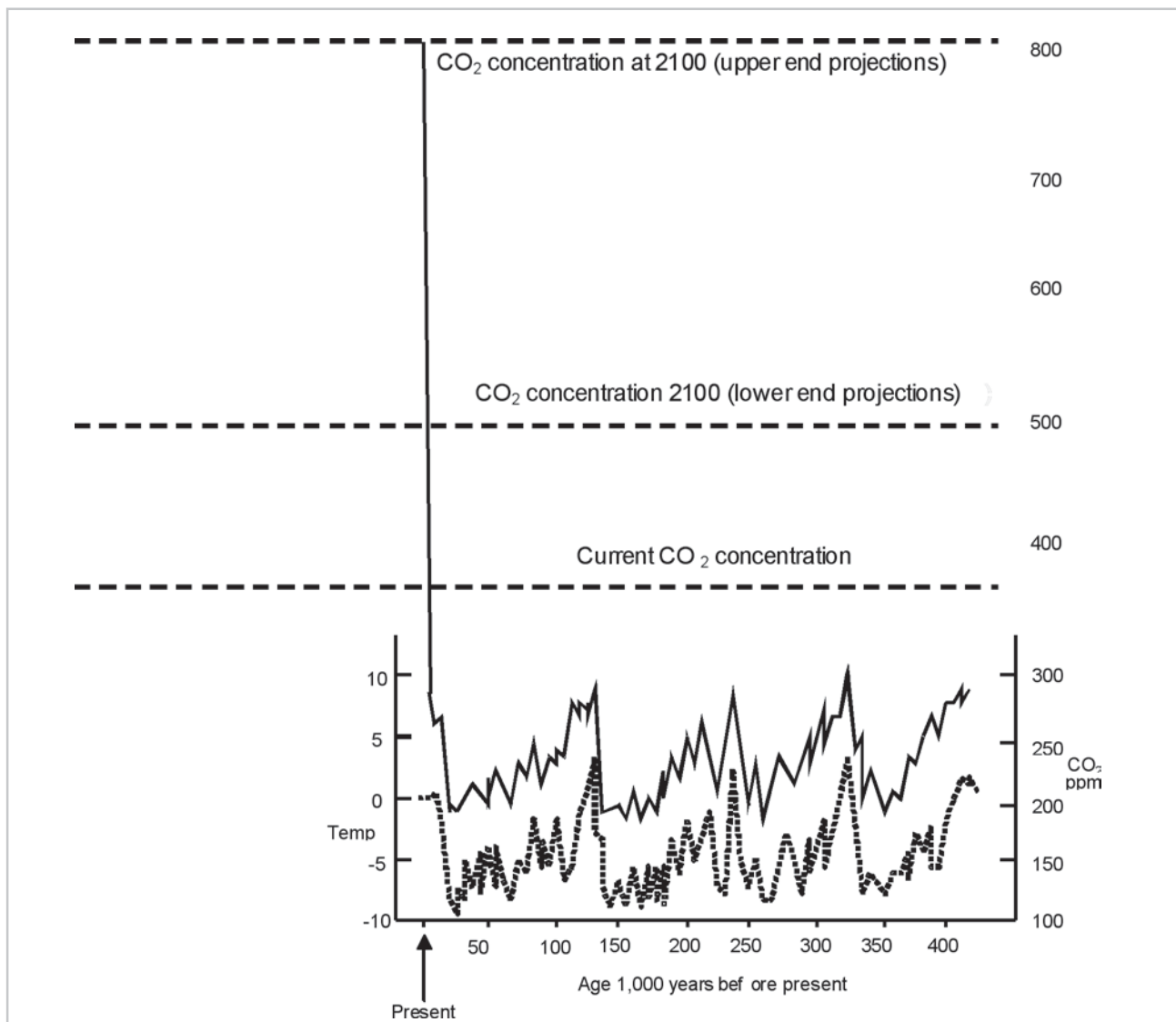
layers to give a proxy record of past temperature. The proportion of different isotopes in the ice is influenced by the temperature when this ice fell as snow. We can test the accuracy of this paleo-thermometer by measuring the oxygen isotopes in water, snow and ice in different parts of the world today (i.e. where there are different climates), and this has shown that the proxy record from isotopes matches the instrumental record very well (Alley, 2000).

When ice core data was used to reconstruct both past climates and past atmospheric gas compositions, an interesting correlation was discovered: when atmospheric

CO<sub>2</sub> concentrations were high, mean temperatures were also high. When atmospheric CO<sub>2</sub> concentrations were low, mean temperatures were low. A remarkable record of this parallel process can be seen in ice core records in both Greenland and Antarctica. The most famous is the Vostok Ice Core from Antarctica (Figure 2).

This close association between atmospheric CO<sub>2</sub> concentrations and mean surface temperature helps to show the likely effect of an increase in CO<sub>2</sub> concentrations as a consequence of industrial emissions. Broadly speaking, an increase in CO<sub>2</sub>

**Figure 3. Current and future projections of atmospheric CO<sub>2</sub> concentration**



*Figure 3: Current and future projections of atmospheric CO<sub>2</sub> concentrations based on the Vostok Ice Core baseline. Current CO<sub>2</sub> concentrations are well above interglacial peak concentrations for the last three interglacials. Future projections based on IPCC (2001a) projections under different mitigation scenarios.*

concentration is likely to lead to an increase in mean surface temperature because of the way CO<sub>2</sub> functions as a greenhouse gas, together with feedbacks in the climate system responding to increased temperature. One of the key feedbacks associated with warming derived from increases in atmospheric CO<sub>2</sub> is additional evaporation leading to an increase in atmospheric water vapour (a much more potent greenhouse gas than CO<sub>2</sub>). Consequently, the total warming triggered by additional CO<sub>2</sub> is greater than the warming that can be attributed to increases in CO<sub>2</sub> alone. There are many other feedbacks in the climate system, some positive (reinforcing the warming trend, e.g. drought, forest fires, snow/ice melt exposing darker land surfaces) and others negative (counterbalancing, e.g. increased reflection of solar radiation from increased cloud cover). It is the net effect of all positive and negative feedbacks that leads to an overall increase or decrease in mean global temperature. It is on this basis that the IPCC concluded that current trends in CO<sub>2</sub> emissions will translate into mean global surface temperature increases in coming decades.

One way to get a sense of the scale of change we may be facing (especially for a scenario where we do not cut back on CO<sub>2</sub> emissions) is to look at future projections for atmospheric CO<sub>2</sub> concentrations on the basis of current emission trends. Figure 3 shows what current atmospheric CO<sub>2</sub> concentrations look like against the historical backdrop, and what is likely for the next 100 years at two projection ranges (one very conservative and therefore accompanied by a high level of confidence, the other still within the realms of possibility but accompanied by more uncertainty).

As can be seen from this graph, current CO<sub>2</sub> concentrations are higher than they have been over the last 420,000 years (Petit et al., 1999; IPCC, 2001a). More recent research by the European Project for Ice Coring in Antarctica pushes this date back to 650,000 years (Siegenthaler et al., 2005). According to this study, current CO<sub>2</sub> concentrations are 30% higher; CH<sub>4</sub> (methane – a much more potent greenhouse gas) is 130% higher; and the rate of CO<sub>2</sub> increase is 200 times faster than at any time in the last 650,000 years. The IPCC also points out that current atmospheric CO<sub>2</sub> concentrations are quite possibly higher than at any time in the last 20 million years (IPCC, 2001a).

At the current rate of increase there is a high probability that atmospheric CO<sub>2</sub> concentrations will rise to double the pre-industrial level (from 280 ppm to 560 ppm) some time this century. The growing consensus among climate scientists is that this would lead to a mean warming of 3°C (Kerr, 2004). Recall that 2.7°C is probably enough to melt the Greenland Ice Sheet (other potential consequences are discussed below).

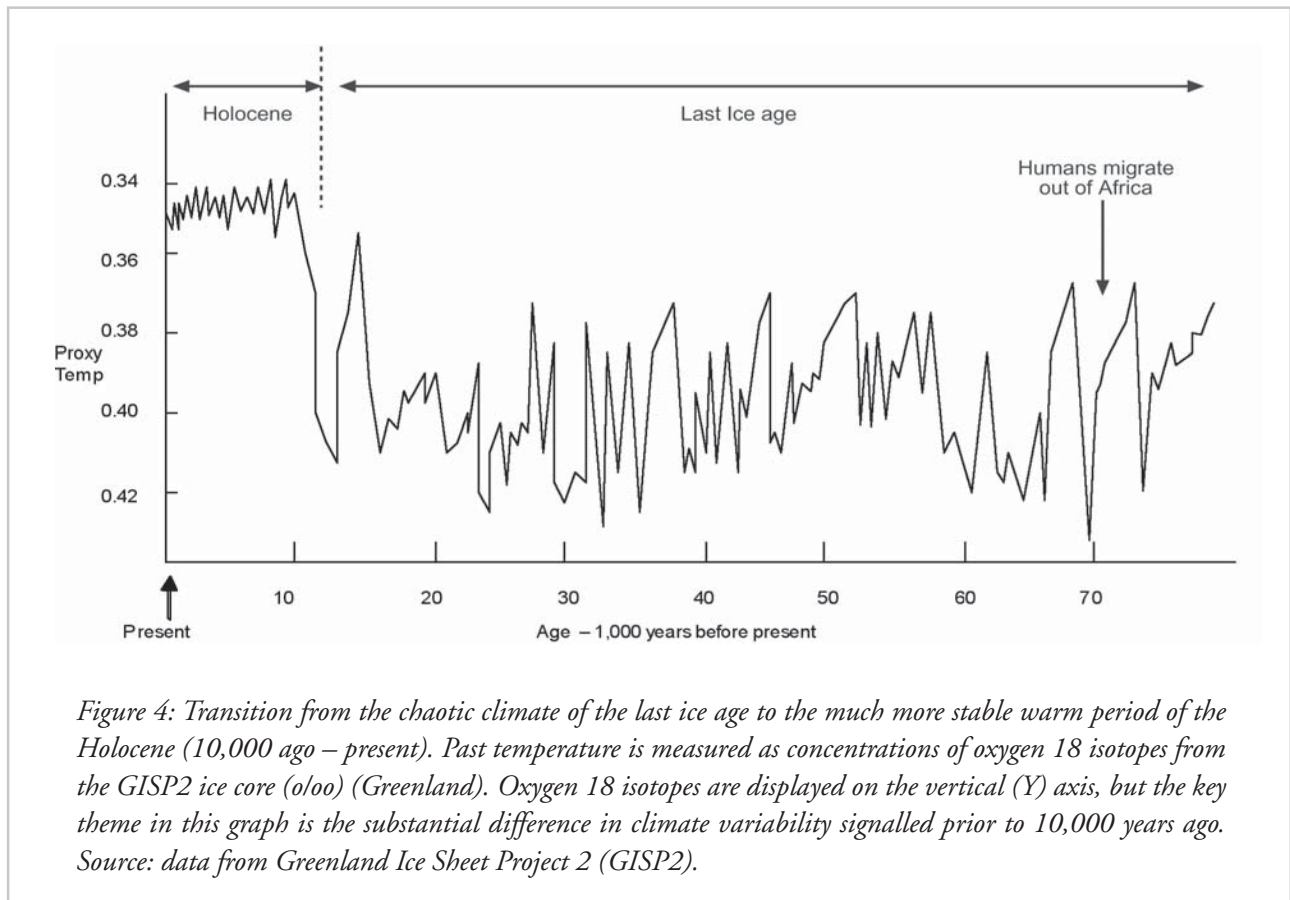
Another interesting finding from ice core climate research relates to changes in climate variability (the range of variation in the climate). During the last several hundred thousand years the climate has been characterised by huge and rapid shifts. Higher resolution paleoclimate records (especially for the last 100,000 years) show that huge swings in the climate have been the norm for this stage in the earth's history, and archaeological evidence suggests how very challenging this was for early human societies trying to cope with (and survive) the ice age. So, anyone who says 'climate change has happened throughout our prehistory' is right. If they also say 'and therefore it is not going to be a problem for contemporary society', they are way off the mark.

## Climate variability

To understand why future climate change is so threatening it is important to look more closely at the last 10,000 years in relation to the very unstable period that preceded it. The last 10,000 years is known as the Holocene Epoch, which refers to the current, relatively stable, warm period (interglacial) that we dwell in. Figure 4 shows a higher-resolution representation of past climate using oxygen isotopes as a proxy for temperature for the last 80,000 years.

This graph shows how the hugely variable climate that has characterised the last half million years changed to a very stable phase around 10,000 years ago. Agricultural societies first developed at this time (i.e. 12,000–10,000 years ago). Prior to this stable period, climate variability was much greater and would have posed a serious problem for potential agriculturalists who, as intelligent humans some 15,000 years ago (we have not evolved much as a species since that time), had to stick to nomadic hunting and gathering (see Burroughs, 2005). One distinct possibility is that the agricultural revolution happened at the same time that a change in the climate allowed it to become possible.

**Figure 4. Transition from the last ice-age to the current stable warm period**



Another feature of past climate that this graph (and many like it) reveals is the way that the climate has changed very significantly and very abruptly in the past. A good example is the sudden drop in temperature just before the Holocene (below and slightly to the right of the dotted line in Figure 4). This sudden cooling happened 13,000 years ago as we were climbing out of the last ice age, and is known to geographers and geologists as the ‘Younger Dryas’. Temperatures abruptly dropped to levels similar to the coldest part of the ice age, stayed cold for 1,300 years, and then abruptly warmed again (by 7°C), in three steps each lasting five years and spread over a 40–50-year period. This shows that sudden temperature shifts of 1.4°C–5.8°C in mean global temperature (i.e. the range predicted for this century by the IPCC) are certainly possible.

### Tipping point

One of the threats that accompanies contemporary climate change is that global warming in the coming

decades could push our stable climate beyond a critical tipping point, where it shifts into a different system state. One possibility is a return to the colder and highly variable climate that has been normal for hundreds of thousands of years (e.g. the right-hand side of Figure 4). But because current and projected atmospheric CO<sub>2</sub> concentrations are already out of proportion to conditions that prevailed for the last 650,000 years, there is a possibility that a shift to a new system state will take us into very uncharted territory, or at least into conditions that have not been seen for many millions of years (see Barrett in this volume).

There are a number of key components of the global climate system that, if triggered, could lead to runaway climate change, with potentially catastrophic consequences. These include:

- Shutdown of the northern portion of the Gulf Stream, leading to sudden regional cooling in western and northern Europe. This can be caused by the dilution



of North Atlantic surface waters as a consequence of melting ice caps and sea ice (Clark et al., 2002).

- Sudden sea level rise: portions of large ice sheets fragmenting and sliding into the sea, transferring their volume to the oceans and raising sea levels abruptly by tens of centimetres or a few metres;
- Tropical drought: a shift to a drier seasonal climate in the Amazon Basin and South East Asia, leading to the loss of their tropical rain forests and the release of large volumes of CO<sub>2</sub> from forest fires. Droughts have been intensifying in South East Asia and Amazonia in recent years and have been accompanied by large-scale forest fires. If the dry season in the Amazon Basin extends from four to six months, there is an increased chance of losing the rainforest (see Cox et al., 2004).
- Destabilisation of global methane reservoirs: release of huge volumes of methane (more than 20 times more potent than CO<sub>2</sub> as a greenhouse gas) from the sea bed and thawing permafrost. The record of permafrost thaw in recent years is well established (see NASA Earth Observatory website). The oceanic methane reservoir (thousands of gigatons of carbon – much bigger than the conventional fossil fuel reservoir) exists as a form of ice in seabed sediments (below 500 metres depth in warmer regions and below 200 metres in the Arctic), and remains stable under cold water temperatures and/or high pressure (Kennett, 2002). The releases of large volumes of methane from this source have been associated with large submarine ‘landslides’ occurring in tropical waters during cold periods and in polar waters during warm periods (Maslin et al., 2004), possibly due to changes in ocean currents at intermediate depths. If this methane were released it would trigger further global warming.

## Challenging civilisations

Clearly, human communities lived in many parts of the world during the chaotic climate prior to the Holocene, which suggests that we will survive if conditions return to this situation. Surviving as a species and thriving as a global civilisation are two different things. One key difference between the ice age and now is that back then our total population would have numbered in the millions, whereas now we have 6.5 billion people to support (rising by 90 million every year), and most of

us are reliant on a relatively stable climate for our food supply and a relatively stable economic system to distribute it (almost half of the human population now live in cities).

It is also important to remember that civilisations only became possible when agriculture enabled the production of food surpluses, allowing a sedentary existence in towns and cities, population increases, a division of labour and the build-up of large armies. Even though climate variability during the Holocene has been relatively small (compared to the norm for the last 400,000 years), these relatively small shifts have been enough to collapse civilisations. For example, around 5,000 years ago there was a relatively minor climate shift that transformed the Sahara from arable land to desert.

Historically, one of the biggest killers of human societies is drought. Droughts lead to crop failures and food shortages, which bring economic losses that can help civilisations fail. The demise of the Akkadian civilisation of Mesopotamia 4,200 years ago, the fragmentation of Egyptian civilisation following the Seventh and Eight Dynasties around the same time, the sudden decline of the eastern Mediterranean economy around 3,000 years ago and the fall of the Mayan civilisation in the ninth century all coincided with shifts to a drier climate (Burroughs, 2005). None of these shifts was accompanied by the scale of atmospheric CO<sub>2</sub> concentrations we now face. Of course, we now have more developed economies and technologies, but our economies still rely heavily on natural resources that, in turn, are reliant on a favourable climate.

## Agriculture

Agriculture is based on the geographical intersection of fertile soils with a favourable climate and water supply. When the climate regime changes, this important partnership is threatened. This theme did not escape the Pentagon, which commissioned a report in 2003 on the threat of abrupt climate change in the 21st century. It anticipates ‘harsher winter weather conditions, sharply reduced soil moisture, and more intense winds in certain regions that currently provide a significant fraction of the world’s food production. With inadequate preparation, the result could be a significant drop in the human carrying capacity of the Earth’s environment.’ It warns of food shortages due to

decreases in net global agricultural production, decreased availability of fresh water in key regions, and disrupted access to energy supplies for the United States (Schwartz and Randall, 2003).

Even in the absence of a change in the system state of the global climate (e.g. shifting from a stable to a very unstable condition), warming trends within the current system state are likely to lead to shifts in the distribution of precipitation, with droughts intensifying in some areas and increased rainfall (and consequent flooding) in others. Conservative estimates show that water shortages are likely to affect agricultural productivity, particularly in drier regions such as south western and south eastern Australia, south western United States, Mexico, much of northern Africa, parts of northern China, parts of India, Central Asia, the Middle East (IPCC, 2001b; Arnell, 2004) and eastern New Zealand (IPCC, 2001b).

## Storms

Increased sea surface temperatures lead to increased evaporation, which puts more water vapour into the atmosphere. This increases the amount of latent heat in the weather system, which means there is more energy for storms (i.e. they get more powerful). Different studies published in the top scientific journals (*Science* and *Nature*) during 2005 independently reported an increase (globally) in the frequency and/or severity of hurricanes. One study using satellite data found that the number of category 4 and 5 storms doubled during the past 35 years in an environment of increasing sea surface temperature. They concluded that larger storms now occur 20-35% more frequently than smaller storms (Webster et al., 2005). Another study looked into storm intensity and found that the power of storms had increased significantly over the past 30 years in all the regions studied, a result that is consistent with an increase in sea surface temperature (Emanuel, 2005). Because no storm comes with a bar code to identify whether it is a consequence of climate change, we can never blame climate change as the sole culprit for any single event. What we can do is expect an increase in the frequency of severe storms and the cost they impose on the economy if the global climate continues to warm.

Storms over the ocean generate storm surges which temporarily raise sea levels locally (as happened in New

Orleans in 2005). When combined with the global rise in sea levels expected in the 21st century (20–80 cm), storm surges from a larger number of more powerful storms pose a significant threat of economic damage to low-lying regions and countries, coastal property, infrastructures and coastal cities. The cost of these kinds of events is not insignificant. When insurance costs are combined with Federal outlays, the total cost of Hurricane Katrina has been estimated at US\$200 billion (MSNBC, 2005).

## Adaptation and mitigation

There is not room here to present the many other impacts of climate change, in areas ranging from human health to biodiversity, fisheries sustainability, coastal erosion, financial systems, insurance, infrastructures and migration, to name a few. Those inspired to have a closer look can explore these themes by reading the 'Summary for Policy Makers' for each of the three volumes of the IPCC Third Assessment Report (available online at <http://www.ipcc.ch/>).

Ultimately, climate change will be expensive, whether from the direct impacts of a changing climate on our economies, the cost of insurance, or from the investments we will need to make in adaptation and mitigation. Either way, it will continue to climb up the policy agenda in coming years, as more and more people realise the scale of the issues and the nature of the threats.

Two things remain clear:

1. Adaptation: we are committed to future climate change irrespective of what we do regarding emissions reductions, and as such we will need to invest in adapting to this change.
2. Mitigation: if we want to be capable of adapting successfully we will need to lower the scale of the impacts that climate change promises to deliver. Fortunately, we do have some degree of control over this, and it relates primarily to the volume of greenhouse gas emissions we choose to put into the atmosphere annually. This is a global challenge and the target is to stabilise greenhouse gas concentrations to avoid dangerous anthropogenic interference with the climate system (to use the language of Article 2 of the United Nations Framework Convention on Climate Change).

There is also insufficient room here to adequately explore the themes of adaptation and mitigation, but a few

things are worth mentioning. Because about 80% of human-induced greenhouse gas emissions have arisen from the burning of fossil fuels, any realistic approach to mitigation will need to confront the global carbon-based energy system and change it (sequester the carbon, move to alternatives, dramatically increase energy efficiency, and lower per capita demand). This will not be easy, as currently 85% of global energy consumption is based on fossil fuels, with 86% projected for 2025 (EIA, 2004). In the absence of any significant change in energy systems, continued growth in world fossil fuel use will increase global CO<sub>2</sub> emissions by 1.9% per year for the first quarter of the current century. This would mean an increase from 23,899 million metric tons in 2001 to 37,124 million metric tons in 2025 (EIA, 2004). On this basis, by 2025 global CO<sub>2</sub> emissions will be 72% higher than 1990 levels. In the meantime, the Kyoto Protocol is attempting to get countries to stabilise emissions at 1990 levels.

No country can claim to be exempt from the impacts of climate change or its causes in carbon-based energy use and deforestation since the industrial revolution. For this reason the response has to be a global partnership, with each nation making a contribution to the solution. This also means that domestic policy and international negotiations need to be in sync. No single country can solve this problem alone. If the United States and the United Kingdom adhered to an emissions target but China and India didn't pursue one we would still be no better off as a global community.

Even countries like Tuvalu and New Zealand that stand to suffer the impacts but do not make a major contribution to the global problem (because of low population rather than low per capita emissions) will need to participate in this solution partnership. Domestic policy in such countries amounts to a contribution in physical terms to the global emissions reduction goal, but also enables those countries to advocate strongly in the intergovernmental arena and avoid the less convincing 'do as I say, not as I do' approach to international negotiations.

## Conclusion

Climate change presents a significant challenge, but one that we are definitely capable of meeting as a global community. Understanding the nature of the risks involved can help in priority setting for present and

future actions. Furthermore, the scale of the response needs to be in proportion with these risks.

The solution path invites both change and continuity: change in the way we fuel our economies and manage our resources; continuity in the role of innovation and ingenuity in the task of progress. We have an abundance of intellectual resources for this task. All that is needed are the policy and political resources to make it happen. A significant barrier is the perceived cost of choosing this path. Understanding the scientific backdrop to climate change policy, however, can help cultivate an appreciation that working to protect what we have spent the last few centuries building is a very worthy investment.

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# Is There Now a Role for Economic Instruments in New Zealand's Domestic Climate Change Policy?

Murray Ward

## Introduction

In late December 2005, the reconstituted Labour-led government announced that a carbon charge would not be introduced in 2007. Indeed, it now appears that there will be no broad-based economic instrument to mitigate climate change before 2012. This story made the world's climate change press. A carbon charge has been on New Zealand's policy agenda since the mid-1990s, and until very recently had been supported by both centre-right and centre-left governments. It was the centrepiece of the climate change policy announced by the Labour-led government in 2002 when it ratified the Kyoto Protocol. So why the abrupt change of policy?

It is likely that politics played a key role. The government had not enacted legislation in its previous term to give effect to the planned carbon tax. As a result of the general election in September 2005, it was questionable whether the new minority government could muster the numbers to pass such a bill. During the election campaign four parties, including two that would become support partners for Labour in October 2005, spoke out strongly against the carbon tax – and Kyoto. Moreover, the 'carbon tax' had become demonised over recent years by a range of business groups.

This brief article does not delve into the politics of this situation. Rather, it looks at the role in the decision to abandon the carbon tax of an interdepartmental Policy Review commenced in mid-2005, and delivered to the new Cabinet in early December. The Review was started because of a realisation that New Zealand is no longer on track to be a net seller in the Kyoto market. For years it had been thought, based on projections, that New Zealand's considerable growth in emissions (along with growth in its economy) would still be more than offset by the sink credits generated from its afforestation efforts in the 1990s. The news had changed in early 2005 when officials did their annual inventory and

projection sums based on the actual planting rates and using the recently agreed new international rules for accounting. Now there is a projected deficit, not surplus.

## The Policy Review and officials' advice to the Cabinet

An assessment of the Cabinet paper presented to the new government on the outcomes of the Policy Review reveals key policy issues and raises many questions.<sup>1</sup> The advice represents, to a significant degree, a full rebuttal of the use of economic instruments that were the core of the 2002 policy package to address climate change issues. This has been surprising to many observers, as they had expected an outcome of the Review to be a ramping up of policy efforts, not a wholesale deconstruction.

Key features of the advice and recommendations include:

- With respect to the carbon charge – referred to as the 'carbon tax model', which incorporates the negotiated greenhouse agreements (NGAs) element – the Cabinet paper asked the Cabinet to *agree* that the carbon tax would not start at the previously announced date of 1 April 2007, and also to *agree* on one of four options. Three of these entailed, to varying degrees, not introducing a carbon tax or any other broad-based greenhouse gas tax; the fourth was to defer a decision until early March 2006 following further consideration of the outcomes of the Review.
- In keeping with these *agree* recommendations, the Cabinet was asked to *note* the Review Report's conclusion that emission reductions cannot be achieved at the lowest cost if NGAs and the exemption for livestock methane and nitrous oxide from a greenhouse gas tax were extended well beyond 2012, and that the carbon tax and associated NGAs are unlikely to be

<sup>1</sup> The report of the Policy Review and the Cabinet paper and associated Cabinet minute can be found on the New Zealand government's climate change website at <http://www.climatechange.govt.nz/>.

sustainable over the medium term and would need to be replaced by some other policy package.

- On agricultural emissions (methane and nitrous oxide from livestock), the paper asked the Cabinet to *confirm* that these emissions would remain exempt from any broad based greenhouse gas tax until 2012.
- On the Projects to Reduce Emissions (PRE) programme, the Cabinet was asked to *agree* that the third round would not proceed.
- On emissions trading, the Cabinet was to *note* that one of the key findings of the Policy Review was that the government should not develop a New Zealand emissions trading scheme to apply in the period 2008–2012, but should consider it for post-2012.

Of the *agree* options provided on the carbon tax, the Cabinet decided not to introduce the carbon tax model or any other broad-based greenhouse gas tax before the end of the Kyoto Protocol first commitment period (KP CP1) – while noting that this did not preclude a more narrowly-based tax on large emitters if this was deemed appropriate.

Against this, with regard to the PRE programme, the Cabinet rejected the advice received and agreed that the third round would proceed. In keeping with this, it directed officials in their March 2006 report back to provide advice on how to achieve greater assurance that the emission reductions resulting from projects will be greater than the emission units given away to project owners.

What was the thinking that underlay this sweeping rejection of the 2002 policy package on climate change? A perhaps cynical and boiled-down judgement of the Policy Review and the related Cabinet paper might be that it ended up in something of a ‘policy no man’s land’. The Review seems to seek efficiency through broadly applied price-based measures. Exemptions from these ‘sticks’ are seen as distortionary and inefficient. But then there are competitiveness issues, and the practicalities of applying stick measures to the agriculture sector. Linking to the international carbon price seems scary. Other possible economic instrument tools (like projects schemes) are really just subsidies, so they are bad. Smart revenue recycling? Not even contemplated. And emissions trading is just all too complex. So what is the answer? Give up on economic instruments and just have the taxpayer buy New Zealand’s way out of KP CP1. And adjust the environmental goals so this doesn’t look too bad. Oh, and better not think too hard about CP2 ... for now at least.

This may be overly harsh. But where has the Policy Review got to, or pointed to, that is significantly different than this? One matter is clear: the Review will not have added any certainty in this important area. Yet policy certainty is a key objective of business, and a valuable commodity in other respects.

## The 2002 policy environment and policy package

A more analytical and objective assessment of the Policy Review reveals some key points. The first is how little the 2002 policy and its underlying objectives seem to be now remembered and understood. The overarching policy environment in 2002:

- took the economic and social risks of climate change to New Zealand and the immediate Pacific region seriously, and set domestic policy within a risk management strategy that involved New Zealand actively seeking greater engagement of the world’s large emitters. This strategy recognised the importance of this country maintaining credibility in order to be effective in this effort;
- cared about the efficiency of New Zealand’s response and worried about costs imposed on the economy and taxpayers as a result of inefficient investments with long-term emissions consequences;
- assumed that it was more likely than not that quantitative constraints on countries’ greenhouse emissions would become more stringent in the future; and
- considered that New Zealand’s international credibility would be seriously affected if it withdrew from international action to address the risks of climate change, and that this effect on international credibility could have severe economic and political implications across New Zealand’s wide range of engagements with the outside world.

Put simply, the prime objective of using economic instruments and putting them at the core of the 2002 policy was to place an *opportunity* cost linked to the international price of carbon on all emissions in the energy sector. This was to be done through an innovative mix of policy tools. The use of economic instruments to help manage CO<sub>2</sub> emissions reflected the desire of the government to tilt the economic playing field towards climate-friendly actions, both on the supply side (e.g. new

investments in electricity generation more likely to be renewables or higher efficiency/less carbon-intensive thermal) and the demand side (e.g. improved economics of energy efficiency and fuel switching measures).

A policy tool, or package of tools, was needed to do this. The 2002 package, arrived at after many years of analysis and rounds of stakeholder consideration,<sup>2</sup> chose a carbon charge at the estimated international price as the core economic policy tool. This charge was primarily on CO<sub>2</sub> emissions in the energy sector. All revenue from climate change policies was to be redistributed back into the economy, e.g. through the tax system and climate change projects/programmes.

Recognising the potential 'lose-lose' situation<sup>3</sup> that may be faced by many of New Zealand's leading industries that face significant international competitiveness risks, the policy included a negotiated greenhouse agreements exemption programme. A set of Kyoto-like flexibilities were included to ensure these firms would also face the opportunity cost of the international carbon price.

Agricultural sector non-CO<sub>2</sub> emissions and some other non-CO<sub>2</sub> emissions were not covered by the charge. Instead, government sought a funding partnership for research to find opportunities to reduce emissions. This recognised the different nature and number of opportunities and decision makers in these sectors.

To address the potential of inefficiencies in sectors not covered by the charge, and even those covered by the charge where market failures may exist, a projects-based scheme was proposed that would see emitters faced with the opportunity cost of the international carbon price. But this could be done without imposing a cost.

The final part of the package was that it could be converted to more of an emissions trading model relatively seamlessly if the international conditions became appropriate. In 2002 it was uncertain if or when this might be the case. (By 2005 it had become clear that most countries with Kyoto targets see emissions trading as their core market-based policy tool, not a carbon charge.)

2 In contrast, many groups complained about the Policy Review's 'closed shop', non-transparent process.

3 Emissions displaced outside the Kyoto cap that covers New Zealand's means an absolute increase of emission to the atmosphere. The second 'lose' is the reduction of economic activity in New Zealand.

## New thinking

The hinge pin of the Review's new tack might be seen in a discussion on whether it is important for New Zealand to be linked to the international price of carbon. This issue is taken up in the Review following a section discussing possible alternative policy options. After making the point that the 2002 policy is based on a central principle that the carbon price should reflect the international price, it goes on to say:

*Most of the options discussed earlier in this section involve a decoupling of the domestic price from the international price in the short term (to 2012), and some options would continue this into the medium term and perhaps longer. Does this matter?*

In short, this section concedes that in the event that New Zealand faces a quantitative commitment, as in Kyoto's CP1, the taxpayer will bear the cost of any additional emissions that may occur because the international price is not reflected: 'Taxpayers would pay more and emitters would pay less.' But it says this fiscal outcome needs to be 'weighed against any adverse effects from a reduction in international competitiveness and, ultimately, in economic growth'.

However, this 'weighing up' is not then done in any analytical fashion. Nor is there any real analysis behind the circular argument:

*As long as New Zealand's commitment to fulfilling its obligations under the Kyoto Protocol was credible, it is unlikely that the country's international credibility would suffer if the domestic price of carbon were below the international price.*

And it goes on:

*Beyond CP1, if New Zealand had specific quantitative commitments, the issues would be the same. However, if New Zealand did not have such commitments, and did not intend to have such commitments in the foreseeable future, there would be no benefit from having the domestic price reflecting the international price.*

This seems to suggest that New Zealand may opt out of taking on future commitments in the international regime that will come after 2012. In turn this indicates that some in government have not bought into the

seriousness of climate change or the risk management strategy that underpinned the 2002 policy package.

## The way forward

Officials have now been directed to report back to ministers in March 2006. Part of this will be on a work programme to develop a replacement set of policies. Also on the table is a restatement of the overarching objective(s) for climate change policy because it is now seen as ‘unrealistic for New Zealand to achieve its internal target, namely gross emissions being set towards a permanent downward path by 2012’. One implication of this is that New Zealand might set a less challenging target at the very time the evidence is pointing to the need for urgent global action – and this is now being taken up daily in the world’s media. What would this do to New Zealand’s international credibility?

Given the significance of the issues at stake, what is needed is a robust and inclusive process that engages the country’s best minds, from both within and outside government, with the objective of developing a coherent and durable climate change policy. Before officials and interested stakeholders begin to delve down into the details of possibly over-narrow tracks, this process should first step back and tackle the following set of high-level issues:

### Risk management

Internationally, governmental initiatives to mitigate climate change are seen as increasingly urgent. Much more action needs to be taken globally in the next 10–20 years to help prevent the crossing of tipping points<sup>4</sup> that would lead to consequences described by many leading scientists and world thinkers as ‘catastrophic’. What is New Zealand’s strategic approach to managing such risks? How important is the credibility of our domestic action?

### Economic efficiency

Unless New Zealand is contemplating backing away from any future international climate regime that generates an international carbon price, the principle that the international price of carbon should somehow guide efficient decision making in New Zealand must still hold. Or are we prepared to have the taxpayer foot the extra bill caused by inefficient decisions (for the lifetime of their effects) by just buying in overseas units?

4 Google ‘tipping points and climate change’ to get a good sense of the recent evidence on and media attention to this.

Economic instruments are widely regarded as being the means to get the carbon price signal to the correct point of decision making. Private agents (firms and individuals) know much better than government what their opportunities are to take cost-effective actions. But price-based (stick) policy tools should not be the only ones in the economic instrument toolkit that New Zealand will consider. For some sectors and actors in the economy, it needs to look also to other tools that can provide incentives at the international cost of carbon without imposing a cost of emissions. But how far is the use of ‘carrots’ acceptable?

## Implementing and sustaining policy

In a policy area with the potential economic and social impacts of climate change, business and public support is critical for policy to be implemented and sustainable over time. This does not mean that policy cannot also be flexible and evolve over time as circumstances change (e.g. uncertainties become resolved). Two key issues are evident here:

- Do we expect that legitimate concerns about international competitiveness will continue for many of our major industries, and that domestic climate change policies should take heed of these concerns while they exist? In short, are (reviewable) exemption policies acceptable?
- Can revenue recycling be considered outside the trap of tax policy orthodoxy, so that price-based economic instruments can be used and garner popular support?

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# New Zealand's Energy Future: A Review of *A Sustainable Energy Future for New Zealand by 2050* and *Future Currents*

Ralph Chapman and Ken Piddington

## Introduction

Not for a few decades has there been a greater level of concern about New Zealand's longer-term energy future, and the interplay between energy issues and climate change issues. In particular, energy issues continue to vex many New Zealanders, not least those facing the prospect of new electricity transmission pylons south of Auckland, energy users worried about supply shortages over the next winter, and vehicle drivers facing another oil price increase as crude oil in world markets hovers around US\$70 per barrel. At the same time, concerns about climate change are intensifying, with some arguing that New Zealand government policy advisers and ministers have failed to grasp the magnitude of this issue. Currently, advisers are exploring new climate change policy instruments, following the government's decision to drop the carbon tax which had been scheduled for introduction in April 2007.

Issues of energy insecurity, peak oil and climate change were all identified in the government's *Sustainable Energy* document of October 2004; what is surprising, even taking into account the discontinuity of the 2005 election, is the lack of progress on them since 2004. A positive sign, however, is the reference in the November 2005 Speech from the Throne, where it was stated that 'the Government would in this term explore a wide range of potential energy scenarios, in order to develop a National Energy Strategy'.

Leaving aside some lower-profile research contributions (e.g. Sims et al., 2005; Ministry of Economic Development, 2003; Chapman et al., 2003), two key recent documents have begun such an exploration, sketching out paths to a range of energy futures. They are the New Zealand Business Council for Sustainable Development's document, *A Sustainable Energy Future for New Zealand by 2050: a business view* (September

2005) and the Parliamentary Commissioner for the Environment's *Future Currents: electricity scenarios for New Zealand 2005-2050* (July 2005). We review the approaches taken and conclusions reached in the two documents. In doing so, we emphasise the strong connections between energy and climate change policy for New Zealand. We give more space to the Business Council's document simply because, covering energy as a whole, it takes a rather wider view than the Parliamentary Commissioner's document, which focuses only on electricity.

## What does the Business Council document do?

The Business Council (BCSD) document scans the wider energy sector, and in so doing provides a well-researched account of perspectives of interest to the business sector. It starts from the hypothesis of *transition* – meaning that in 2050 New Zealand's energy sector will have a much more sustainable profile than we see in that sector today. It also builds in a timeframe for the decisions which have to be made in order to achieve 'energy sustainability' by that date.

The BCSD document aims to raise awareness within the business sector of how the economy's future demands for energy could potentially be met in a more environmentally sustainable way, if certain policies are adopted. The analysis is cast at a headline level in terms of achieving *energysustainability* (which need not imply environmental sustainability), but the text does in fact put considerable weight on environmental goals.

The BCSD document uses a set of four scenarios to explore possible energy future paths and reach certain outcomes by 2050. It is less clear on the process that might be followed in order to reach the outcomes, although in its final paragraph ('The Challenges Ahead')

it does assign a leadership role to government ‘in ensuring that we keep our energy options open’.

The scenarios are focused around two main dimensions: GDP growth and energy demand growth. By focusing on these two dimensions, greater and lesser degrees of decoupling (of economic growth from energy demand) are explored. Decoupling of economic growth from environmental impact, and issues of energy security, are also explored (e.g. reduced environmental impact occurs in those future states where low energy demand is projected).

Although the two chosen dimensions of focus (GDP and energy demand) are not the only possible two dimensions to choose as the basis of energy scenarios, they are undoubtedly important to New Zealand business and to others. Other dimensions of importance both to New Zealand business and to the wider community, but only lightly sketched are environmental sustainability, social/behavioural change and ‘energy services’ (rather than energy demand *per se*).

### Strong points of the BCSD document

The BCSD report is valuable in a number of ways for any dialogue about future energy paths.

First, the scenario approach helps the report’s audience to visualise a number of future paths which the economy and society could take, and underlines the key point that strategic choices need to be made by both government and the business sector.

Second, the report recognises the key issues of both ‘peak oil’ and climate change. However, a view that ‘global oil production will peak sometime over the next 50 years’ is too relaxed a view of this (Hirsch et al., 2005), and the document also radically underestimates the importance of early moves to decarbonise our energy system (see below).

Third, the BCSD report recognises the importance of maintaining system resilience and adaptability by not closing options through poor decisions (i.e. providing ‘optionality’).

Fourth, it acknowledges that energy infrastructure decisions made now have ramifications for many years ahead. As the report states: ‘We made [at various points in our history] large infrastructural decisions that set

the course of our energy use for years to come’ (p.5). A corollary is that ‘Infrastructure investment risks are high and mistakes have long-term costs’ (p.5). This point is vital: the effective lifetime of our urban form, for example, is more than 100 years, exceeding even the lifetime of our hydro power stations. In economic terms, there is major ‘path dependence’ in urban form and other infrastructure decisions, which means that we need to consider timeframes of at least 50 years when investing in energy use or production infrastructure. The likelihood that peak oil and climate change will have fundamentally altered the energy picture by then is very high.

Lastly, many of the BCSD’s recommendations make sense; for example, that ‘the government needs to understand what drives the acceptability and uptake of energy and usage options in New Zealand’ (p.19). This may sound obvious, but the empirical work has often simply not been done to generate an adequate picture of uptake and behaviour.

### Gaps in the BCSD approach

#### Environmental sustainability

There is some welcome attention given to environmental sustainability (see ‘Sustainability criteria assessment’ for each scenario, pp.10-11), but the report in our view radically underestimates the importance of climate change to New Zealand’s energy future. Climate change is factored in, but not adequately. For example, even rough indications of future CO<sub>2</sub> emission paths are not provided. Undoubtedly, careful modelling of CO<sub>2</sub> emissions would have been complex, but indicative assessments would have been valuable, given the importance of being able to assess scenarios in terms of climate change policy contribution and policy risk.

The scenarios do acknowledge climate risks, but underestimate the risk of New Zealand facing tight constraints on energy choices due to climate change developments. For example, it is stated that ‘New Zealand *may become constrained* by the way we limit or alter our use of fossil fuels to mitigate potential climate change impacts’ (p.3, emphasis added). New Zealand is already constrained by choices of fuels in the past (e.g. use of Maui gas) and will very likely be heavily constrained by climate change requirements in the future. There is a substantial likelihood of New Zealand

having to make deep reductions in fossil fuel use within a decade, if climate change impacts accelerate or projections become more alarming (e.g. Hansen, 2005), unless we can find other ways to substantially cut our greenhouse gas emissions.

### Social/behavioural change

The BCSD report does not ignore the need for behavioural change ('we will require behavioural change', p.18), but it underplays it, at least in terms of headline presentation, in favour of a stress on technology (especially carbon capture and storage, or CCS) and efficiency.

There is some implicit attention to changes in social and behavioural patterns (e.g. under 'How we live', p.12; in respect of both Conservation and Transformation scenarios, pp.10-11, brief reference to affordability; and p.19) but this tends to be overwhelmed by the focus on technological change. This is captured in the statement that 'We can have high growth and environmental standards only if technology developments are realised' (p.14). This underplays the importance of behaviour (and underlying attitudinal) change.

Similarly, the report's approach does make some connection between social outcomes and energy demand (e.g. 'demand will be an outcome of the type of society we want to build' (p.8)), but this is not elaborated significantly. Moreover, the various dimensions of social and behavioural change are not explored in depth. It would have been helpful to see a discussion of the relative scope for technological as against social/behavioural change.

The report does acknowledge that this is a 'gap': it states towards the end that 'The focus of the scenario analysis has been largely technical and economic' (p.16). However, it then draws a conclusion which is debatable; that those scenarios which involve more rapid change from 'business as usual' (i.e. the Transformation and Conservation scenarios) suppose 'changes in our society which result in a general acceptance of *more direction* about the way we use energy' (emphasis added). This remark might be interpreted as doubtful about the acceptability of 'direction'. However, substantial behavioural change might follow from a judicious combination of education, information and application of (reasonable) economic incentives.

### Energy services

The report is light on distinguishing the demand for energy *services* from energy, yet this is an important distinction if demand is to be fully analysed. There is a reference (p.10) under the Transformation scenario where it is stated that 'change has been assisted by a radical focus on the way New Zealand's social and transport needs are met', but this is not elaborated. Moreover, there is some detailing of transport energy demand (p.12), but little discussion of adaptation (or otherwise) of transport services.

Rather, the approach taken in the report is essentially to distinguish a high rate of AEEI (autonomous energy efficiency improvement) in two scenarios – Transformation and Conservation – from a low rate in the two other scenarios – Growth and Shielded. The two AEEI rates assumed are 1.5% and 0.75% respectively (p.8). While these rates are not implausible, the approach is a 'black box' one - it is not evident what evolution in energy service demands lie behind these numbers. For this reason, the projections of energy demand in 2050, especially the higher ('business as usual'-type) demand projections, should be seen as indicative only.

### Trade-off emphasis

A feature of the discussion on p.18 is the emphasis on trade-offs ('For a sustainable energy future we face trade-offs between affordability, security of supply and environmental protection'). This formulation is repeated in the conclusion (p.20). This has some immediate appeal – some hard choices will always be necessary – but this particular trade-off does not necessarily stand up. No compelling substantiation of this trade-off is offered.

It can, on the contrary, be argued that in order to maintain development in the longer term that can be 'afforded' in a broad sense, both environmental protection and security of supply are vital. Without investments in technology and behaviour change that are socially and environmentally responsible, the likelihood of ongoing sustainable development is severely reduced. This requires a range of actions going beyond mere 'broadening' (p.18) of renewables: a dramatic uptake of available and new renewables is needed, along with behavioural change, on a timescale

that reflects the urgency of the climate change issue and the need also to address peak oil.

In the context of maintaining ‘optionality’, it should be noted that conventional solutions such as lumpy investment in the national grid south of Auckland or in the ‘top of the South’ may *reduce* optionality, as well as being environmentally undesirable and possibly less affordable than small-scale distributed generation. Lumpy national grid investment may crowd out the development of a multi-directional grid connecting smaller-scale generating units. Moreover, the challenges facing grid-constrained regions (and rural regions facing disconnection post-2013) may well create opportunities for new partnerships and institutional arrangements. An example might be a public/private partnership in a region such as the East Coast, investing in local resources and using a new financial structure to achieve a broad set of local objectives.

### Assumptions in the BCSD report

A key underlying assumption made in the BCSD analysis is that economic growth is fundamental and is necessary for sustainability:

Growth is a fundamental requirement for economic and social development. (p.1)

Part of this challenge [to shift to more sustainable energy] will be to ensure that we have the economic growth necessary to afford the changes required. In other words, a sustainable energy future will come from growth that in turn is dependent on adequate supplies of affordable energy. (p.3)

This assumption has some superficial basis in the association between more rapid economic growth and faster turnover of capital and take-up of energy efficiency. But the connection is overly simplified; the ‘wrong’ sort of growth (e.g. growth involving major urban expansion or higher investment in energy-intensive sectors) may make the required shift harder. Moreover, it would be possible to achieve a combination of somewhat *slower* economic growth and greater environmental sustainability or, more positively, a modest but ‘sufficient’ rate of economic *development* associated with enhanced sustainability (Daly, 2005). There is good evidence that this mix is something which New Zealanders would support (see Annex). Literature on the Environmental

Kuznets Curve also shows that there is a variety of future states of economic development and environmental sustainability that can be attained by developed economies, depending on the mix of policies and approaches adopted.

A second important assumption (or rather, set of assumptions) relates to new technology development. For example, the assumption that CCS (carbon capture and storage) could move to commercial viability by 2025 (Growth scenario) seems optimistic. As noted in the document, ‘Proven CCS technology is therefore critical [to meeting climate change obligations].’ With CCS being critical to the Growth scenario in this sense, that scenario becomes particularly risky. To give due credit, the report does note on p.15 that all the scenarios (except Conservation) rely on CCS, ‘with Growth and Shielded carrying the highest risk should CCS development be either delayed or too costly’. The assumption of increased CCS uptake from 2021 is ‘in line with the earliest world view’ of demonstration, take-up and availability. The extent of reliance on this risky assumption could perhaps have been given more prominence.

Conversely, a (third) assumption of technological breakthroughs in renewables in the late 2020s is probably too pessimistic, as may be the assumption that smart grid technology would not be available before 2025 (p.15). For photovoltaic, wind and wave energy, the document probably underestimates the impact that technological advance will have on investment decisions across both the public and private sectors, and at both the corporate and individual/community levels. In respect of the grid, there are some signs that innovative solutions are closer than 20 years away.<sup>1</sup> And Chinese investment plans for new automobile technology suggest that fuel cell vehicles may be available well before 2025 and are likely to be ‘widely available’ well before 2050 (cf. Figure 8, p.6).

A questionable fourth assumption is that, within the Growth scenario, New Zealand would be able to meet its climate change obligations. The assumption is stated as: ‘New Zealand meets its climate change obligations

1 At the CAE workshop on Distributed Generation in June 2005, a British expert indicated that it was not so much a question of new technological breakthroughs being required to accommodate small, intermittent generators close to the point of use, but rather of a need for new software (at least in the UK).

through relatively benign environmental pricing instruments that provide assistance to renewable energies' (p.10). Given that energy prices remain low in this scenario, and that renewables stagnate between 2010 and 2020, this outcome seems implausible.

Conversely, a fifth and major assumption relates to the scope for carbon emission mitigation in the absence of new technologies. The assumption that New Zealand's increased carbon emissions 'will not be mitigated until new technologies (e.g. CCS) or alternative fuels (e.g. transport biofuels) become available' (p.16) is not defensible. It downplays the potential for considerable further mitigation through exploitation of other renewables, and behaviour change/energy efficiency.

Lastly, various other assumptions in the report can be debated. For example, it was not realistic in mid-2005 to assume (p.7) that petrol and diesel will be available at 45-55 cents a litre (wholesale, presumably) until somewhere between 2025 and 2050.

## Conclusion on the BCSD report

Despite some limitations, the BCSD report is a significant contribution to an enlightened dialogue on energy futures. The emphases on sustainability and on keeping options open in making a transition over the period to 2050 represent real strengths in the document. Some of the assumptions in the document (such as the forces underlying the projected rates of growth in energy demand) can be debated. Nonetheless, this document does provide a useful framework for this dialogue process. It also helps to underline the fact that there is a range of views on the speed of technological and behavioural change, so any future dialogue should draw on a range of experts familiar with the factors which can influence such change in various ways.

Moreover, the report's conclusion that there is a role for government in encouraging choices that are sustainable is worth underlining. The report should have gone further in creating a sense of urgency about the need for environmentally sustainable investments, particularly renewables and behaviour change in areas such as sustainable transport, in the light of the converging concerns of peak oil and climate change. Nevertheless, the BCSD report is likely to have a valuable impact in raising awareness within the

business sector of how the economy's future demands for energy could potentially be met in a more environmentally sustainable way, if forward-looking policies are adopted. To that end, it usefully complements other recent publications, namely the government's *Sustainable Energy* framework document and *Future Currents*, from the Parliamentary Commissioner for the Environment (PCE).

## What does the PCE document do?

Like the BCSD document, the PCE analysis, *Future Currents: Electricity Scenarios for New Zealand 2005-2050*, uses scenarios as a means to consider future energy paths. Its focus, however, is on electricity rather than the energy system as a whole. The PCE's motivation includes a sense that there has been a lack of futures thinking and strategic planning for electricity and energy issues at an official level in New Zealand since the 1980s. In fact, the PCE report, focusing as it does on environmental implications of trends and changes in the electricity system, is the first of its kind.

The PCE report spells out two distinct scenarios from now to 2050 – Fuelling the Future and Sparking New Designs. They highlight 'how different our futures could be, depending on the decisions we make' (p.3). The former relies on major infrastructure investment, while the latter emphasises smart design to provide energy services in efficient and innovative ways. Decision making also tends to be more conservative in Fuelling the Future, stressing shorter-term goals, the supply side and the goal of low-cost electricity, while Sparking New Designs emphasises longer-term goals, energy efficiency as well as supply, and a focus on energy services rather than low-cost electricity.

## Strong points

The PCE report is accessible and engaging; it makes an innovative effort to bring critical future energy path issues to a wider audience. Its main method for doing this is to explore two scenarios using the device of perspectives from two fictional characters, Shane ('down on the farm') and Robyn ('city life'), who personalise the scenarios. This makes the PCE report highly readable. At the same time, the PCE report, like the BCSD document, is clearly based on a large body of work, including quantitative modelling, which underpin the scenarios and ensure their internal consistency.

## The PCE approach

Although it is highly innovative and credible (indeed, the Commissioner says in his preface that ‘Our scenarios are conservative’), the PCE report is arguably too optimistic in aspects of its Sparking New Designs scenario. For example, it projects zero emissions (CO<sub>2</sub>) from the electricity sector by 2050, on the basis that all power generation is by then renewable. Underlying assumptions include more hydro (e.g. 70 MW in Marlborough) and geothermal (475 MW in the Waikato), as well as more wind and much more solar photovoltaic (1200 MW across New Zealand), and markedly improved energy efficiency. The level of photovoltaic penetration is highly dependent in turn on the assumption of ‘very large’ cost reductions (p.24).

However, within the domain of scenario building, to say that the Sparking New Designs scenario is too optimistic is arguably not a valid criticism. After all, it is important to choose a range of scenarios that bound the domain of what is reasonably able to be envisaged without having to suspend disbelief. If New Zealand were lucky in terms of imported technology breakthroughs in areas such as photovoltaics, then an outcome of zero carbon emissions from electricity could be attainable. It should be noted that such an outcome could be expected to be accompanied by markedly less pressure on energy prices generally, since worldwide, photovoltaics could be expected to be displacing fossil fuel use.

Sparking New Designs is best seen as a credible view of the future at one end of the spectrum, the purpose of which is to facilitate the process of taking the steps to get from here to there - i.e. to aid the ‘backcasting’ process. Fuelling the Future, the alternative scenario, is in this sense a characterisation of the sort of future we may face if more enlightened policies are not taken up. It is not a disastrous future, but it is one in which little progress has been made to deal with the twin issues of how to improve electricity efficiency and how to reduce New Zealand’s carbon emissions. In this sense it is not a sustainable future.

One of the big imponderables with the electricity sector is pinning down future demand. For example, it is arguable that in the process of decarbonising (or reducing the fossil fuel intensity of) our transport system, we may end up using more electricity. One

technology which could hasten this outcome is recharging electric vehicles overnight. While ‘plug-in’ technology is not currently economic, it could well become so quite soon (*Public Power Weekly*, 2006). In New Zealand, another trend of this sort is the move towards heat pumps: while these are markedly more energy-efficient and more climate-friendly than alternatives such as unflued gas heaters or old-fashioned electric resistance heaters, their rapid rise in popularity may mean an increase in electricity load overall.

## Overall conclusions

The two documents reviewed here are quite different, and illustrate the diversity of thinking on New Zealand’s energy future. The BCSD document is targeted at electricity sector and policy professionals who are used to the arcane methodology of energy projections, and can be expected to have a fairly well developed, technically-based view of plausible future paths for New Zealand’s energy system. By contrast, the PCE report, although it deals with a narrower slice of the energy sector, namely electricity, is targeted more broadly, at the informed general reader together with policy professionals. It is a more accessible, user-friendly document, less technical than the Business Council report, but still robust.

Both documents are useful and contain a solid body of argument. Our main criticism is of the Business Council report, which in our view gives too little weight to the climate change issue in its assessment, and underplays the significance of peak oil. The full impact of the probable ‘convergence’ described above, with climate change and peak oil together exerting a powerful influence on future policy development, is thus obscured. As pointed out in *Policy Quarterly* No. 2 (Piddington, 2005), it is less important to forecast the exact timing of the peak oil phenomenon than to embark on a transitional strategy, within a framework of risk management. There is now a sufficient body of evidence for us to conclude that climate change policy instruments should be included as an essential part of such a strategy.

In this context, we can see both studies as a contribution to multidimensional (and multidisciplinary) analysis of future options. They will help open up a critical dialogue about energy, the economy, the environment and the future of New Zealand society. The first five years of

## Annex: New Zealanders' attitudes to quality of life, the environment and economic growth

## PERSONAL IMPORTANCE — SUMMARY TABLE

*Now can you tell me how important the following aspects of New Zealand are to you PERSONALLY – where – 0 is not important at all and 10 is very important? Remember you can say any number between 0 and 10 – 5 is the mid-point on this scale.*

	All			Maori			Business		
	0-3 %	4-6 %	7-10 %	0-3 %	4-6 %	7-10 %	0-3 %	4-6 %	7-10 %
Quality of life	0	7	93	1	11	88	0	7	93
Quality of natural environment	1	12	87	1	18	80	0	12	87
Quality of education	3	13	83	5	14	81	4	14	82
The public health system	6	16	78	6	20	74	9	16	75
Employment prospects	5	18	76	5	19	75	6	19	74
Level of wages and salaries	4	23	72	5	26	69	3	23	74
Race relations	8	24	68	6	22	72	9	26	65
Potential to increase personal wealth	5	27	68	6	25	69	2	29	69
Level of economic growth	4	28	67	5	32	60	3	22	75
Business opportunities	5	29	65	6	32	62	2	22	76
Providing a supportive business environment	6	28	64	6	32	61	3	24	73
Quality of artistic and cultural heritage	10	35	54	4	22	72	9	39	51
Base: All respondents									

Source: UMR Research (2003) for the Growth and Innovation Advisory Board

this century have delivered ample warning that new approaches will be needed, and that it would be false to rely on 'business as usual' and the illusion of continuity.

In a situation of discontinuity, it is certainly encouraging to find that, both in the business sector and among public sector advisers, there are creative minds preparing for the inevitability of change. We can only hope that this cross-fertilisation of ideas proceeds with a sufficient sense of urgency.

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# Strong Families: A Key to Social and Economic Success in the 21st Century<sup>1</sup>

Marcel Lauzière

This lecture discusses the importance of strong families, and in particular the importance of early intervention and the role that government can play in this area. I want to begin, however, from another place entirely.

Let me start by saying that if New Zealand is to compete globally in the future, I profoundly believe that we need to succeed socially. In the years ahead, the international labour market is going to become increasingly competitive because of population ageing and because the global workforce continues to be more mobile. A key challenge for New Zealand – and this is the case for many other OECD countries – will be to retain and attract the best skills and the best talent. We need to be thinking now about the best ways and means of ensuring that New Zealand is seen as one of the best places to work and live, and simply enjoy life.

It may seem odd to start off a discussion on the importance of strong families by talking about global competitiveness, but I really believe that all of this is closely interconnected, and I think that when we talk about competitiveness we too quickly revert simply to the economy and we ignore the social dimensions. If we are going to attract and retain skills and talent in the future, we should be thinking about creating the best possible social conditions.

This is really about creating a competitive advantage for New Zealand.

Allow me to continue along this line just for a moment and stress that social and economic development go hand in hand. The importance of economic growth for social well-being is well recognised – economic growth ensures wage growth and rising living standards and it enables government to pay for programmes to protect those who are less well off.

But social well-being is equally important for economic growth in a country like New Zealand. Creating the

right social conditions will help ensure a well-educated, well-motivated workforce that is able to deal with new challenges as they arise. A well-functioning society will also reduce the costs associated with social problems.

We need to move beyond the view that economic and social development work in a linear fashion. Rather, we should see them as a virtuous circle where social development contributes to economic development, and vice versa. Once again, if we want to prepare the future success of New Zealand, we need to work on these two fronts at the same time. I know that this is easier said than done, but I certainly feel that we need to explore further how this virtuous circle can be strengthened.

So, if we agree that we need to succeed socially to be competitive globally in the future, and we agree that social and economic development build on each other (of course, you may want to dispute this, but bear with me for the moment), then we need to identify what are some of the key ingredients of success.

What I propose is that one of these ingredients is strong families. I don't need to belabour the point that strong families are important for a well-functioning society. Strong families nurture and socialise children. They meet the material and emotional needs of their members. They provide a sense of identity and belonging and a psychological anchor. They also serve to transmit culture and knowledge and values. Children who are raised in well-functioning families are more likely to grow up to be well-adjusted adults and productive members of society.

We all have a role to play in encouraging strong families, and government is a part of this. Strong families are

<sup>1</sup> This is a slightly amended text of the annual lecture for the Roy McKenzie Centre for the Study of Families Te Putahi Rangahau Whanau, delivered at Victoria University of Wellington on 15 December 2005.

desirable in themselves (I think we all agree with this), but what I want to emphasise is that they also have an important strategic value for New Zealand's future. I want to stress this because we often tend to ignore the future. Of course, there are obvious reasons for this. The first reason is that we have pressing immediate needs that must be addressed on a daily basis. This must be our priority.

That said, we need to be thinking now about the challenges ahead. Strong families will go a long way to creating the right social conditions that will make New Zealand an attractive place to live and work in the future.

There are a number of ways we can support strong families as we move forward, but here I want to emphasise the strategic importance of early intervention as a central element in our efforts to do this.

The early years of childhood are crucial for laying a platform for children's later development. We know this. The early years are when children are experiencing rapid brain growth. Given appropriate stimulation, this lays the foundation for intellectual functioning, which is crucial for future learning. We know so much more about this today than we did only a few years ago.

At the same time, young children need to develop attachments that will provide a secure basis for both future relationships and their psychological health. Research around the world has shown us this.

Early intervention programmes can help establish the strong early foundations that children need to enable them to achieve the best possible start in life and to maximise their potential. Government, in partnership with many other actors, needs to work on a number of fronts to deliver and support early intervention programmes, to ensure that children and families receive the right support at the right time in an effective way. And we need to move boldly on this. We have increasing evidence here in New Zealand and around the world that the right programmes can make a significant difference to children's outcomes. I'll return to this matter shortly.

Success in this area, I think, will stem from having programmes and services that work on three different fronts. We need services that are universal; we need services that are available to everyone as they require them; and we need services that are clearly targeted at families with additional needs, whose children may be more vulnerable to poor outcomes.

In the first area, universal services are an important part of our approach to early intervention, especially in the areas of health and education. We want to engage every family in these services so that all children attend at least one form of early childhood education programme and receive such core health services as immunisations and WellChild checks. These are vital services for all children, whatever their circumstances.

A second group of services is available to all families as required. The SKIP programme is a great example in this area. SKIP, which stands for 'Strategies with Kids - Information for Parents', is a programme that offers a range of resources to parents in need of practical information on parenting techniques and non-punitive methods of discipline. Any parent may need this information at some point in their child's life.

I think we would all agree that the majority of parents are able to provide the support their children need through their own networks and by accessing the universally available information and services I've just mentioned. But there is a third set of services that needs to target those families with additional needs, who can often be difficult to engage and hold on to. These services include New Zealand's Family Start and Early Start programmes.

So, what are our key goals if we are to be successful in nurturing and supporting strong families? I think we want all families to have easy access to good information and advice about parenting. We want them to be able to access community-based formal and informal support networks and to receive services that help them raise their children. We want families with additional needs to have access to high-quality services that meet these needs, and we want families and children that continue to be vulnerable to poor outcomes to receive effective coordinated intensive services.

I want to consider a few key initiatives under way in these three areas here and overseas.

There is some very positive evidence internationally for early intervention programmes that are targeted at vulnerable families. One important mode of delivery is home-visiting programmes, which place emphasis on making the home safe for the child and modelling parent-child interactions. The Nurse Family Partnership in the United States is considered to be a landmark home-visiting programme that has achieved significant success

in changing children's long-term developmental pathways and outcomes. These include reduced rates of smoking during pregnancy, reduced rates of poisonings and injuries, child maltreatment and arrest at age 15, and reduced numbers of sexual partners at age 15.

From its early beginnings as a demonstration programme in a couple of small cities, the Nurse Family Partnership has expanded to the point where, today, over 700 nurses are delivering services to more than 13,000 families in more than 250 sites in the US.

While this is a very good example of excellent work overseas, New Zealand is right up there. The findings of an evaluation of the Early Start initiative in Christchurch (led by David Fergusson) compare well with those of the Nurse Family Partnership. Although the size is relatively modest, the effects are pervasive and can be seen across a range of outcomes. The evaluation showed that Early Start families made greater use of GPs and preschool dental services, and had fewer hospital attendances for accidents, injuries or poisonings. Participating children also showed reduced rates of behaviour problems, and increased exposure to early childhood education and to positive, non-punitive parenting practices.

This is excellent news. The results of the evaluation make a significant contribution to our knowledge about 'what works' in this area and they provide us with good information about the impacts of well-designed programmes. We need to use these results to help us move forward.

I now want to return to the SKIP programme. It's difficult to overstate the role of parents in the development of their children – we all know that – and supporting parents is a key ingredient in encouraging strong families. It's also one that is not associated with any particular socio-economic group.

Baseline research from SKIP shows that parenting is top of mind for a large majority of parents – 95% of parents think about parenting at least once a week and 60% said they were using positive parenting techniques. That being said, there is still scope for improvement – only 37% of parents are making efforts to use smacking and yelling less, and 39% are not confident they are actually applying the positive parenting techniques correctly.

SKIP itself is going quite a way in supporting parents. SKIP's goal is to support parents to raise their children in a positive way that provides them with both affection and boundaries. SKIP produces a range of resources for parents and support organisations, including a series of pamphlets that provide practical advice on topics like managing tantrums and surviving a trip to the supermarket. (That's something I would have needed when my kids were younger!)

They have had an overwhelming response – over three million of these pamphlets have been printed. The uptake has been tremendous. My understanding is that they are going like hot cakes. And I can understand why. I think most parents are longing for this kind of information and advice.

I've talked about Early Start programmes, about parenting support; now I want to add that ensuring they have access to good-quality and affordable childcare is another way of supporting all parents, especially if they are working. One area where New Zealand is doing particularly well is early childhood education. As at July 2004, 94% of new entrants had attended some form of early childhood education before starting school. A strong emphasis for these services in New Zealand has been on high quality.

That said, where we need to do more is in out-of-school care. Over the last few years government has increased its support to providers of out-of-school services, as well as the thresholds and rates for the Childcare Subsidy. We need to continue on this front to ensure that parents are provided with choices and to ensure that out-of-school care contributes to good educational, social and economic outcomes for children.

I've discussed some key areas where government can play an important role, such as delivering programmes like Family Start and SKIP and ensuring parents have access to good-quality and affordable childcare. I'll add another, of a very different nature, and that is in the development of knowledge and evidence through rigorous research and evaluation.

Fostering and undertaking research and evaluation is a key way that government can support work related to early intervention. Research and evaluation gives us a better understanding of the current situation and how we can improve it. Also, if we are serious about supporting strong families and about developing robust

and effective early intervention programmes, then we need to measure and we need to monitor progress as we move forward.

I also want to emphasise that we need to take full advantage of all the work that is being done, whether it is happening in universities, in the community and voluntary sector or in government. In fact, we need to find the means to work more closely and more collaboratively (but looking at ways to do that would be the topic for another day).

One of the major pieces of work produced in my section at the Ministry of Social Development is the annual *Social Report*. This is a report that enables us to monitor progress on a number of key indicators relating to the social health and well-being of New Zealand. It allows us to compare ourselves internationally (if we agree that we will be facing an increasingly competitive international skills and talent market in the future, we need to see how we are faring against others around the globe in terms of social outcomes) and, for the first time, this year we have data that compare regions across the country. This is a real breakthrough.

Many of the *Social Report* indicators relate specifically to children and families: levels of participation in early childhood education, the child mortality rate from intentional injuries, and young people's satisfaction with the amount of time they spend with their parents.

If we believe that the issues I have been discussing are important to our future success, we need to be able to measure if we are making progress. The *Social Report* helps us to do this. I want to add that New Zealand should be very proud of the *Social Report*, which the OECD considers the best of its kind. We also produced a more targeted report at the end of 2004 called *Children and Young People: Indicators of Wellbeing in New Zealand*. My understanding is that this report has been used extensively.

There is still much to be learned, though, and part of our strategy needs to be about continuing to find out what works and what doesn't. To be effective, research and evaluation need to happen in parallel with policy development and service delivery. On the research front, we need to continue to push the frontiers of our knowledge. On the evaluation front, we need to be

learning as we go. In other words, we need to build research and evaluation activities to allow us to improve our programmes as we move forward. At the end of the day, this is why we do it.

One initiative in development at the moment is a new longitudinal study of New Zealand children and families. The planning stage is being led by the University of Auckland and a decision to proceed with the study will be made at the end of this 18-month period. The intent is to follow the lives of a group of New Zealand children from birth through to adulthood. It would provide us with a rich and dynamic source of information over this period in areas including health, education, social adjustment and behaviour as well as factors that influence children's development - I'm thinking of family environment, schooling and community resources.

Longitudinal studies are important because they provide the best means of studying the causal origins of developmental problems. By understanding what causes the problems, we can design better policy solutions to boost children's development. The idea is for this work to build on the success of the Dunedin and Christchurch studies from the 1970s that have been acclaimed internationally.

So research is important, and particularly if it informs our actions. The research we undertake, and the activities that allow us to measure progress (such as the *Social Report*), need to lead to concrete actions that will actually improve outcomes. The government's social strategy, *Opportunity for All New Zealanders*, is an example of using knowledge and evidence to make choices and set priorities. *Opportunity for All New Zealanders* was clearly informed by the social conditions reflected in the *Social Report*.

*Opportunity for All* identifies five critical social issues:

- improving education achievement among low socio-economic groups;
- increasing opportunities for people to participate in sustainable employment;
- promoting healthy eating and healthy activity;
- reducing tobacco, alcohol and other drug abuse; and
- preventing family violence, and abuse and neglect of children and older persons.

All of these issues are critically important to the future of our families in New Zealand. I want to stress that a key criterion for selecting these areas for future work was the recognition that substantial progress could only be made on these issues with strong collaboration across agencies and across sectors. This is absolutely relevant when we think about what is needed to support strong families and what is needed to progress our work in the area of early intervention.

## Conclusion

In closing, I want to emphasise the importance of collaboration and working across sectors. The challenges that I have discussed are hugely complex and no one sector can be successful on its own. If we are to succeed socially as a country in the future, we need to be working together, across government, the community and voluntary sector and universities, and let's not forget the private sector. And, of course, we mustn't forget that families themselves are the key actors here. Interventions simply will not be successful unless we do it right and we work collaboratively.

The Early Start programme is a good example. Not only is it a partnership between government and the community and voluntary sector, but its family/whānau workers act as advocates and coordinators between the many different agencies a family may be involved with to ensure that the family's needs are met. This way of working is critical to our future undertakings.

So, to summarise, I believe that if we are to compete globally in the future, we will need to succeed socially. I also believe that a key part of achieving this will be through strong families and effective early intervention programmes and services. This should be part of our collective strategy in the years ahead and as we think about the future of New Zealand.

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# Paid Parental Leave in New Zealand: A Short History and Future Policy Options

Paul Callister and Judith Galtry

## Introduction

In early 2005 the Labour-Progressive government stated that, while New Zealand's overall labour force participation rates were high, the rate for some groups of women, particularly those aged 25-34 years, were below the OECD average. Given that this is the main childbearing age range for New Zealand women, mothers of young children form a significant component of this group. There was subsequently much debate about the benefits or otherwise of bringing more mothers into paid work and, inevitably, questions arose about the level of both parental leave and childcare support available to new parents.

Parental leave is a particularly contentious area of public policy. Concerns include health protection for mothers in paid work, equal opportunities for female workers, gender equity in the home, access to adequate antenatal and birthing care, and fertility support. In addition, parental leave debates involve issues around payment, including whether there should be provision for job protection only or for a period of paid leave; who pays for it; the level of payment, including whether there is a 'cap' on the payment; and the length of the payment period. Discussions also often focus on appropriate eligibility criteria for parental leave, including who is considered to be part of a family. Parental leave policy is relevant not only to parents and children, but also to employers, co-workers and the wider society. Given all these potential interest groups, as well as the multiple and sometimes conflicting goals behind various parental/maternity leave policies, it is perhaps not surprising that views about paid parental leave are widely divergent.

Due to the complexity of parental leave considerations, research articles and policy debates often focus on only one aspect of leave. For instance, in the labour market literature there is concern about how 'time out' might

affect earnings for women, while the implications for parent-infant bonding and attachment receive little attention. In the health arena, consideration is often given to the optimal length of leave necessary for both recovery from childbirth and breastfeeding, but the effects of leave policies on gender equity concerns do not come to the fore. In this article we argue that health, labour market and gender equity perspectives need to be considered when designing parental leave policies.

This article draws on a number of research papers written by the authors since the early 1990s.<sup>1</sup> First, it briefly considers historical New Zealand policy debates about parental leave. This discussion identifies themes that continually recur in the debates. Consideration is then given to how paid parental leave policy might develop in the future. This includes a brief discussion as to why there is justification for taxpayers' support for paid parental leave.

## A short history of policy developments

In industrialised nations, the issue of maternity leave has long been a part of debates around 'protective' labour legislation. For example, in 1877 Switzerland passed legislation which restricted women's paid work two weeks before and six weeks after the birth of a child. A number of European countries followed with similar policies. In 1919 the International Labour Organization (ILO) was

1 The main papers and book chapters informing this article include: Galtry, J. and P. Callister (2005) 'Assessing the optimal length of parental leave for child and parental well-being: how can research inform policy?', *Journal of Family Issues*, 26(2), pp.219-46; Callister, P. (2002) 'Should job protection and income support for new parents be separated? Policy options in a US and New Zealand context', *Community, Work & Family*, 5(3), pp.279-99; Galtry, J. (2002) 'Child health: an underplayed variable in parental leave and early childhood education policy debates?', *Community, Work & Family*, 3, pp.257-78; Galtry, J. and P. Callister, P. (1995) 'Birth and the early months: parental leave and paid work', in Callister, P., V.N. Podmore, J. Galtry and T. Sawicka (eds), *Striking a Balance: families, work and early childhood education*, Wellington: New Zealand Council for Educational Research, pp.13-66.

formed. The Maternity Protection Convention (No. 3) was among those policies developed during the first year of the ILO's existence.<sup>2</sup> This convention 'protected' women's employment, including through provision for a period of paid leave. However, while many European countries subsequently introduced maternity leave policies, including in some cases provision for paid leave, in New Zealand it took until 1948 for some form of leave to be introduced, and then it covered only maternity leave within the public service.<sup>3</sup>

During the 1970s the issues of maternity and parental leave gained prominence in policy debates in New Zealand. This was perhaps not surprising, as it was a decade in which there was a dramatic upsurge in interest in feminist issues, both in New Zealand and overseas. However, other trends, in particular changes in the demand for and supply of labour, also impacted on those debates.

Part of the impetus for these debates came from internationally-inspired events. Throughout industrialised countries the 1975 United Nations International Women's Year provided a focal point for debates about a range of issues affecting women, including matrimonial property and parental leave. As a forerunner to this year, in September 1973 the Labour government in New Zealand set up a select committee on 'Women's Rights'. The committee's findings were published in 1975. This publication covered a wide range of issues, including education, childcare and parental leave. The committee's recommendation on parental leave was that the government (a) introduce legislation for paid maternity leave for employed women with the objective of either (i) ratifying by legislation ILO Convention No. 103 concerning maternity protection, or (ii) giving effect to the principles contained in the convention; and (b) consider the desirability of introducing paid paternity leave in cases of family need.

The Labour government did not act on these recommendations, but in the latter part of 1975 introduced a new concept, that of a child minding allowance to be paid to mothers. This was part of a separate, but related, debate about paying a 'mothers' wage' which was taking place.

The 1975 election manifesto of the opposition National Party indicated that it was not in favour of paid leave.

Reflecting its concerns about business viability, it stated that maternity leave without pay would be available to women for a period of up to 12 weeks, without loss of job security, promotion or superannuation rights, providing this did not cause undue disruption to a business enterprise. The possibility of men needing job 'protection' at the time of a child's birth was also raised.

Despite the undertaking in its manifesto, the new National government elected in November 1975 did not immediately act on its promise to introduce maternity leave. Instead, in 1976 it asked the National Council Advisory Council on the Employment of Women (NACEW) to draw up a series of proposals for protecting women's employment. NACEW argued for a single-rate social security benefit payment for a period of three months from the date of birth, regardless of the mother's marital status, and up to two weeks paternity leave, with a single-rate social security benefit. These recommendations are likely to have reflected other policy issues of the time, including the promotion of universal rather than targeted benefits.

### Job protection legislation

In late 1979 the National government introduced the Maternity Leave and Employment Protection Bill. As indicated by its name, this bill focused on job protection, only covered women, did not include parents who were adopting babies, and had very tight eligibility criteria.

Key issues identified in submissions to the select committee considering the bill included the need to expand the eligibility criteria for leave to include fathers, and to reduce the length of time in paid employment required before a woman could take leave. In the original draft of the bill, female employees had to serve 24 months with an employer and work full time (defined as 35 hours or more per week). A number of women's groups also made the point that parental leave was

2 The International Labour Organization's Maternity Protection Convention was introduced in 1919 (Convention No. 3), revised in 1954 (Convention No. 103), and then again in 2000 (Convention No. 183).

3 This is an example of an employer, the government in this case, offering paid leave. Employers can, and do, offer paid leave to some employees. Estimates of the prevalence of PPL (paid parental leave) funded directly by New Zealand employers prior to the introduction of the 2002 paid leave legislation varied from just 13% to 43% of workplaces. Just over a third of employees (35%) had some form of PPL in their contracts ([http://www.eeotrust.org.nz/news/index.cfm?content\\_id=212](http://www.eeotrust.org.nz/news/index.cfm?content_id=212)). While important, the issue of employer-provided leave is not directly discussed in this article.

essential if a mother was seriously ill, died or was otherwise unable to care for her child.

A significant number of submissions argued for paid leave, and there was also concern that the bill did not cover adoption. Not surprisingly, unions and women's groups featured prominently in the call for paid leave. While most of the submissions supported the concept of mandated leave, the main opposition to the passing of the legislation came from employers. This is a response seen across most OECD countries.

The submissions to the select committee tended to focus on labour market concerns. Despite maternity leave having been promoted in many countries on the basis of its potential health benefits to women and children, such as promoting breastfeeding, few submissions mentioned these.

While some women's groups considered that the legislation needed major redrafting to be of use to women and, moreover, to not penalise them, it was not opposed outright by them. This is possibly because it was seen as a first step towards more appropriate laws. In contrast, in debates occurring at the same time in the United States, some women's groups opposed bringing in any such 'protective' legislation unless it was completely gender neutral.

After its consideration by the select committee, the bill continued to cover only women. However, the time they had to have served with an employer was reduced to 18 months, while the hours per week required to be eligible for leave were reduced to 15 or more. In addition, women who adopted an infant were now also included in leave coverage. The bill was passed into law in 1980.

With the change of government in 1984, the Labour Party was in a position to change the law. In its 1984 election manifesto it had promised to investigate paid parental leave, and to support unpaid parental leave being available to either parent in heterosexual, two-parent families for a period of up to five years to care for each preschooler, with the right of re-entry into the workforce with any necessary retraining. Subsequently, in 1986 a working party was set up to investigate payment for parental leave. The majority of this group considered that there were strong arguments for a parental leave payment on equal employment opportunity grounds. It was argued that such payments

would reduce potential conflicts between paid work and family responsibilities and help ensure adequate infant care. The working party nevertheless concluded that a payment could not be justified at that point in time because the costs would be substantial and payments would be ahead of existing practice in awards and agreements.

### **Extending job protection**

In late 1986 the Labour government introduced the Parental Leave and Employment Protection Bill. The most significant feature of this bill was the expansion of job protection provisions to include fathers. In addition, it increased the period of extended leave from six months to a year. Finally, in the final legislation the eligibility criteria were reduced to 12 months service and 10 hours to be worked per week.

For those in favour of the legislation three key issues emerged: eligibility to take leave; flexibility in its use; and payment. In terms of eligibility, NACEW and various unions argued that the exclusion of some part-time workers continued to be problematic. While job protection was now being extended to fathers, many of the submissions considered this too narrow in view of changing family and parenting patterns. For example, the Federation of Labour considered that paternity leave should instead be called 'nominated care givers' leave. Again, it was mainly unions who argued for paid leave. The favoured funding system was some variation of the ACC system, with employers, employees and the state sharing the cost.

In 1988 the Royal Commission on Social Policy considered the issue of parental leave. The Commission acknowledged the value of the legislation, but felt there was no logic in imposing an arbitrary level of working hours for entitlement to parental leave and recommended that this restriction in the act be removed. The Commission also recommended that the legislation be extended to cover all primary caregivers.

On the question of paid leave, the Commission agreed with the findings of the 1986 working party that there were strong arguments for payment. It nevertheless concluded that payment for parental leave was only one of a number of strategies required for the attainment of greater equality of opportunity in employment, and, in view of various financial constraints, advised against it at that point in time.



Instead, the Commission recommended the introduction of a 'carers' allowance' for those engaged in the full-time care of children. This entitlement would be individually assessed and, because of the potentially high cost to taxpayers, would be set at a relatively low level compared with allowances for sole parents. Such a payment was seen as a first step towards paid parental leave.

Despite these changes, there continued to be debate about parental leave, with issues raised in the 1970s still being discussed. In 1993 Alliance MP Laila Harre launched the campaign for 12 weeks paid parental leave. Subsequently, Harre was to become a key force in the introduction of paid leave. The 1994 International Year of the Family provided a focal point for further discussions about parental leave, centring mainly on the issue of paid leave. In the same year the Labour Party published a report on paid leave.

In 1995, under a National government, a further report on parental leave was published by the Ministry of Women's Affairs. This focused on labour market issues. Overall, the study provided evidence of the benefits of parental leave in terms of assisting women to remain attached to their workplace around the birth of a child, as well as providing arguments for introducing paid leave.

In 1998 Harre introduced a private member's bill for 12 weeks paid leave. This bill was referred to select committee, with most submissions supporting the legislation, but it was defeated in Parliament by a narrow vote in 1999.

Subsequently, the Parental Tax Credit was introduced as part of a wider Family Assistance package outlined in the 1999 Budget. It was available to qualifying families with a child or children born on or after 1 October 1999. The government did not support the provision of European models of paid parental leave, but nevertheless wished to provide some financial support to new parents with low incomes.

### **The introduction of paid leave**

The context for the re-introduction of paid leave legislation included intense debate in New Zealand in the 1990s about the role of the state, including the influence of employment law on the workings of the labour market. Reducing the role of both the state and unions in the labour market, the Employment Contracts

Act was passed in 1991 by the National government. Subsequently, an incoming Labour government repealed this legislation.

There were other changes in the 1990s that affected the labour market. One was the passing of the Human Rights Act in 1993, with one aim of this legislation being to prevent discrimination in the labour market. A key concern in historical debates about parental leave was that if such leave were made available, employers would discriminate against women of childbearing age.

In 2001 the Labour-Alliance government introduced the Parental Leave and Employment Protection (Paid Parental Leave) Amendment Bill to Parliament. The Alliance party, led by Harre, had made the introduction of paid parental leave legislation a key part of its coalition agreement with Labour. The design of the legislation was strongly influenced by Harre's background in supporting women's and workers' rights. However, the health benefits of parental leave, particularly the potential support for breastfeeding, were focused on far more than in previous parental leave debates.

In the bill, statutory job protection and eligibility for paid leave were linked. Mothers who were eligible under the job protection criteria were to be entitled to 12 weeks paid leave, commencing in July 2002. Mothers could chose to transfer some or all of the leave to their partner provided the latter was also eligible for job protection in his or her own right.

In the final legislation, the allocation of rights to leave for adoptive parents was no longer determined by gender. This was an indication that, for adoptive parents, the care of children, not pregnancy, childbirth or breastfeeding, was a key concern, and it was considered that families themselves, not the government, should determine who took the leave. However, for biological parents the legislation remained the same: i.e. the mother retained the primary entitlement to paid leave. Ironically, this was supported by some women's groups, despite the strength of their earlier arguments for gender-neutral leave. Therefore, from 1 July 2002 biological mothers and a nominated adoptive parent who had been employed by the same employer for at least 10 hours per week over the previous year were eligible for 12 weeks paid parental leave. As a backup to this scheme, the government also announced the extension of the existing tax credit scheme for new families.

**Table 1: Key events leading to the introduction of paid parental leave in New Zealand**

1919	International Labour Organization signed Maternity Protection Convention (No. 3)
1948	Maternity leave introduced in New Zealand public service
1980	Maternity Leave and Employment Protection Act
1987	Parental Leave and Employment Protection Act
1999	Parental Tax Credit announced in budget
2002 & 2004	Parental Leave and Employment Protection (Paid Parental Leave) Amendment Act

### Further incremental change

Subsequently, the paid parental leave legislation has been reviewed. In these reviews and associated discussions, concerns have centred on both the length of leave and the eligibility criteria. A formal complaint was also lodged with the Human Rights Commission on the grounds that the legislation discriminated against biological fathers, as they did not have an independent right to take a period of paid leave.<sup>4</sup> These reviews have resulted in the length of leave being changed first to 13 weeks, and then to 14 weeks in December 2005. It is also proposed that from 1 July 2006, 14 weeks paid parental leave be available to self-employed mothers who have been working an average of 10 hours per week during the six months before the birth or adoption of a child (with the same right to transfer to their partners as applies to employees).<sup>5</sup> This proposal moves eligibility away from being based on job protection, as legislation cannot protect a self-employed position. However, no changes have been proposed to the eligibility criteria for biological fathers.

### Future policy options

In this section, three main issues are considered. First, should paid leave be a universal right rather than being linked to job protection? Second, should there be a further extension of the period of leave and, if so, is there an optimal length of leave? Third, and particularly relevant if the period of leave is extended, should fathers be better supported to take a period of leave?

### Why should taxpayers provide paid leave?

To contextualise these issues, it is first worth considering some of the reasons why governments might step in

and mandate job protection and/or for taxpayers to provide some income transfer to new parents. According to the European Commission, there are, potentially, many societal benefits of parental leave. These include the 'promotion of equal opportunities between women and men in the labour market through enabling women to retain their position in the labour market during child-bearing'; the 'improvement of economic performance, through making better use of human resources as a result of retaining women workers in the labour force and enabling parents to work under less stress'; and 'recognising the social importance of motherhood and fatherhood'.<sup>6</sup>

The list of benefits set out by the European Commission can be re-grouped into three main categories. These are:

- promotion of gender equity in both the labour market and the home;
- protection and promotion of the physical and psychological health of parents (mainly mothers) and children; and
- maximisation of employment and utilisation of the skills of the workforce.

4 The history and outcome of this complaint can be found at <http://www.fatherandchild.org.nz/submissions.htm>.

5 The Parental Leave and Employment Protection (Paid Parental Leave For Self-Employed Persons) Amendment Bill was being considered by select committee in early 2006.

6 European Commission (1994) *Leave Arrangements for Workers with Children: a review of leave arrangements in the member states of the European Community and Austria, Finland, Norway and Sweden*, Brussels: European Commission Network on Childcare and other Measures to Reconcile Employment and Family Responsibilities for Women and Men.

In addition, reducing the conflict between work and family may potentially have a number of beneficial effects on society, including possibly increasing national fertility rates in the face of an ageing population.

It is difficult to quantify many of the potential benefits. For some, such as an increase in fertility, there is mixed evidence as to whether parental leave policies in fact have any influence. While the relationships are difficult to unpick, there is some evidence that paid parental leave has a positive effect on child mortality rates. Some of these possible benefits may be obtained through job protection alone, even if no payment is attached. But payment potentially allows a much larger group to take time out of work and utilise longer periods of leave. It also signifies recognition that some parents might not take a sufficient period of leave if relying on their own financial resources.

### **Should job protection and eligibility for payment be linked?**

As indicated by past debates about leave policies in New Zealand, a fundamental question remains as to whether paid leave should be linked to job protection or whether it should either be a universal right, or targeted on the basis of some other criteria such as income. This is a particularly important issue in countries such as New Zealand that have relatively flexible labour markets. OECD surveys have demonstrated that entitlement to both job protection and income support is often conditional on previous work experience undertaken on a continuous and full-time basis, yet contingent and/or non-standard work is becoming more common in many countries.<sup>7</sup>

If income support is seen as societal recognition that parents lose income from paid work in order to care for children, then there is some reason to link payments to recent work history. This approach potentially recognises that the opportunity costs associated with ‘time out’ of paid work vary. Higher income parents who have invested heavily in their education and subsequent careers potentially lose more money than lower income parents when they take time out of paid work, so may need to be compensated at a higher rate.

However, there remains a question as to whether all work history should be considered, not just those periods spent in eligible jobs and in eligible time periods.

Alternatively, if parental leave is seen as being a ‘workers’ right’ in the same way as the right to paid holidays and paid sick leave, then payment should also be linked to current earnings, with the time out being set at the same daily rate as would be earned on normal work days. If it is perceived as a workers’ right, it should also be the employer, or perhaps employers as a group, who pays, rather than the wider society. However, there are a number of problems with this approach, including that employers may then discriminate against women of childbearing age.

The arguments for basing payment on narrow, employment-related eligibility criteria are substantially undermined when a significant number of potential new parents find themselves in contingent employment, or have a period out of paid work before having a child, sometimes through choice, but often through no fault of their own, and are thus excluded from having the right to job protection, and therefore, in a New Zealand context, to paid leave.

While not all those in contingent or non-standard work are unskilled, low paid workers, this group will suffer the most if ineligible for leave. The current eligibility criteria therefore give rise to concerns about ‘middle class capture’. For instance, in the policy agencies that designed parental leave in New Zealand, eligible new parents are often able to claim their statutory entitlement to paid leave while also receiving a period of paid leave from their employer. In contrast, the lower paid contract cleaners who tidy their offices at night are less likely to be supported by their employer when taking a period of parental leave. Depending on their contract, they may also not be eligible for the statutory paid leave scheme.

In contrast, viewing parental leave from a health perspective encourages a de-linking of parental leave payment from a narrow, job-based eligibility criterion. There may well be some health impacts for fathers associated with having a period of leave, such as improved emotional well-being through being able to bond with their infant and having an increased commitment to childcare, even if parents subsequently separate. However, the health literature generally focuses on the impacts on women and children. Having leave

<sup>7</sup> Non-standard work is generally seen as not being permanent or full-time. Included in non-standard work are self employment, short-term contracts and casual work, including seasonal work.

from paid work can have an impact on pregnancy, recovery from birth, the ability to isolate young infants from possible sources of infection by looking after them at home (a gender-neutral activity), and the ability of mothers to breastfeed their children. While the costs in terms of ill health can be high for individuals, these costs also impact on the wider society through either private health insurance premiums or taxes to support public healthcare programmes. While implicitly understood by policy makers for a long time, the relationship between parental leave policy and child health has only recently been explicitly highlighted in the English-language parental leave literature. The health perspective suggests either targeting paid parental leave based on income or the universal extension of paid leave to all new parents.

### Gender equality?

A key concern for parental leave policy makers relates to the appropriate length of leave, and in particular whether there is an optimal length. As this is bound up with issues of gender equity as well as biological functions, gender will be considered first.

For gender equity to occur both in the labour market and the home, one, or preferably both, of the following needs to take place:

8 A number of recent papers have considered fathers and parental leave, including Carlsen, S. (1998) *Men on Parental Leave: how men use parental leave in the Nordic countries*, report prepared for the Nordic Council of Ministers.

- Women need to increase their employment tenure and their lifetime hours of paid work and, related to both of these, their yearly and lifetime earnings from paid work.
- Men need to undertake an equal share of childcare and household work. This will generally require a reduction in their paid work hours.

One rationale for providing job protection to women is to keep them attached to the labour market. This will increase their job tenure and, hopefully, their hourly and lifelong earnings relative to men. But in the Nordic countries in particular, policy makers have decided that encouraging fathers to take leave is also a means of achieving greater equality between women and men. The introduction of a special non-transferable 'pappa' month of leave in 1995 in Sweden has been associated with an increase in the time fathers spend on leave (see Box). However, research indicates that this leave is likely to be taken if:<sup>8</sup>

- it is non-transferable to the mother;
- the mother has not resigned from work but has a protected job to return to;

### Swedish parental leave

In Sweden, a couple can take up to 13 months off work between them, with the government paying 80% of lost wages up to a ceiling. A further 90 days can be taken with a smaller payment. The leave can be used in a block, or taken in batches before the child is eight. However, most of the parental leave is taken during the first two years after the child is born. Sweden was one of the first countries to earmark part of the parental leave for fathers. One 'pappa' month was introduced in 1995 and a second 'pappa' month followed in 2002. There is no government support for out-of-home childcare in the first year of a child's life, but strong support in subsequent years.

While Sweden actively encourages fathers to take a period of paid leave, some other paid leave legislation is, unlike the New Zealand legislation, gender neutral. For example, the Californian Paid Family Leave Law that became effective in mid-2004 is gender neutral. It can be used as a maternity leave, but fathers or adoptive parents can equally use it. It is not the government that determines who has primary rights to take leave, but rather parents themselves.

In Sweden, the fact that two months of paid leave can be set aside specifically for fathers partly reflects the long period of paid leave. This raises the issue of whether a relatively long or short period of leave is the best option. In turn, there is the question of who is considered when determining the optimal length of leave: i.e. is it infants, mothers, fathers, or perhaps employers or taxpayers?

- the level of payment is relatively generous; and
- fathers are actively encouraged to take a period of leave.

Hence, where mothers do not return to paid work, there is less incentive for fathers to take a period of leave. In addition, if mothers do not resume employment, fathers are less likely to experience a period of sole care of the child. However, childcare policies also affect these decisions. For example, in Sweden there is little taxpayer support for childcare for children under one year old. In contrast, in New Zealand childcare for children younger than 12 months is subsidised.

### An optimal length of leave?

A review article published by the authors of this article in the *Journal of Family Issues* in 2005 considered whether there was an optimal length of leave. It seems that a short period of leave following childbirth is less costly to most employees in terms of its economic and employment effects. However, the negative economic consequences of longer leave appear to be less observable

in countries like Sweden, where such behaviour is more predictable. Conversely, other research, mainly from the biomedical arena, suggests that longer and, ideally, paid parental leave periods are required if the highest attainable levels of child health are to be achieved. With regard to foetal and maternal health, leave policies must include measures that offer pregnant workers the opportunity to take a period of their leave entitlement prior to childbirth. However, taking a portion of leave in the pre-birth period should not, ideally, reduce the length of leave available to women following childbirth. In the prenatal period, however, it is difficult to determine a universally appropriate length of leave, as this is largely determined by the nature of the pregnancy, as well as the woman's job type and working conditions. Following childbirth, women's physical and mental health is generally facilitated by a period of leave. Moreover, research establishing the importance of a period of time out of the workplace to support longer periods of breastfeeding justifies on both public health and equal employment opportunity grounds the need for a six-month period of postnatal leave so that mothers

**Table 2: Diverse goals relating to the design of parental leave policy**

Policy areas	Some of the issues to consider	Possible design of paid parental leave
Health	Mother's well-being in pregnancy, birth and recovery; breastfeeding; health problems related to group childcare	Paid leave not linked to job protection but universal payment; relatively long periods of leave; no taxpayer support for out-of-home childcare in the first year of child's life
Employment	Cost of time out of the workplace for parents; problems faced by employers with employees taking leave; increasing non-standard work affecting eligibility criteria	Paid leave linked to job protection; relatively short leave periods
Gender equity	Inequality in the workplace; roles of mothers and fathers in the home; differing family types (same-sex couples, etc)	Short gender-specific leave or longer gender-neutral leave; specific 'daddy' leave; promote leave-taking by fathers
Supporting fertility	Higher opportunity costs associated with taking leave for well-educated women	High level of leave payment; universal payment

can exclusively breastfeed their infants for this recommended period.<sup>9</sup> In addition, workplace measures are required to enable those employees who wish, or are economically compelled, to return to work immediately following childbirth to better integrate their work and family commitments. These include measures for 'phasing back' through part-time work, shorter working days and/or flexitime, as well as provisions for breastfeeding breaks and facilities. Such measures are also required to enable employees returning to work after a period of leave to continue breastfeeding.

However, if an initial, six-month period of leave following childbirth is warranted primarily on maternal and child health grounds, leave then comes to be seen as unavoidably female-specific: i.e. pertaining primarily to women. Herein lies the gender equity conundrum. In heterosexual, two-parent families, if greater equality in both the home and the workplace is to be achieved, parental leave needs to be shared equally by both parents, thereby avoiding the entrenchment of traditional gendered roles and responsibilities. This then necessitates parents taking leave concurrently or, alternatively, an even longer period of leave, so that they can then take it consecutively. Leave longer than six months would ensure that fathers have the opportunity, and are also actively encouraged through education and policy measures, to both spend time with their child and balance the breastfeeding mother's potential time input during the early months, if indeed she takes leave for this purpose.

One way of achieving this scenario would be to emulate the Swedish model. Although still having a considerable way to go with regard to attaining full gender equality, Sweden has nevertheless managed to design and develop a parental leave policy package that recognises and endeavours to address the dual objectives of child health and gender equity.

## Conclusion

Since 1999 New Zealand has had a taxpayer-funded, paid parental leave scheme, first as a tax credit, then as a cash payment to eligible parents. However, debate continues about the length of leave and the eligibility

criteria, particularly given that the current New Zealand policy is less generous than those in some other OECD countries, notably the Nordic countries.

Given that there are many potential goals of paid parental leave, some of them conflicting, designing an optimal scheme in a New Zealand context is likely to remain a difficult public policy challenge. New Zealand's leave policy appears to have been designed as a compromise by the coalition government. Since it was introduced it has been altered a number of times, including through extensions to the length of leave and a loosening of its eligibility criteria. However, there still remains a fundamental question as to whether paid leave should be linked to job protection. We suggest that there is a need to keep the job protection legislation, but, primarily on health grounds, payment for leave either should be made available to all new parents or it should be targeted on income grounds. If the length of leave continues to increase it is likely that the question of how fathers are treated will also continue to be raised. While it seems doubtful that New Zealand will go as far as Sweden in setting aside a specific period of leave for fathers, we suggest there are good reasons to make at least part of the current period of paid leave for biological parents equally available to mothers and fathers, rather than giving primary eligibility to mothers.

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<sup>9</sup> The World Health Organization recommends a period of six months exclusive breastfeeding and partial breastfeeding up to two years and beyond.

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