

4. What Australians knew 25 years ago

The awareness of the greenhouse issue is probably greater amongst the general public in Australia than in any other country in the world

Ann Henderson-Sellers & Russell Blong, *The greenhouse effect, living in a warmer Australia*, 1989

Australia's early good knowledge of climate change was documented in a well-credentialed 1989 book that came to a startling conclusion. Following two national greenhouse effect science and public knowledge events staged in 1987 and 1988 by the national science agency the CSIRO and the federal Commission for the Future, earth scientist Ann Henderson-Sellers and her co-author Russell Blong reported on the outcomes of a two-year media and public awareness campaign. They felt able to claim that 'the awareness of the greenhouse issue is probably greater amongst the general public in Australia than in any other country in the world' (Henderson-Sellers & Blong 1989: 155).

Public knowledge was also borne out in opinion polls. A September 1988 poll reported in *The Sydney Morning Herald* began with the following headline and lead: 'Most want action over the greenhouse effect. Three-quarters of Australians are troubled by the environment-threatening greenhouse effect and believe something must be done to halt it, the latest Saulwick Herald Poll shows' (Carney 1988: 5). This was just one of hundreds of articles from that period examining science and policy on the greenhouse effect.

A questionnaire prepared by Henderson-Sellers and Blong revealed that a majority of respondents worried about the nuclear power option as a response to the greenhouse effect. The same people understood the link between greenhouse effect action and lower use of fossil fuels, and they worried about higher temperatures and rising sea levels. People confessed to a lack of scientific understanding, but wanted to know more. Perhaps most interesting in regard to the 1990s sceptic debate and related framework of uncertainty, was that a majority of respondents demanded only 50–70 per cent certainty from scientists before action was justified.

At that time, certainty was essentially available. The language in the first United Nations-sponsored Intergovernmental Panel on Climate Change (IPCC) report in 1990 was plain English and definite, and it set a communication benchmark that is commonly overlooked in research discussions of IPCC reports. Unfortunately, in the communication worlds of science and policy, the 1990 IPCC report may in hindsight be seen as a refreshing anomaly. Henderson-Sellers and Blong

report that signs of mainstream scientists returning to safer conventions of scientific reporting were apparent as early as 1989. They write that at a public presentation 'Considerable surprise was expressed that scientists should be vehemently debating small differences of certainty ranging from 95–99%' (Henderson-Sellers & Blong 1989: 166).

They also found the public that they interviewed, while admittedly not the 'man-in-the-street', had a sophisticated understanding of how society interacts with such an issue. They asked whether people felt there was any attempt from any sector to deliberately confuse the scientific issue. Twenty-nine per cent of respondents thought so. The respondents, who as a group were better educated than a random poll, thought journalists and politicians were largely to blame, while scientists were seen as somewhat responsible, but not very.

Other agents of confusion nominated were multinational corporations (self-interest) and extreme environmentalists (propaganda). The authors conclude that all those surveyed, including high school students, correctly understood the scientific message, while interpreting the response of politicians and planners as ineffectual and possibly uncaring. The young people were described as seeing an unsatisfactory future, but not seeing a way to change the outlook.

Two state surveys of Australian public attitudes that were published in 1989 come from the Electricity Commission of New South Wales and the State Electricity Commission of Victoria (SECV). They are evidence that states at that time were starting to act on public knowledge with a view to containing consumer demand for coal-fired electricity. Concern about cutting down forests, the hole in the ozone layer, and the greenhouse effect were most frequently mentioned as top world environmental problems. In the NSW survey, conducted by the Roy Morgan Research Centre, 95 per cent of respondents had heard the term 'greenhouse effect' and 41 per cent knew it was warming the earth, although an almost equal number confused it with ozone layer depletion. Respondents nominated running a car, burning coal and logging forests as primary causes (along with the ozone-depleting aerosols). People also expressed themselves willing to pay more to have a large impact on emission reductions (Morgan 1989).

The December 1989 SECV survey was a small, self-selected sample in response to a discussion paper on alternative responses to 'the greenhouse challenge'. *The SEC and the greenhouse effect* found that respondents were in favour of an even stronger target for emission reduction than 20 per cent, people understood the benefits of efficiency measures, and said coal-fired electricity should not be promoted for home heating and hot water heating in preference to gas and solar. Renewable energy was supported and respondents said hidden subsidies to status quo industries should be removed. Tree-planting programs were strongly supported. Respondents even pointed out the severe conflict between

wanting to attract energy-intensive industries with cheap coal-fired electricity and, on the other hand, reducing CO₂ emissions. People noted that alternative jobs could be created with clean-power industries (SECV 1989).

Evidence that people knew the risks of greenhouse gas emissions

There is ample evidence of a public discussion up to 1992 on the risks of adding to atmospheric greenhouse gases by burning fossil fuels. From greenhouse conferences and popular science books to government documents supported by a steady stream of media articles, the public was informed about risks posed by climate change and their obligations as global citizens.

Just the books published in 1989 leave no doubt about the considerable knowledge of climate change that was available to the public 20–25 years ago. Besides Henderson-Sellers's and Blong's book, another four books on the subject were published in 1989.

In their book *The greenhouse effect: a practical guide to changing climate*, the conservation campaigner Stewart Boyle and *Guardian* newspaper journalist John Ardill wrote about climate change with uncommon style and understanding of what people 'hear', or relate to, like weather analyses:

Many of 1988's droughts and floods, heat waves and hurricanes were random events, the roll of the dice. But the dice are being weighted. In coming years they will fall hot and stormy-side uppermost more often. Hard-nosed politicians with voters to cosset, powerful vested interests to satisfy and rivals to guard against began to talk like prophets, ecologists and utopians ... they began to talk of a world that is frugal and fair. (1989: 4)

Boyle and Ardill reported that, at the time, politicians appeared to have achieved a 'glimmer of visions' and that this was framed in language that spoke of solidarity, equity and accountability—in other words, an ethical framework—rather than the tyranny of the immediate. And they put this unusual political focus within the context of worldwide weather catastrophes that marked 1988:

In 1988 the atmosphere came within one per cent certainty of proving that humanity has upset its natural balance and that it will strike back blindly and with catastrophic unpredictability. Global warming is the threat that bundles up all our woes into one problem and one solution. (Boyle & Ardill 1989: 5)

Other significant books were written by Fred Pearce, a long-time environmental correspondent for *New Scientist* magazine (Pearce 1989) and by physicist Ian Lowe, who was at the time acting director of the forward-thinking, strategic Commission for the Future and a faculty member of the Science Policy Research Centre at Griffith University. Lowe summarised for a lay audience the science and policy understanding of 1988–1989 following two groundbreaking greenhouse conferences and after encountering tremendous public interest in the subject (Lowe 1989).

The Commission for the Future, established in 1986 by then federal science minister (1983–1990) Barry Jones, was to provide a think tank environment and a public awareness forum for science and innovation developments. While the commission disappeared in the early 1990s, along with other structures from the Hawke Labor government it was influential in informing the public while it lasted.

The books from this period challenge the notion of an incremental, one-way path towards greater political and public understanding over the course of the next 20 years and up to the present. For example, Boyle and Ardill quote Mostafa Tolba, then executive director of the UN Environment Programme (UNEP) who said, ‘Political leaders now accept the broad scientific consensus that human activity is altering climate and that the changes and their impacts will become more pronounced over the next few decades’ (Boyle & Ardill 1989: 6).

Together with the newspaper record and other documents, these books provide a science history of events, understandings and values—at least in the English-speaking world at that time, and of Australia’s climate change knowledge and response in the late 1980s.

Lowe is one of the small group of Australian scientists and researchers (with training that qualifies them to be considered expert)¹ who have consistently written and spoken about climate change and its risks to civil society, even in the face of a decade and more of increasing scorn and scepticism from powerful politicians, think tanks and opinion columnists in the media, specifically in the News Limited media and in commercial talkback radio (which scorn is still at fever pitch today).

Lowe’s 1989 book *Living in the greenhouse* was followed in the mid-1990s by *Living in a hothouse*, now out of print. The first book offers the chapter and verse

1 Other Australian scientists/technologists from this era, who have continued to publish for a lay audience and have disputed prevailing economic ideologies driving responses to climate science during the 1990s, include Mark Diesendorf and Alan Pears. This is in addition to atmospheric scientists—CSIRO’s Barrie Pittock, Willem Bouma, Graeme Pearman and Michael Raupach *inter alia*—who have spoken in many public fora and published for decades on this subject.

of what was known at the time on climate change—its risks and solutions—in notable contrast to public discussion that developed through the mid-1990s and into the present.

Delving into *Living in the greenhouse* provides the whole story of discovery from the 1890s on. The natural greenhouse effect balance of gases has been beneficial in keeping the earth warm and habitable. But:

Our contemporary problem is that human actions since the Industrial Revolution have been changing the composition of the atmosphere ... the scientific community has been concerned for several decades. By the 1950s it was suggested that the rate of burning fuels such as coal could be changing the amount of carbon dioxide in the atmosphere. (Lowe 1989: 1)

What stands out from the publications of this period is the matter-of-fact, declarative language, clearly linking atmospheric pollution and human actions. No debate there. The descriptions assume that the chemistry underpinning the science is basic and easy to understand. Lowe notes upward trends of coal burning globally (from 1.5 million tonnes annually in the 1920s to an estimated 20,000 million tonnes 60–70 years later) and the simple chemistry of burning carbon + oxygen = carbon dioxide.

As early as 1980 the Australian Academy of Science organised a conference in Canberra to review the thinking of leading scientists on the issue (Pearman 1980). Lowe says 'It was noted then that carbon dioxide levels were increasing quite rapidly and it was estimated that the pre-industrial level could be doubled by the year 2030' (Lowe 1989: 2).

The authors writing in 1989 were aware of atmospheric modelling work soon to be summarised in the 1990 IPCC report suggesting temperature increases of 1–2 degrees Celsius (°C) near the equator and 4–6 °C at higher latitudes within the 21st century under 'business as usual' scenarios. These predictions have hardly changed. (By the mid-1980s the world was experiencing a 0.5 °C average increase). Looking back, Lowe said in an interview in 2007, 'We've known for 20 years the impacts but we underestimated the speed of change; numbers have changed remarkably little. Climate change is happening a little faster.'

In the late 1980s scientists were able to confidently paint the macro effects—such as sea-level rise and changing, extreme, and unpredictable weather events—but they could not be specific about local and regional effects. This inability to predict what would be happening in particular locations was another reason for the more qualified language coming from scientists when they spoke to the public or the media in the 1990s and beyond. Unfortunately the later talk of 'probable' and 'likely', even when there was 95 per cent certainty about the

likelihood of the outcome, tended to fuel debate because politicians and the media don't engage with the grey area of scientific uncertainty and tend to hear 'we don't know'.

Newspaper reports from the late 1980s indicate that scientists were signalling unambiguous confidence that the greenhouse effect was a real phenomenon caused by human activities. A review of 25 stories published in *The Sydney Morning Herald* for half of 1988–1989² shows that most of them quoted US scientists and referred to Australia in a global context. Potential consequences were openly discussed by government scientists and technologists. For example the following article quoted Australian scientists, with the headline 'Scientists warn of islands' peril':

Australia may need to take in a wave of environmental refugees from coral atolls in the Pacific and Indian oceans, according to two scientists. The islands' inhabitants face being displaced by a likely rise in sea level due to the greenhouse effect, they say. The prospect was raised yesterday at the 26th Congress of International Geographical Union in Sydney by Dr Peter Roy, of the NSW Department of Mineral Resources, and Dr John Connell, of the University of Sydney. Up to about 500,000 people living on small coral islands in the two oceans could be displaced if the predictions of a one-metre rise in sea level over the next 50 years prove correct. (Quiddington 1988: 7)

Looking back in 1993, Henderson-Sellers credited the involvement of scientists and clear communication for prompting policy action. Besides being direct and to the point, early descriptions of human-caused climate change by scientists and reporters tended to address what lay audiences were likely to 'hear' from their own past experience. They used the language of risk, or current weather events, or likely impacts, such as sea-level rises. There was also an early understanding that 60 per cent or more global reduction in emissions was the necessary response and there was, therefore, a matter-of-fact assumption that the public interest required a strong response.

This assumption is reflected in the statement of then chairman of the CSIRO, Neville Wran, who told *The Australian Financial Review* in 1988 that regulation might be needed to achieve emission cuts. 'The Federal government may have to

² Newspaper sampling for this analysis focused on Fairfax-owned media with one national business newspaper, *The Australian Financial Review*, and one metropolitan and regionally distributed general interest paper, *The Sydney Morning Herald*. The editorial content of these two publications over time, unlike the Murdoch press, has not been studied elsewhere. Samples were taken from years bordering IPCC reports in 1990, 1995, and 2001 as well as 1988/89. Key words like greenhouse effect, global warming and climate change yielded a pool of articles with samples taken from a consistent period at the beginning and end of the sample years.

bring in laws to control the greenhouse effect ... legislation would be required to either recognise international agreements on controlling the greenhouse effect or to regulate the phenomenon in Australia' (McKanna 1988: 4).

A senate inquiry in December 1989 also did not hedge its language and the clarity of its findings provides a useful contrast to the confused discussions we witness today. The inquiry was briefed to look at the contribution that Australian science and technology could make to combat the greenhouse effect. To do so, the Senate Standing Committee reported that it met with Pearman and Lowe; Dr John Zillman, Director of the Bureau of Meteorology; and Nelson Quinn, a senior officer from DASETT (the department of environment). The report accepted the science of the physics and chemistry, the predicted impacts for Australia, the risks, and the moral obligation as a global citizen—as shown in the following extracts from the introduction (Senate Standing Committee on Industry, Science and Technology 1989).

The experts with whom the Committee met confirmed that there is *irrefutable scientific evidence* that the composition of the atmosphere has been, and continues to be, altered significantly by human activities [discusses ice core evidence in particular] ... The changes that are likely to occur as a result of these changes in the atmosphere cannot yet be predicted precisely. However, the scientists *predict with a high degree of confidence* that a global warming of between 1.5 and 4.5 degrees centigrade can be expected to occur by 2030. Climatic records indicate that this warming may already be happening. This phenomenon is popularly known as the greenhouse effect. (my italics)

On likely impacts the report stated:

The sea level can be expected to rise between 0.2 and 1.6 metres, as the oceans become warmer and expand. There will be changes to the climate ... In Australia the prevailing weather patterns are expected to move south. Some areas will receive more rain but it can be expected that droughts will become more frequent in other areas, and that climatic extremes such as cyclones will occur as far south as Brisbane.

There is a risk that if the response to this problem is delayed until the evidence of significant climatic change becomes irrefutable, it may be too late to avoid some of the more extreme changes that could occur ... Early action is essential to stop or slow some of the more extreme effects ...

The senate document shows that the political framing was moral and sought opportunity. Since our per capita emissions are large, 'we would not be in a

position to seek change elsewhere unless change is implemented here'. The document said Australia should 'serve as an example' and 'develop industrial techniques and innovations'.

Indeed, the global, ethical approach is a standout feature of this time in Australia's history (McDonald 2005) briefly shared by other English-speaking countries. Ethical responsibility was seen owing both to the rest of the world and to future generations.³

In July 1989, Prime Minister Bob Hawke declared in his Statement on the Environment:

The growing consensus amongst scientists is that there is a strong possibility of global warming with major climate change, and that this is linked with the levels and nature of industrial and agricultural activity. Significant climate change ... would have major ramifications for human survival ... (Hawke 1989: 28)

Earlier still, influential Labor powerbroker and then federal environment minister Senator Graham Richardson concurred in a *Sydney Morning Herald* interview, calling the greenhouse effect the greatest threat facing Australia and the world (Secombe 1988).

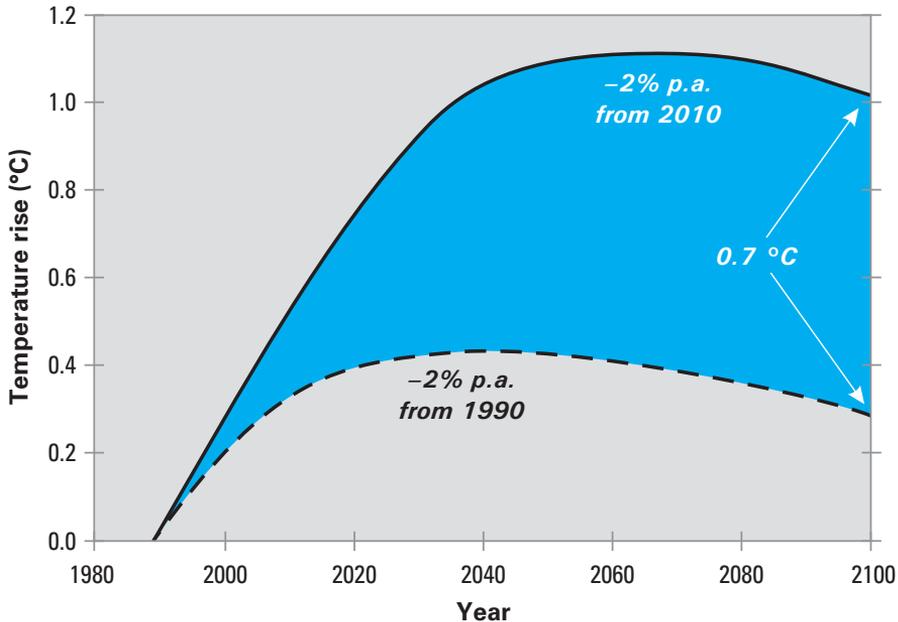
Cost of inaction known

The evidence in these documents indicates that politicians and their advisers at that time were establishing a narrative for early intervention, as a good global citizen open to regulation for the common good. This remained a rhetorical goal at the time of Australia's participation in the United Nations Framework Convention on Climate Change (UNFCCC) 1992. Also known to policymakers at the time was the 1990 IPCC assessment of the cost of inaction or sticking with the status quo: 0.7 °C of additional warming by 2100, which is represented by the blue curve in the figure below.

The graph comes from a federal government publication released in 1992 showing how matter of fact this knowledge was at the time. The National Greenhouse Advisory Committee, chaired by ANU ecologist Henry Nix, whose main brief was to fund research, was borrowed by then federal environment minister Ros Kelly to explain climate change science to the general public. The resulting publication used plain English as it transferred the messages from the 1990 IPCC report and corrected some sceptic refrains, such as the argument that

³ This definite and ethical approach is highlighted in a surprising speech given by then British prime minister Margaret Thatcher to the United Nations in 1989, quoted at some length in the next chapter.

changes to the world’s climate have occurred before and will again naturally—which ignores the unprecedented rate and rapidity of change caused by human activities.



‘Warming to the year 2100 is shown for two scenarios: 2% reduction per annum in greenhouse gas emissions starting in 1990, or 20 years later in 2010. The difference is the “temperature penalty” for delaying reductions.’

Source: Mitchell 1992 citing IPCC 1990: 40.

The publication noted: ‘Climate change induced by the enhanced greenhouse effect represents change to the planet’s climate system at a greater rate than experienced for at least 10,000 years’ (Mitchell 1992: 41). (The comparison has since been amended to at least 100,000 years and, more recently, as the CO₂ level continues to rise, to 400,000 years).

Weather framed risk

The compelling climate change narrative in the late 1980s and early 1990s was often anchored by the observation that the weather was getting hotter with

droughts, heatwaves, and changing rainfall patterns around the world. This was gaining public attention thanks to media stories from the period along with the popular science books from 1989.

Consider this 1988 article in the business-focused *Australian Financial Review*, aptly titled 'Government officials start to feel the climate of change':

... yesterday, Queensland's Water Resources Minister, Mr Don Neal, was at the forefront of the discussion. He pointed out the possible economic impact on Governments from increased flooding, more severe droughts, the effect on agricultural and pastoral industries and the need to redefine engineering design codes for roads, bridges, railways, dams and even housing ... 'There is no longer any serious doubt that climate will change more rapidly over the next 50 years than ever before in natural history'. (Massey 1988: 28)

Given 2010–2012 weather events in Queensland, this historical record becomes even more interesting. Risk messages framed the expected weather changes—with likely short and longer term impacts known at the time including the following unpleasant consequences of unchecked human greenhouse gas emissions: temperature rise (tropical cyclones); changes in average rainfall and intensity (floods); sea-level rise (landslides); droughts (wildfires); and land degradation and health consequences. New data have *refined* regional detail of risks, but the record shows the macro impacts were all known by 1988.

One could not get more 'popular' in publications than *Newsweek* or *Playboy* both of which explored the greenhouse effect in the 1980s ('Mother nature's revenge' 1987; Shears, 'The greenhouse syndrome', 1980).

In US Congressional testimony, leading climate scientist James Hansen of the National Aeronautics and Space Administration (NASA) testified that he was 99 per cent certain that the warmer weather of the 1980s (along with a headline-grabbing drought) was a sign global warming had started. This reportedly galvanised legislators into considering rapid action (White 1990). Australian media reports overwhelmingly heeded this international response as well as active domestic science communication. The target audience was the Australian mainstream and the message was framed as risk to everyone. In June 1988, a report from Paul Sheehan in Washington D.C. published in *The Sydney Morning Herald*, states:

Scientists have warned about the 'greenhouse effect' for years. Now it is no longer a scientific nightmare; it has arrived. ... The 'greenhouse effect' is the term given to describe the gradual heating of the Earth's atmosphere caused by the increasing production of fossil fuels and pollutants. (Sheehan 1988)

Risk management was also on the government's agenda, as shown in a 1987 federal environment department (DASETT) briefing minute to the CSIRO Division of Atmospheric Research. It said 'risk management was necessary' and that 'action needs to be taken now' ('Climate change due to the greenhouse effect' 1987: item vi). The document speaks of more extreme events and erratic weather. It urges action despite scientific uncertainties on specifics, but understands the risks posed by human activity creating the greenhouse effect. A similar understanding is evident in numerous other government documents published between 1987 and 1991.

The important Toronto conference 'The Changing Atmosphere', which was held in 1988, saw the Canadian Government host some 300 scientists, politicians, and economists from 48 countries. The conference coincided with severe drought and high temperatures in North America. The events of the conference, and its dramatic final statement of urgency and call for emission reduction targets, were widely reported in the Australian and international media. *The Sydney Morning Herald* reported on 2 July 1988 that the international call to action was attempting 'to reverse the trend towards a hotter, drier, carcinogenic world before the pace of environmental deterioration accelerated beyond man's ability to stop it' (Benesh 1988). This is one of many articles from the period that accepted the scientific risk assessment as fact *before* the first IPCC report.

Toronto helped focus world policy attention, reaching for an action model that seemed to have worked to curb ozone pollution—set targets internationally and let governments work out the policies to meet them (Weart 2004). The conference's experts proposed reduction of CO₂ emissions to 1988 levels by 2000 and a further 20 per cent reduction by 2005, a formula picked up by Australia and other countries at the time.

1988: Coming to grips with a terrifying global experiment

The Toronto conference statement made it clear that climate change would affect everyone. It called greenhouse gas atmospheric pollution an 'uncontrolled, globally pervasive experiment whose ultimate consequences could be second only to nuclear war'. World governments were urged to swiftly develop emission reduction targets (*The changing atmosphere: implications for global security*, 1988).

Toronto paved the way to the United Nations and World Meteorological Organisation IPCC structure, which was also established in 1988.

Hundreds of climate scientists, economists and national policy representatives were asked to review the global research on causes, impacts and potential responses (three working groups) and report to the second world climate conference in 1990 in Geneva and every five years thereafter. Science journalist Fred Pearce noted the irony that the IPCC concept was promoted during the US administration of President Ronald Reagan as an effort to contain or dilute noisy government scientists talking about dangerous climatic changes as they did at their groundbreaking 1985 UN-sponsored conference in Villach, Austria.

The purpose of the IPCC was to put scientists back in the cages they had briefly escaped from at Villach, and to this day the IPCC's members are government nominees. But it was too late. The story of global warming — and what scientists really felt about it — was out. (Pearce 2005: 53)

The scientists who gathered at the 1985 Villach conference made significant risk pronouncements linking anthropogenic increases in greenhouse gases with global warming and climate change. A consensus emerged within the climate science community that 'we have a problem' (Bolin et al. 1986; Pearman 1988).

At the same time, the multi-decade struggle to understand and ban ozone-depleting substances, another major man-made risk to planetary health, was drawing to a conclusion. In 1987, the international Montreal Protocol banned most of the traditional chemicals that had been used in refrigerants and powered aerosol sprays. This seemed to demonstrate that countries *could* come together for the good of their living environment, based on scientific advice. (Unfortunately, the two issues—the hole in the ozone layer and greenhouse gas pollution—also became confused in the public mind).

It may surprise those who think the scientific evidence was thin at that time, but the Villach statement in 1985 reflected conclusions drawn from much previous research, ranging from ice-core evidence to analysis of atmospheric chemicals, experiments with general circulation models, and observations on heat and sea-level rise (Lowe 1989).

By 1988 politicians were becoming more involved. Graeme Pearman called the evidence facing the Toronto global conference of concerned scientists and bureaucrats a 'clarion call to politicians to take action' (Lowe 1989: 4). Pearman was an author of the 1990 IPCC science working group report.

A brief open door of opportunity

The 1990s political changes that would bury Australia's early climate change response strategy make the events of the late 1980s all the more remarkable

in hindsight. Early public awareness in Australia probably reached its apex as the CSIRO, along with the federal government's Commission for the Future, developed two national greenhouse conferences featuring Australian climate change science of international standing. The conferences garnered widespread media and community attention.

An important element of the 1980s history of climate change understanding in Australia and overseas was the leadership by scientists and their effective interaction with media and policymakers as well as the organisation of conferences and major public events. European environmental journalist Fiona Harvey told the (US) Society of Environmental Journalists in 2006: 'When people first heard about global warming, it wasn't from politicians, it was from scientists through the media. So we got the scientific view before any politics got attached to it' (quoted by Thacker 2006).

In the United States, media research has suggested the same phenomenon: media stories peaked between 1988 and the early 1990s, and scientists were a primary source of information during that early period. Environmental journalists recalled that media coverage picked up again around 1997, when the Kyoto Protocol was under discussion (Wilson 2000).

The December 1987 CSIRO 'Greenhouse '87' conference was primarily a meeting of scientific experts who were given a baseline that climate change would happen and were asked to analyse the most likely impacts and scenarios (Pearman 1988; Lowe 1989). 'The conference attracted considerable media interest, with the main emphasis, perhaps predictably, being on the worst cases of gloom and doom: coastal land possibly flooded, agricultural areas possibly turned to desert, cyclones possibly moving further south, and so on' (Lowe 1989: 4). The media appetite that emerged for the most dramatic possibilities may have encouraged scientists themselves to draw back from such black and white predictions and the definitive language that characterised the first (1990) IPCC report.

A year later, another CSIRO event was organised with the federal government's Commission for the Future. 'Greenhouse '88' has been characterised as 'extraordinarily ambitious' (Lowe 1989: 5) with conferences in all capital cities plus Cairns. Local meetings were held to establish planning committees for future action. The committees were composed of generally well-informed individuals committed to improving the level of community awareness.

US atmospheric scientist Stephen Schneider gave the keynote address at 'Greenhouse '88', saying scientific consensus and evidence was sufficient to take action (Lowe 1989: 6). Other speakers included: Barry Jones as science minister; then Victorian minister for education (and soon to become premier) Joan Kirner;

and commission chairman, broadcaster and writer Phillip Adams—and the documentary record shows many organisations, public and private, were also involved.⁴

Schneider, who died in 2010, played a significant role during much of the early history of climate change communication. It started with his 1976 book *The Genesis Strategy* in which he famously predicted that in 2000 the effects of human activities will emerge from the background noise of natural climate variation (Schneider 1976: 228), which proved to be close to the mark. During the 1990s, however, he also argued persuasively to diffuse the language of the IPCC to emphasise the uncertainties. Melbourne *Age* journalist Geoff Strong, who reported on climate change during these years, observed that raising the profile of uncertainties unwittingly played into the hands of denialists and naysayers in the decades to follow (which is covered in more detail in the following chapters).

Local discussions following ‘Greenhouse ‘88’ continued for two days and organisers counted 8,000 people involved, claiming it was the largest conference ever held on an environmental issue. Being widely reported, it garnered political attention across the spectrum. Then environment minister and Labor powerbroker Graham Richardson, for example, was one who spoke out at the time.

His role and sincerity on the climate change issue is still debated, with many contemporary observers guessing that his interest was purely political and involved ‘counting the numbers’ of potential votes for the next election, which, in itself, would stand as testimony to the strength of public awareness. Regardless of motive, his utterances in the media record reveal a solid understanding of the magnitude of the risk. Ian Lowe told me in an interview, ‘Richo at first was just a pragmatic political fixer but when (Greens leader) Bob Brown took him to the Tasmanian forests, he became a convert’.

Through his involvement with the Commission for the Future, Lowe had firsthand experience with the contemporary public interest and wrote his 1989 book on climate change in part to satisfy that interest. He testifies to a great deal of media coverage:

The mass media took up the question of possible climate change with great enthusiasm. The *Age* published a 4-page supplement in association with the Commission. TV programs *Quantum* and *Beyond 2000* made

4 In his 1989 book *Are We Entering The Greenhouse Century?*, Schneider recalled his invitation to speak at ‘Greenhouse ‘88’ by Philip Noyce, deputy director of the Commission for the Future, and the intense round of media interviews throughout the country that were organised preceding his speech. He found (to his relief) that both the media and general public were well informed and asked good questions, thus providing further evidence of Australia’s good public knowledge at this time.

special editions, a special Sunday Conference was devoted to the issue and it seemed to be on every radio station. Suddenly it seemed that everyone knew about climate change. Radio stations aimed at the youth market were particularly keen to take up the issue, reflecting their awareness of the great concern of young people about environmental issues (Lowe 1989: 6).

Australia's early emission reduction targets 1989–1990

Following these national events and in response to the Toronto targets and international calls for action, by 1989 Australian state governments released initial greenhouse response strategies focused on energy conservation and substitution for coal. The need to retain native vegetation was acknowledged (and in 1990 would be supported by the Hawke government kicking off the decades of Landcare and tree planting).⁵ Local government looked at specific impacts, and schools and voluntary groups got informed and involved. To help them out, the Commission for the Future released the *Personal action guide for the Earth* that again shows the early understanding of the consequences of the greenhouse effect and that the science findings have hardly changed in a quarter of a century (Commission for the Future 1989: 5).

In October 1990 Australia formally adopted the Toronto targets by setting a so-called 'interim planning target' of stabilising greenhouse gas emission at 1988 levels by 2000, and reducing them by 20 per cent from that level by 2005 (Commonwealth 1990).

Energy efficiency headed the response strategies talked about at that time, framed as a way to cut emissions significantly and as a win-win with cost savings. Early 1990s Commonwealth fact sheets for the public promote efficiency measures and fuel substitution for heating, lighting, and transport (e.g., use of insulation, passive solar, fluorescent light bulbs and solar hot water, heat recycling, conversion to gas).

They promised that these strategies could yield an 18.8 per cent cut in carbon dioxide emissions over time, in line with the interim planning target of cutting at least 20 per cent. At the same time, consumers and businesses could save millions in energy bills (*Climate Change Program*, Commonwealth n.d.). As we shall see, this efficiency approach—called demand management—eventually

⁵ The Landcare movement officially began in 1989 when the Australian Government formed the 'Decade of Landcare Plan' in an effort to protect, restore and sustainably manage Australia's natural environment and productivity.

stumbled in the face of the growth and 'sell more electricity' lobby as state-owned energy suppliers were corporatised, and/or privatised, and found themselves competing in a national market.

In so many ways back in 1989, with the weather giving warning signs, and media plus political leadership on board, the documentary evidence indicated that appropriate action would follow step by step. And so it did—on paper. Yet, within 10 years these messages had been reframed into a hazy 'scientific debate' characterised by uncertainty, which confused the public and blocked action.

Even at the early and active stage, some commentators were cautioning about the length of time it might take for effective global action. Lowe, for example, harked back to the slow trajectory of action on the ozone hole—between 1974, when discovery of damage by chlorofluorocarbons was made, and 1987 (13 years later) when degeneration of the ozone layer became measurable. In the event, the climate change story is taking longer to sink in, subjected to comparable forces of denial and manufactured uncertainty.

The ozone story provides a parallel about communication and issues within the scientific community itself regarding empirical evidence. 'For 13 years those who wanted to do nothing could stall by saying the evidence is not good enough, only *measurement* is evidence that warrants action,' Lowe said in an interview for this story.

For communication scholars, another important lesson when comparing the two phenomena under similar sceptic and industry attack is that the ozone hole risk enjoyed the advantages of being easily described with a metaphor (a hole in the earth's protective shield), it denoted an urgent crisis (skin cancer risk) and there was a comparatively simple solution to hand (Ungar 2000).

Emission reduction stalls at reality of energy markets

Despite the understanding of urgency to act, it was recognised early that somewhat mitigating the risks would be a major undertaking, let alone reducing emissions by 60 per cent as the IPCC was suggesting might be necessary. The 1990 IPCC report on response strategies warned that, 'Achieving a 20 per cent reduction from current emission levels would require major changes in global energy markets, plans and infrastructure and intervention by governments' (Bernthal 1990: 66–67).

A 1989 report from the Australian Prime Minister's Science Council noted that reaching this same target would call for 'deep-reaching and pervasive energy-

restructuring at considerable cost and substantial government intervention' (Kolm & Walker 1989: 147) foreshadowing major barriers that would be erected to action in the next decade, namely the cost barrier, the power of the status quo and the ideological dislike of regulation.

Inefficient Australian industry in export environment: change the story, not the industry

In the late 1980s the media conducted an open discussion about the state of Australian fossil fuel-based industries. Top of the agenda for a different energy production profile was conservation and efficiency and fuel conversion (to gas), renewables, along with related new job creation. The following article from *The Australian Financial Review* discusses the federal government's push for energy efficiency, and says Australian industry is extremely wasteful in its use of energy:

ignoring even simple energy-saving projects that would have a payback time of less than one or two years. The study found that energy consumption and greenhouse gas emissions could be cut by 15 per cent using easily identifiable energy savings that would actually make rather than cost money.

...

The bigger picture is that the industrial sector contributes 36 per cent of all Australian emissions of carbon dioxide, the main gas associated with the greenhouse effect. A national target of a 20 per cent cut in emissions by the year 2005 is thought likely to be adopted in the near future. If this is to be achieved, then industry is going to have to show it is taking the problem far more seriously. Otherwise it will only be inviting the Government to force it to take action. (Roberts 1989: 17)

In other words, it was recognised in 1989 (and in the business media) that halving emissions from an inefficient industry sector would get Australia a long way towards its target of 20 per cent cut in emissions. There is also early evidence of the conflict created by Australia's economic direction towards expanding minerals extraction, and specifically a focus on coal, that would come to dominate in the 1990s. The following *The Australian Financial Review* article made public the conflict between emission reduction and the push towards 'quarry Australia':

The reasons for Australia's awkward position on global preventative responses to the greenhouse effect are simple. Ours is a carbon intensive

economy. We are the biggest exporters of coal in the world. Electricity generation has been growing by 6 per cent per annum over the past two decades, to account for 44 per cent of carbon dioxide emissions. Ninety-five per cent of electricity produced in Australia is generated by the burning of fossil fuels such as coal and gas.

Per capita, Australians are the fifth highest greenhouse polluters in the world ...

Moreover, to trade out of its foreign debt burden, Australia hopes to do much more processing of raw materials in the 1990s. Like the wave of aluminium smelting investment of the early 1980s, this would be energy intensive—and thus greenhouse intensive—stuff. (Stutchbury 1990: 16)

Fast forward 23 years and the documentary record indicates that *The Australian Financial Review* since the mid-1990s has moved a long way from its editorial position in the 1980s and early 1990s as a critic of business practices when necessary for an informed public.⁶ Early *Financial Review* articles, such as the above, illustrate a more neutral and sometimes critical stance on Australia's energy-intensive industries. In those early years the publication also reported the climate science story much as other mainstream papers did. That changed to a strongly partisan pro-industry position by the mid-1990s.

The 1990 Stutchbury article foreshadowed that Australia's minerals and smelting sector would drive an argument that Australia had a special case not to make energy sector changes or significantly lower greenhouse gases—because it was an inefficient sector that was sensitive to increases in the price of electricity if it wanted to remain competitive on the world stage.

Instead of including that sector in efficiency drives and lower electricity use, a succession of Australian policymakers and industry lobbyists during the 1990s decided to keep the energy production and use status quo as it was (Pearse 2007), and instead change the framing of the public narrative to suit that goal. (To the extent that energy-intensive industries still operate inefficiently, this may partly explain the hardline resistance to carbon pricing by their allies in the federal government under Tony Abbott).

Also revealing where the country was headed was a November 1989 report, again in the *Financial Review*, that the Treasury under Paul Keating—in an internal argument about emission reduction targets—was advocating the position that Australia could increase its pollution as a specialist energy user.

⁶ The reporter of the above article, Michael Stutchbury, after a stint as economics editor at the Murdoch-owned *Australian*, returned recently to *The Australian Financial Review* as editor-in-chief and, in a 2013 ABC panel program, defended the position of the coal industry in national affairs. The political website *Crikey* has called the *Financial Review* in its current incarnation an elite outlet for big business messages (Dyer & Keane 2013).

It was reported that:

Senator Richardson wanted to set a 20 per cent reduction target by the year 2005 but was defeated by the intervention of the Treasurer, Mr Keating. The Treasurer convinced Cabinet that Australia should instead promote itself as an energy-efficient industrial centre. The argument was that while pollution might increase in Australia, there would be an overall reduction worldwide. (Dunn 1989: 8)

Industry opposition, sceptics on horizon

The first rumblings of opposition from the mining sector started at this time too. An early example comes from a scientific presentation at a Brisbane seminar organised by the Queensland Government in 1989. Lowe reports that Griffith University scientist Roger Braddock presented a cautious paper reflecting scientific uncertainty about the state of knowledge on interaction of atmosphere and oceans, that is: how, and how much, carbon dioxide from the atmosphere was being stored in the oceans.

It was only too depressingly predictable that his paper would be misrepresented; the President of the Queensland Chamber of Mines wrote letters to politicians and various publications, claiming that Dr Braddock's cautious approach proved concern about climate change was unjustified hysteria from wild-eyed extremists. (Lowe 1989: 11)

Sceptic scientists were on the horizon by December 1991 when a prominent representative—Robert Balling, a climatologist from Arizona State University—was invited to The Australian National University (ANU). It was reported in the federal government's newsletter, that he called the IPCC report 'scare mongering' and said there was no evidence of a hotter planet. The visit was sponsored by the Tasman Institute, a free market think tank. Balling's visit was one of several by US sceptics who were brought to Australia in the early 1990s by think tanks, but also supported by the CSIRO and universities, in the name of free enquiry and debate (Department of Primary Industries and Energy 1992).

Sceptic and atmospheric physicist Richard Lindzen, who had some of the most relevant scientific credentials of the well-known critics, was invited to Australia by the CSIRO and addressed the National Press Club in June 1992. He is quoted in an industry conference paper saying 'most scientists in the field do not agree the case for action has been demonstrated' (Daley 1992: 3).

Still, at that time, then federal science minister Barry Jones recalls, 'I didn't have the Minister for Minerals and Energy shooting me down (and) at that time there

weren't the hardball lobbyists.' He also points out, however, that even during that early period the scientists with whom he spoke did not have a unified view on the human contribution to climate change and that both the head of the CSIRO Division of Atmospheric Research, Brian Tucker, and the Bureau of Meteorology's head John Zillman, while in the minority, were personally more sceptical and also influential because of their positions. Both of these men, perhaps due to their disciplinary backgrounds, (more on that later), were more liable to express reservations about climate system modelling that could not be measured on-ground.

It is noteworthy though that, in his professional capacity, Tucker had edited a monograph on climate change science for the Australian Academy of Science as early as 1981. In June 1986 he would make a presentation on behalf of the division to the Australian Environment Council (AEC) that helped galvanise the government into more research funding and also into communication activities, as recorded in a 1987 departmental minute to the division (*Climate change due to the greenhouse effect* 1987).

According to federal politician Bob Chynoweth, the then parliamentary representative on the division's advisory board, who reported back to Jones during the mid-1980s, Tucker and his scientific colleagues also knew how to effectively operate in the policy environment: 'The real work was done by short-circuiting the bureaucracy and going straight to the minister. That's how you got things done. Lobbyists go straight to the minister,' he told me in an interview about how science and politics used to interact.

Atmospheric scientists knew the communication game

As one of Australia's lead scientists in the new field of climate change science, Graeme Pearman approached his role in much the same way. He appreciated the integrated nature of sustainability research and communicated widely. He said his strength was to get to know and engage directly with politicians, bureaucrats, community groups like Rotary, and particularly the media, and that he saw this as a serious opportunity to benefit the taxpayer's investment in the research.

Barrie Pittock, Pearman's colleague at the CSIRO Division of Atmospheric Research, wrote numerous articles during the 1980s and 1990s for professional and lay publications focusing on the state of scientific knowledge and risk, and he tackled the still uncertain issue of regional and local impacts on Australia.

The following summary comes from a paper in *Australian Forestry*, one of dozens of articles, book chapters, and conference speeches Pittock produced from 1980 to the late 1990s:

The atmosphere beyond the year 2000 will be different from any experienced since before the last glaciation, more than 100,000 years ago. This will profoundly affect forestry locally and globally. Large percentage increases in carbon dioxide and other greenhouse gases will cause temperatures at a given location to be far higher than any in human history, and [also cause] large local changes in rainfall and humidity. These will greatly affect tree growth, species composition in natural forests, and fire frequencies. (Pittock 1987b: abstract)

A 1991 paper, co-authored by Pittock on climate change scenarios for Australia and New Zealand by 2010 and 2050, is notable also for how long the publisher had been around—the journal *Climate Change* was by then in its 18th issue. In a 1987 presentation to a lay audience at the Peace Research Centre, Pittock did not hedge his words: ‘The greenhouse effect throws into question the whole global trend towards increasing population, and industrialisation based on greater energy use’ (Pittock 1987a). At the time, such plain speaking and policy comment was not unusual for scientists. These public interactions became more unusual by the mid-1990s, as more scientists employed a language of uncertainty or stopped public discussions altogether.

Politicians: Many did not believe impacts *could* happen

In the late 1980s, political leaders (Jones, Hawke and Richardson) publicly interacted with the CSIRO scientists and division advisory boards. From that advisory board, Bob Chynoweth personally briefed the prime minister, according to a Hawke speech to the division on 19 March 1990 (Hawke 1990).

Chynoweth himself gave an extraordinary speech to federal parliament in October 1987, in which he laid out in clear language some of the scientific scenarios of likely impacts of a warmer world, ‘a huge greenhouse’ (Chynoweth 1987). Direct human impacts, he said, would include increased incidence of skin cancer and eye disease, and immune system depression and disease related to increased ultraviolet radiation. Collapse of ocean ecosystems came high on the list.

‘We must now accept the very chilling announcement that mankind is actually fouling its own nest. For the first time the life habits of one of earth’s inhabitants is upsetting the very balance of all life on the planet’. He reported to federal

parliament more than 25 years ago the scientific prognoses of what would happen when temperatures climb 2–3°C: ‘Rainfall will increase by up to 50 per cent in summer and there will be a decrease of 20 per cent in winter’, and there will be more cyclones and expected sea-level rises (Chynoweth 1987).

Yet Chynoweth acknowledged that despite the open exchange between scientists and politicians during this period, most of his colleagues did not speak of or voice concern about climate change. He said that many people just did not believe the sea level could rise. Here is further evidence that leadership commitment to the issue made the difference in the policy arena in the face of beliefs and values that rejected the science findings. Such matters of belief were reinforced as the 1990s progressed and leadership changed.

‘Special interest’ tag for environmental lobbyists

The exchange became more adversarial as green groups gradually did more of the talking on climate change action and the focus shifted from science to the political arena in the lead-up to the Kyoto Protocol negotiations. The shift to non-government lobby groups encouraged the political and media perception and narrative that this was a ‘special interest,’ not a mainstream issue, championed by people who wanted to harm the Australian economy. This frame was possible because, by the mid-1990s, the domestic narrative had shifted to an almost exclusive discussion of economics and costs, with far-reaching consequences, as we see in the following chapters.

The economy was also on Brian Tucker’s mind after he quit the CSIRO Division of Atmospheric Research (outgoing as chief in 1992, to be succeeded by Graeme Pearman). Thereafter he aired his sceptical views with publications through the free market Institute of Public Affairs (IPA). There he gave different policy suggestions, criticising emission reduction targets, and other responses meant to lower risk. As he viewed it, these threatened to severely compromise the national economy. He suggested ‘planned adaptation’ to any climate change would be the most sensible policy (Tucker 1994: 1). His involvement with the IPA think tank, along with other sceptic scientists like geology professor Bob Carter, added credibility to the IPAs attacks on atmospheric scientists and their modelling tools.

Early call to action was non-partisan

It is hard to recall from the current, bitterly divided political stage, but climate change action was non-partisan during the late 1980s and early 1990s. Far from the political split on the subject that started during the Coalition government under John Howard in the later 1990s, early policies and leadership rhetoric of both major political parties were publicly committed to taking decisive action on climate change mitigation.

Thus in 1991, the then chairman of the Australian and New Zealand Environment and Conservation Council (ANZECC) was Bill Wood, a Labor politician from the Australian Capital Territory. He wrote in a foreword to a report on the response programs proposed by the states starting in 1988, that ANZECC had noted: ‘that the Panel on Climate Change (IPCC) “calculated with confidence” that emissions of carbon dioxide from human activities would have to be reduced by 60% to stabilise its concentration and that other gases would need to be reduced between 15% and 85%’ (ANZECC 1991: i).

New South Wales, for one state example, was looking at mandatory insulation of homes, government leadership on energy efficiency and investment in alternative technologies, and reviews leading to new restrictions on clearing native vegetation—all under then Liberal premier Nick Greiner (‘New South Wales in climate strategy’ 1989).

The bipartisan consensus before 1991 was influential in allowing response measures and public understanding to proceed as far as they did. This consensus contrasts strongly with the public doubts and confusion regarding human agency in climate change that were led by Coalition politicians after 1996, and the ideological division already evident in internal bureaucratic debate under the Keating Labor government after 1991.

Will to action turns to wishful thinking on reducing emissions, later

Reflecting the good public and political understanding of the late 1980s, Pearman said in 2009: ‘In the late 1980s we still had a chance to stop emissions at 350 ppm’. The figure of 350 ppm (parts per million) of CO₂ in the atmosphere was a scientific benchmark for a concentration where negative impacts are still considered reversible over the course of a century. (We might remember that stable, pre-industrial levels were around 250 ppm).

Some 20 years later, in 2008–2010, influential government economic consultants and advisers (e.g., the Garnaut Climate Change Review, emission trading scheme (ETS) modelling) assumed a course of ‘stopping’ (combined) greenhouse gas emissions at 550 ppm in the next decades (Garnaut 2008). The 550 ppm figure is more than double the pre-industrial level—with CO₂ emissions alone at about 400 ppm in 2013.

The relaxed 30–40 year timelines for emission reduction in these recommendations show a lack of appreciation of the long-term effect of accumulating gases. Instead the assumption is that, through some undescribed levers, gas levels and related temperatures can be eventually dialled down as convenient to the needs of national economies (Glikson 2008a). Such thinking is consistent with contemporary Australian Government and business dedication to maintain status quo fossil fuel use and coal exports with no end in sight.

The reality is that there is no option to dial down emissions and early deep cuts have major benefits, as explained for example in the 1995 IPCC science assessment. Any hope to stabilise greenhouse gas concentrations is governed more by the accumulated amount of emissions rather than by how those emissions change over time. Defending higher emissions, or very small cuts (such as a proposed five per cent cut) guarantees the need to offset by cutting more deeply in the future to have a hope of a stabilising even at a suggested 450 ppm or 550 ppm of combined gases (IPCC 1995: 3).

This is not a recent revelation. In 1989 it was already understood that a ‘business as usual’ approach would set the atmosphere on track for 450–550 ppm of combined gases or CO₂-equivalent (CO₂-e equals CO₂ plus methane plus nitric oxides) within the 21st century—a level of greenhouse gases that atmospheric scientists then and since have said could well lead to dangerous climate tipping points where ‘feedback loops’ cannot be stopped—including massive methane emissions escaping the Arctic tundra as it melts.

Atmospheric scientists set 450 ppm of CO₂-e in the atmosphere as the outer limit where accumulated emissions lead to about 1 °C warming—a scenario where change is still reversible. That means, with appropriate emission reductions, the excess CO₂ in the atmosphere could be captured within a century (IPCC 1995: 6, 15–16).

This understanding appeared lost as the climate change narrative reported in the mass media became framed by people other than specialist climate scientists, with a preponderance of economists providing media commentary. Canberra technology writer Ben Sandilands was one of the commentators in December 2008 who said the federal Labor Government’s emission reduction target of five per cent of 2000 levels, based on the Garnaut review, and linked as an

objective to the carbon price, did not reflect the true risks. Sandilands blamed a popular discourse that is 'scientifically illiterate' and a media 'which is too lazy to inform itself about the realities' (Sandilands 2008).

From one reporter's summary of 1990 knowledge (or, all the solutions we are considering now were known then)

The following points, extracted from a lengthy article by *Sydney Morning Herald* reporter Paul Cleary, show the extent of knowledge in 1990 reported in the media, in this case with the headline 'It's the end of the world as we know it'. This article also shows the beginning of government and industry economic modelling on cost that came to dominate the discussion in later years.

- Australia's economy is carbon intensive.
- Our output of greenhouse gases is rising at double the world average and our per capita emissions are among the highest.
- The federal government (under Hawke) wrote Cleary, 'has quite clearly embraced the concept of global warming and is keen to put in place a range of policies'.
- The first IPCC report (1990) 'provides virtually irrefutable evidence of global warming'.
- The world was heading toward a climate convention (to become the Framework Convention on Climate Change, 1992), which in turn, should lead to binding emission control protocols.
- It was thought at the time that there would be general agreement on cutting greenhouse gas emissions; the target was the Toronto goal of 20% below 1988 levels by 2005, which should be adopted by governments. The Toronto meeting of scientists and governments had agreed that significant global warming was a near certainty.
- A carbon tax on wealthy nations was seriously being considered.
- The 1988 Toronto conference coincided with a severe drought in North America and elsewhere, which ignited the media's attention.
- The government was being urged at the time to become a 'fast follower' of technological opportunities for business development related to lowering emissions.
- Substantial government 'intervention' in the economy would be required.
- Cleary accepted that 'There is little doubt that the cost of achieving such a target, both in terms of resources and standard of living, will be huge'.

Examples given by Cleary show that Australian resource industries were starting to do their own figures; e.g., coalminer CRA was warning that cutting emission by 20 per cent would hike power charges by 40 per cent; raise car prices by 25 per cent and petrol by 120 per cent—much later shown to be serious overstatements or ambit figures—e.g., by the 2006 Stern Report and the 2007 IPCC report.

- Policy responses considered included ‘ironing out inefficiencies that had long been a way of life’ such as:
 - state government subsidies for electric power generation that kept prices low
 - state electricity authorities should stop increasing capacity and focus on helping consumers conserve (demand management).
- Other detailed proposals worked out how much CO₂ emissions could be avoided if solar hot water were promoted to a reasonable level—8 megatonnes (MT) a year. There are similar figures for energy efficiency of appliances and refrigerators; switching to natural gas; retrofitting homes and calling for energy-efficient design of new homes as part of the building code; as well as developing energy audits—it was all there and could be achieved within 15 years (i.e., by 2005), saving about half of the 40 MT of CO₂ then emitted by households annually.
- This article does not mention fuel efficiencies and the auto industry, but those were other areas discussed at the time where efficiencies could be made, and involved federal rather than state government regulations.
- Energy-intensive industries, such as aluminium, could make process adjustments to save on electricity and low-energy intensive industries could make savings by redesigning new buildings and retrofitting old ones e.g., estimates that aluminium could cut its emissions by one third (32 MT) annually by changing process from electrolysis to direct reduction.
- Cogeneration (electricity) with natural gas could cut emissions by 10 per cent or 25 MT.
- Some cleaner coal burning options at the time, such as gasification, could achieve savings up to 25 per cent or 50 MT.
- One easy, positive outcome would be the elimination of another greenhouse gas — chlorofluorocarbon emissions (18 per cent of the total)—by 1995, thanks to the global treaty to ban these gases to protect the shielding ozone layer.

Taken together, the options documented by Cleary posed a challenge to the status quo, but not a ‘freeze in the dark’ proposition (Cleary 1990). As government analyses commissioned at the time pointed out (e.g., Greene 1990a) there were plenty of dollar savings and job creation possibilities to make it a potential ‘win-win’ scenario. In the event, almost none were put into effect.

Leadership

As in Australia, international leadership was evident in the late 1980s, at least at the rhetorical level. Robert M. White, then president of the US National Academy of Engineering, wrote an extensive 1990 report about the scientific and political climate change understanding at the time (accepting human agency). He advised that governments were rushing to outdo each other on advocating action to stabilise the global climate: 'Soviet President Mikhail Gorbachev, President George (H.W.) Bush, Prime Minister Margaret Thatcher and French President Francois Mitterrand, share similar views on the climate-warming issue' (White 1990: 18).

In fact, reportedly briefed by senior scientists and advisers, Thatcher made an extraordinary speech to the United Nations in November 1989, which is worth quoting at some length because it is solid evidence of the early knowledge available to policymakers, which would not be considered outdated 20 or 25 years later. Addressing both secular and religious audiences she said:

What we are now doing to the world, by degrading the land surfaces, by polluting the waters and by adding greenhouse gases to the air at an unprecedented rate—all this is new in the experience of the earth. It is mankind and his activities that are changing the environment of our planet in damaging and dangerous ways.

The result is that change in future is likely to be more fundamental and more widespread than anything we have known hitherto. Change to the sea around us, change to the atmosphere above, leading in turn to change in the world's climate, which could alter the way we live in the most fundamental way of all. That prospect is a new factor in human affairs. It is comparable in its implications to the discovery of how to split the atom. Indeed, its results could be even more far-reaching.

The evidence is there. The damage is being done. What do we, the international community, do about it? ... The environmental challenge that confronts the whole world demands an equivalent response from the whole world. Every country will be affected and no one can opt out. Those countries who are industrialised must contribute more to help those who are not.

Reason is humanity's special gift. It allows us to understand the structure of the nucleus. It enables us to explore the heavens. It helps us to conquer disease. Now we must use our reason to find a way in which

we can live with nature, and not dominate nature. We need our reason to teach us today that we are not—that we must not try to be—the lords of all we survey.

We are not the lords, we are the Lord's creatures, the trustees of this planet, charged today with preserving life itself—preserving life with all its mystery and all its wonder (quoted in Monbiot 2005).

Who advised Thatcher to such an ethical defence of the Earth? One contention is that it was James Lovelock, an independent scholar scientist, therefore not tainted as a 'government scientist' in free market eyes (Flannery 2005: 246). Others have credited (Sir) John Houghton, lead author of the first IPCC scientific assessments and a leading UK atmospheric scientist, then director general of the UK Meteorological Office.

Even in this global context, with world leaders offering such stirring speeches, some still felt able to claim that Australia in the late 1980s was a world leader in public awareness of anthropogenic climate change. The question then becomes, how could such definite knowledge change dramatically to a sceptical debate as it did, and under what influences?

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