

The Business Case for Early Action

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Australian Business Roundtable on Climate Change



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This report is based on findings from independent research conducted by CSIRO and the Allen Consulting Group. Their reports are available on the Roundtable website www.businessroundtable.com.au and at the respective websites of CSIRO and the Allen Consulting Group.

Preston BL and Jones RN (2006), *Climate Change Impacts on Australia and the Benefits of Early Action to Reduce Global Greenhouse Gas Emissions*, CSIRO Marine and Atmospheric Research. www.dar.csiro.au

Allen Consulting Group (2006), *Deep Cuts in Greenhouse Gas Emissions. Economic, Social and Environmental Impacts for Australia, Melbourne*. www.allenconsult.com.au

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“Climate change is a major business risk and we need to act now”

Australian Business Roundtable on Climate Change

Climate Change: The time to act is now

Joint CEO Statement

As business leaders representing a cross-section of the Australian economy, we believe that climate change is a major business risk and we need to act now.

There is broad consensus that climate change is real, the impacts may be significant and we need to act to reduce greenhouse gas emissions. However, there is currently no agreement on how best to respond, when this response should begin and what it will cost.

Business is understandably concerned about the impact this response could have on Australia's economy and international competitiveness. We believe there is a need to balance this with the potential impacts of climate change on Australia and the economic costs of continuing policy uncertainty.

Together with the Australian Conservation Foundation, we formed the Australian Business Roundtable on Climate Change. The Roundtable commissioned independent research from CSIRO to quantify climate impacts on Australia. This research confirms that Australia is particularly vulnerable to climate change. The economic impacts are significant and widespread, affecting in particular two of Australia's leading export earners, agriculture and tourism. This will have flow-on effects for the whole economy.

However, CSIRO has concluded that reducing global greenhouse emissions will reduce the rate and magnitude of climate change. Even if we cannot avoid further warming, we will have more time to adapt to a harsher and more varied climate. Acting early to cut emissions not only reduces damage, but buys time.

Given the incentive to act and to act early, the Roundtable commissioned the Allen Consulting Group to analyse what it will cost Australia to substantially reduce its greenhouse gas emissions as part of an international response, and the comparative costs of early and delayed action.

This research demonstrates that Australia can deliver significant reductions at an affordable cost. Furthermore, the longer we delay acting, the more expensive it becomes for business and for the wider Australian economy.



Gerry Hueston
President
BP Australasia



Michael Hawker
CEO
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Managing Director
Origin Energy



These findings have near-term policy implications for Australia. We support government calls for a collaborative approach to climate change, as demonstrated by the Asia-Pacific Partnership on Clean Development and Climate and the recent Council of Australian Governments (COAG) initiatives. However, we believe Australia needs to do more.

We ask Australian governments to work together, for example through COAG, to develop nationally consistent climate change policies, supported by all jurisdictions. This approach will ensure that Australia has an economically and environmentally effective national response and provides the necessary certainty for investors.

The Roundtable suggests that business and governments work together to frame policies on three fronts:

- Design a 'long, loud and legal' framework to establish a carbon price signal;
- Encourage innovation and investment in emerging and breakthrough technologies;
- Build national resilience to the impacts of climate change.

The Roundtable believes the full package of recommendations outlined in this report will create the necessary investment conditions to enable Australia to reduce greenhouse gas emissions while maintaining strong economic growth. We believe this response is in the national interest and call on governments to adopt the recommendations now to allow business to respond effectively.



Keith Scott
Head of Australia & NZ
Swiss Re



Harry Debney
CEO
Visy Industries



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CEO
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Swiss Re



westpac

Executive Summary

The Australian Business Roundtable on Climate Change (Roundtable) was formed to undertake new research to advance the understanding of business risks and opportunities associated with climate change. Six large businesses, representing a cross-section of the Australian economy – BP Australia, Insurance Australia Group, Origin Energy, Swiss Re, Visy Industries and Westpac – determined that there are significant gains to be made from working on this major issue cooperatively, and together with the Australian Conservation Foundation, formed the Roundtable.

Climate change is a business issue

CSIRO states that Australia is one of many regions experiencing climate change as a result of global greenhouse gas (GHG) emissions from human activities. With broad-based consensus in the scientific community that climate change will impact on the Australian economy, a growing number of businesses are positioning to take a higher profile role in the debate on climate change. However significant challenges remain in determining how and when to act and what the cost implications of a practical response will be.

The Australian Government has a strong long-term focus on technology which is a necessary part of the solution. However, many in business perceive a near-term policy gap. Given the imperative to invest in sectors such as electricity supply, policy uncertainty may lead to higher greenhouse-intensive investments before these breakthrough technologies are available.

The Roundtable wanted to better understand what action should be taken to significantly reduce national greenhouse gas emissions while maintaining strong economic growth in Australia.

Independent research by CSIRO

The Roundtable commissioned CSIRO to quantify climate change impacts on Australia. This research, outlined in CSIRO's report *Climate Change Impacts on Australia and the Benefits of Early Action to Reduce Global Greenhouse Gas Emissions*, confirmed that the economic impacts are potentially significant and widespread, affecting a wide range of industries. Of particular concern are impacts on two of Australia's largest export earners – agriculture and tourism. These impacts will have flow-on effects for the whole economy. Additional research related to specific sectors was sourced from recent reports commissioned by the Australian Government.

Examples of these impacts are:

- The \$32 billion tourism industry is highly climate-dependent. For example, the Great Barrier Reef supports a \$1.5 billion industry but with a 2-3°C increase in temperature, 97% of the Reef could be bleached;
- The \$17 billion of exports from the livestock industry face risks from more heat stress, more pests and disease; national livestock carrying capacity is expected to fall by 40% if temperatures increase by 2°C; and
- A 2°C increase in temperature would reduce water flows in the Murray-Darling Basin and to Melbourne, by about 15%. Based on a 20% reduction in Australian irrigation allocations, GDP is projected to fall by around \$750 million in 2009/10.

More broadly, there will be constraints on other water-dependent industries such as power generation and process industries.

How Australian industries and economic systems cope with these impacts depends not only on the extent and rate of climate change, but on their capacity to adapt. CSIRO concludes that reducing global greenhouse gas emissions will reduce the rate and magnitude of climate change, thereby allowing industries more time to adapt. Acting early to cut emissions not only reduces damage, but buys time.

CSIRO concludes that reducing emissions in developed countries by 60% or more by 2050 as part of an international response would prevent some of the worst-case scenarios of climate change in Australia.

Independent research by the Allen Consulting Group

The Roundtable then commissioned the Allen Consulting Group to provide economic modelling which details what it will cost Australia to substantially reduce emissions in line with the CSIRO findings. Based on international calls to limit temperature increases below dangerous levels, and specific targets adopted by a number of countries, it was agreed to model a 60% reduction on year 2000 emissions by 2050.

This research is ground-breaking work as it is the first time that the economic viability of achieving such a goal in Australia has been tested and published.

Two trajectories were specified as alternate pathways, as part of an international response, to meet the same total emission reductions over the time period – an early action scenario with a carbon signal introduced in 2013, and a delayed action scenario which assumed that the carbon signal would be delayed until 2022. The base case was specified as no global carbon price and no global action post-2012, that is no further action beyond programs already existing in 2005. This would result in 2050 GHG emission levels in Australia being 80% higher

than current levels. This is a reference case only, does not factor in the economic impacts of climate change on Australian industry, and is an unlikely international or domestic response. Full details are available in the Allen Consulting Group report, *Deep Cuts in Greenhouse Gas Emissions: Economic, Social and Environmental Impacts for Australia*.

The research found that it is possible to deliver these significant reductions at an affordable cost and endorses the case for early action.

The key findings* of the economic modelling are summarised below:

Achieving a 60% reduction in greenhouse gas emissions from year 2000 levels by 2050 is possible while maintaining strong economic growth

Under the early action scenario the deep cuts in GHG emissions are delivered while GDP grows strongly at an average 2.1% pa over the period to 2050, in comparison with the base case in which GDP grows on average by 2.2% pa. This early action scenario would provide an estimated \$2 trillion GDP in 2050, meaning that Australia would then be about three times wealthier than in 2002.

Economic impact by 2020 under early action would be modest

Under the early action scenario, the economic impact by 2020 under early action would be modest; the GDP projected for early action is \$1.095 trillion compared with \$1.110 trillion in the base case (and delayed action scenario) in 2020.

Delayed action may lead to a major disruptive shock

Delaying for just nine years has a significant negative impact – under the delayed action scenario, the deep cuts are achieved but on a steeper trajectory from 2022 which in turn limits GDP growth to an average 1.9% pa over the period to 2050. Not only would the economic costs be substantially greater under the delayed scenario, but the costs would be concentrated over a much shorter period which may lead to a major disruptive shock to the Australian economy.

Early action favours employment growth compared with delayed action

Under the early action scenario, employment growth is 38.7% compared with 36.2% under a delayed action scenario. A total of over 3.5 million jobs are created in the period from 2013 to 2050 under the early action scenario. This equates to 250,000 more jobs than if action were delayed.

Electricity price impacts are lower under early action than delayed action

Under the early action scenario, electricity costs are lower as business invests earlier in a wide range of low and zero emission technologies. Early market uptake of technology leads to cost reductions through greater economies of scale and market experience. This provides a wider portfolio of cost-effective technologies that can be used to meet the target. More expensive low and zero emission technologies are required on an accelerated basis in the delayed action scenario to meet the deep cuts. As a result, future electricity price rises are three times higher in the delayed action scenario.

* All real estimates are measured in 2002 constant prices.

The modelling does not incorporate the economic benefits of cutting GHG emissions to reduce the rate of climate change, for example reduced extreme weather events. As such, the modelling is a cost-effectiveness assessment, indicating the economic costs of reducing a quantity of emissions rather than a cost-benefit analysis, which would also seek to value the benefit of minimising climate change.

Early action can buy flexibility by keeping a range of policy options open. In the event that scientific evidence demands that action to reduce GHG emissions must be accelerated, Australia will be better positioned as a result of the early action taken. By adopting the precautionary principle and acting early, the economic impact under the early action scenario by 2020 would be modest. This result should provide strong support to policy-makers that there is real value in acting early to transition towards a less greenhouse intensive economy.

It is clear that there will be winners and losers in the transition to an economy as described in these scenarios over the period to 2050. Business must work with governments and the community to facilitate these changes in a measured way and to avoid major economic and social disruption.

What does Australia look like in 2050 under early action?

According to the model, the electricity generation mix will still include 60% fossil fuels (35% coal; 25% gas) as a result of the commercial deployment of carbon capture and storage; renewable technologies will contribute about 40% of supply. Road transport will be dominated by hydrogen fuel cells and hybrid motors. Households, government and industry will all use energy more efficiently than today.

In the primary industries sector, forests will thrive as sinks for the sequestration of GHG emissions and methane emissions from livestock will be significantly reduced through the use of a vaccine. Changed land-use practices will be adopted to better suit prevailing climatic conditions.

Adaptation will be required within our built environment and our native landscape to reduce the impacts of a harsher climate – particularly with respect to water, energy and extreme weather events.

What are the near term policy implications?

In order for these trends to emerge and be fully realised it will be important to mobilise support across all sectors of the economy. A multi-track approach will be required by the Australian Government in cooperation with the State and Territory Governments. The Roundtable recommends Governments work with business and the community to frame policies on three fronts.

Firstly, consistent with the conclusions of the G8, a long, loud and legal framework is required to establish a carbon price signal and deliver immediate and cost-effective emission reductions. Secondly, innovation and investment in emerging and breakthrough technologies must be encouraged in order to deliver deeper cuts in the future. Thirdly, Australia must build national resilience to mitigate the adverse affects of a changing climate.

Recommendations

The Roundtable supports government calls for a collaborative approach to climate change as demonstrated by the Asia-Pacific Partnership on Clean Development and Climate and recent COAG initiatives. However, we believe more needs to be done.

We have developed an integrated package of recommendations which we believe will create the necessary investment conditions to enable Australia to reduce greenhouse gas emissions while maintaining strong economic growth. These recommendations complement current government efforts to develop and deploy breakthrough technologies that will deliver the necessary deep cuts to greenhouse gas emissions in the long term.

Australian business is looking to the Australian Government to implement a policy framework that will accommodate the fine balance between uncertainty about future international agreements and advancing scientific knowledge of climate change. Achieving such an outcome would also enhance our ability to influence negotiations for international action. Australia has a major role to play in these negotiations, driven by our vulnerability to climate impacts and our economic reliance on greenhouse-intensive fossil fuels.

The research and the recommendations outlined in this report are designed to provide a timely contribution to framing Australia's policy response. The Roundtable strongly believes that these recommendations are in the national interest. Long-term competitiveness will be enhanced by leading the development of market-based solutions to the climate change challenge. By acting early, we will all benefit.

Roundtable recommendations

Design a 'long, loud and legal' framework to establish a price signal

- 1** Set a long-term aspirational goal for Australia to significantly reduce greenhouse gas emissions as our contribution to a global effort designed to avert dangerous climate impacts.
- 2** Set a short-term binding target for Australia in 2020 to facilitate a smooth transition to a low-carbon economy and as a milestone towards achieving the long-term goal.
- 3** Introduce a national market-based carbon pricing mechanism to deliver cost-effective emission reductions:
 - Clearly signal a framework by 2007
 - Design the mechanism to deliver comprehensive national coverage by 2013
 - Link the mechanism to the binding 2020 target and the long-term aspirational goal
 - Design the mechanism to allow for international linkages
 - Until international linkages are established, employ transparent policies to maintain international competitiveness of trade-exposed sectors
 - Re-state the 'no disadvantage' principle for early action to reduce emissions.
- 4** Make a public statement that government will not provide an indemnity against future carbon risk and investors will be required to fully manage their own exposure.
- 5** Accelerate efforts to manage energy and reduce GHG emissions:
 - Build on the National Framework for Energy Efficiency process by mandating best practice performance standards for buildings, vehicles, fuels and appliances
 - Develop one clear framework for GHG emission and abatement reporting among all governments to better identify opportunity and risk
 - Coordinate a national consumer awareness program on climate change in line with other successful campaigns such as water conservation.

Encourage innovation and investment in emerging and breakthrough technologies

- 6** Engage with business and the community to expand fiscal incentives to encourage deployment of emerging and breakthrough technologies for power generation and transport to build scale and reduce costs, such as tax credits, accelerated depreciation and programs like the Low Emission Technology Demonstration Fund.
- 7** Build modelling capacity in Australia sufficient to estimate the full economic cost of climate change and provide a cost-benefit analysis for future mitigation and adaptation actions.
- 8** Create a stronger science and technology culture through targeted school and university campaigns, and increased funding for centres of excellence to support the development and deployment of breakthrough technologies in Australia.

Build national resilience to the impacts of climate change

- 9** Develop, fund and implement a national strategy to build resilience and reduce vulnerability to climate impacts by fully integrating adaptation into development and planning processes to address, for example, building codes, water resources, health responses, biodiversity, heritage areas and climate-dependent industries.

Introduction

There is now broad consensus that climate change is real, the potential impacts are very significant and we need to act now to reduce greenhouse gas (GHG) emissions¹.

Since the United Nations Framework Convention on Climate Change was signed in 1992, it has been mainly governments that have driven the international climate change agenda. Over the intervening period, scientific data has advanced and is now suggesting that more significant action may be required, and on an accelerated basis.

There is a widening gap between this advancing scientific evidence and the international response from governments leading to higher levels of uncertainty for business. As a result many businesses are adopting a much higher profile role in the international debate on climate change, in particular the discussions around future policy frameworks.

Internationally, business is anticipating tighter constraints on GHG emissions. Investment decisions for major infrastructure, particularly for long-lived assets such as power stations, require strategic assessment of policy and market drivers. Without suitable policy frameworks which cover timeframes to match these investment horizons, business has little appetite to invest due to the risk of stranded assets.

The Australian Business Roundtable on Climate Change (Roundtable) was formed to undertake new research to advance the understanding of business risks and opportunities associated with climate change. Six large businesses representing a cross-section of the Australian economy – BP Australia, Insurance Australia Group (IAG), Origin Energy, Swiss Re, Visy Industries and Westpac – determined that there are significant gains to be made from working on this major issue cooperatively, and together with the Australian Conservation Foundation, formed the Roundtable.

The members of the Roundtable have in total about 40,000 employees and have a collective reach to nearly 100% of Australian households and businesses through banking and finance, insurance, energy production and retail, product packaging and recycling and community programs. Likely constraints on GHG emissions affect the members'

operations, customers, investors and communities. The Roundtable is committed to participating in and leading stakeholder discussions on climate change strategy and will use its reach to disseminate information and to build an understanding of opportunities and risks.

The Roundtable commissioned independent research from CSIRO to quantify climate impacts on Australia, and economic research from the Allen Consulting Group to understand what it will cost Australia to substantially reduce its GHG emissions, as part of an international response. The Roundtable remains firmly committed to playing an active role in that response.

This report provides a summary of the key findings of this research and includes an integrated package of recommendations aimed at helping Australia reduce GHG emissions while maintaining economic prosperity.

There is now broad consensus that climate change is real, the potential impacts are very significant and we need to act now to reduce greenhouse gas emissions.

Why business is concerned

Climate change is a major business risk. Uncertainty about the future of climate policy heightens the risks associated with investment.

Scientific research indicates that by significantly reducing global GHG emissions it may be possible to slow the rate of climate change. According to the Australian Greenhouse Office, however, Australia's GHG emissions after 2012 are projected to increase substantially. Australian business is therefore seeking to work with government to better understand the risks and opportunities of climate change and the likely impacts on the national economy.

Uncertainty related to climate change policy

The decisions that business makes every day are already starting to be affected by the risks of climate change. Business is used to working in uncertain environments, for example fluctuating interest rates, exchange rates and crude oil prices. However existing frameworks allow business to take informed positions on these variables.

It is clear that a framework is required to determine future climate policy impacts. Such a framework would assist business in making decisions and investments using established business models to manage climate risks and exploit opportunities.

Uncertainty increases risk, thereby reducing and delaying investment which is critically required to maintain and grow infrastructure. Lack of an appropriate policy framework encourages the status quo, however new investment in emission-intensive infrastructure could lead to future stranded assets which would impose a significant cost to the national economy. Without a clear policy framework that matches investment horizons, business has little incentive to invest now in newer, cleaner technologies.

Case Study 1

Sovereign risk and the electricity sector

Reliable electricity supply underpins the Australian economy. The Energy Supply Association of Australia (ESAA) estimates that \$30 billion of investment is required in the electricity sector over the next decade². Lead times for base load generation are four to six years and these assets have long lives. In the absence of carbon risk, these investments would be driven by well known factors. But climate change is now a key factor in the decision-making process for base load generation.

In the absence of a clear long-term framework on climate change, investor appetite for new large plant is likely to remain low due to potential sovereign risk. The ESAA has stated that "*One of the biggest sovereign risk issues facing the energy sector is [the uncertainty surrounding] future Government policy and measures on emissions*"³. A neutral policy response is not possible, so investors are keen to work with government to reduce the policy uncertainty.

Without a clear policy framework that matches investment horizons, business has little incentive to invest now in newer, cleaner technologies.

Climate risks to Australian industry

CSIRO states that Australia is one of many regions experiencing climate change as a result of global emissions of greenhouse gases from human activities. In its report⁴, *Climate Change Impacts on Australia and the Benefits of Early Action to Reduce Global Greenhouse Gas Emissions*, CSIRO confirms that Australia is highly vulnerable to climate change as a result of projected global average temperature increases of 1.4–5.8°C by 2100 (relative to 1990). This research and that undertaken recently for the Australian Government⁵, indicates that the potential economic impacts of climate change are significant and widespread, affecting a wide range of industries. Examples for a number of industries are given in Table 1 of this report. Implications for the insurance industry have been drawn from industry research.

Case Study 2:

Climate risks and opportunities in banking

Any understanding of the associated risks and opportunities arising from climate change has to begin with the recognition that climate change is not just an environmental problem; it is also fundamentally an issue of economics.

In a carbon-constrained marketplace, investors need to understand the value of embedded carbon risk and that GHG emissions will become financial liabilities on many companies' balance sheets. At the same time, carbon is becoming a tradeable commodity, allowing companies to hedge their risks, profit from new assets and turn this new discipline into a competitive advantage. As the biggest market of its kind in the world, the European Union Emissions Trading Scheme is currently valued at around 60 billion euros. Australian business cannot afford to be locked out of market opportunities such as this.

This research indicates that the potential economic impacts of climate change are significant and widespread, affecting a wide range of industries.

Tourism

Tourism is a critical industry to the national economy – it is one of Australia's highest export earners and stimulates nationwide development⁶. In all, the \$32 billion Australian tourism industry employs 6% of the population directly and a further 10% indirectly, and earns over 12% of total export dollars. The Great Barrier Reef alone supports a \$1.5 billion industry⁷.

However, Australia's top regional and outback attractions are threatened by climate change. For example, in Australia's tropical north, CSIRO projects that if global average temperatures rise by another 1°C, 60% of the Great Barrier Reef could be regularly bleached; with a 2–3°C rise, 97% of it could bleach, leaving it permanently damaged. With a 3–4°C rise, CSIRO research indicates that there may be a 95% decrease in the distribution of Great Barrier Reef species.

The projections for Kakadu are equally devastating. With only a 2–3°C rise, there may be an 80% loss of the freshwater wetlands. In the Australian Alps, a 2°C rise and 8% drop in rainfall could reduce snow cover area by 66%, putting about half of the \$550 million ski industry at risk.



Primary industries

Agriculture is one of Australia's largest export earners and is vulnerable to climate impacts. Earlier this decade, Australia was reminded of the increasing economic cost of drought. By 2003, the drought had cost the economy \$13 billion (1.6% of GDP) and about 70,000 jobs⁸. In areas where rainfall decreases, droughts are expected to become more frequent and severe. For example, with only a 1°C rise in global temperature, New South Wales is projected to see a 70% increase in drought conditions.

Overall, climate change will have varied consequences for the Australian agriculture, livestock and forestry industries. For example, the impact of climate change on wheat production varies significantly with rainfall. However, total Australian primary production could fall by 6% with a 3°C rise in temperature.

The livestock industry is a major contributor to the national economy, from both domestic sales and significant export earnings of \$17 billion⁵. The livestock industry faces risks from more heat stress, more pests and disease, and more variable feed supplies. Nationally, livestock carrying capacity is projected to fall by 40% with a 2°C rise.

A 2°C rise in temperature could reduce water flows in the Murray-Darling Basin by about 20% which has real economic consequences. As an example based on a 20% reduction in irrigation allocations, GDP is projected to fall by \$751 million per annum by 2009/10⁵. Land degradation and increased salinity will further reduce yields.

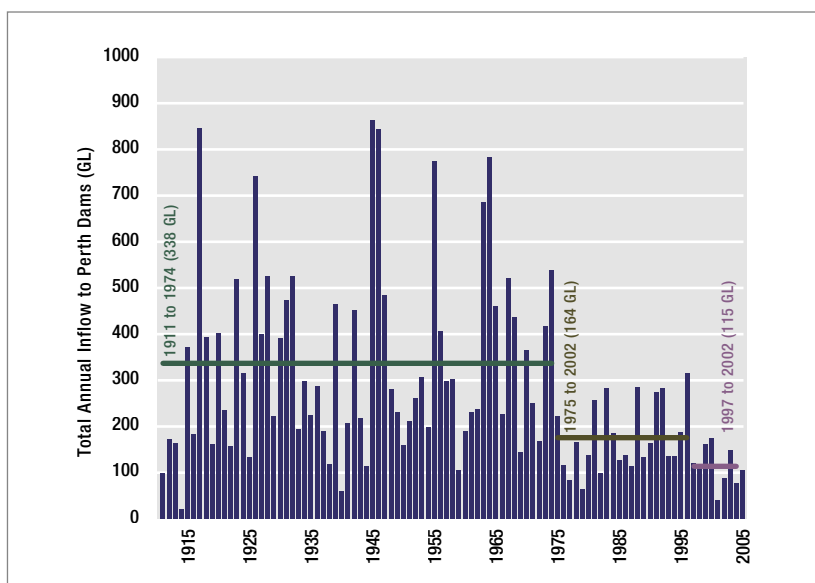
Ocean fishery yields are also projected to fall with increasing temperatures, affected by warmer oceans and shifting currents. Australia's single largest fishery, the annual \$260 million western rock lobster harvest, is at risk from changes to the Leeuwin current⁵.

Forestry will perhaps be Australia's least affected agricultural industry, but reduced rainfall and more bushfires, drought, pests and storms will erode earnings in many regional centres reliant on forestry.

Water, energy and resources

Many of Australia's water supplies are already limited and increasingly stressed by declines in rainfall and increases in demand. Yet a 2°C rise in temperature could reduce water flows to Melbourne and the Murray-Darling Basin by about 15%. Figure 1 illustrates the reduction that has already been recorded in water inflows to Perth dams. Perth businesses and industries have already incurred costs as a result of this changed water supply.

FIGURE 1: DECLINING WATER INFLOWS TO PERTH DAMS, 1911-2005



Australia's water resources are already being stressed by declines in rainfall and by increasing demand. Since 1976, Perth and southwest Western Australia have seen significant declines in rainfall and businesses and industries have already incurred costs as a result of this changed water supply.

Source: Integrated Water Supply Scheme surface water inflows 1911-2005 to storages, Water Corporation, Perth, 2005



With reduced rainfall and more frequent drought, there will be increased stress on power supplies. Power stations need water both for steam to drive the turbines and for cooling. At the height of the 2002 drought, for example, Queensland's power stations faced the situation that output could be restricted due to uncertain water supply.

Similar types of operational restrictions are already evident, with aluminium production in New Zealand, South America and North America reduced as a result of drought-triggered energy constraints over the past four years.

Insuring property and risk

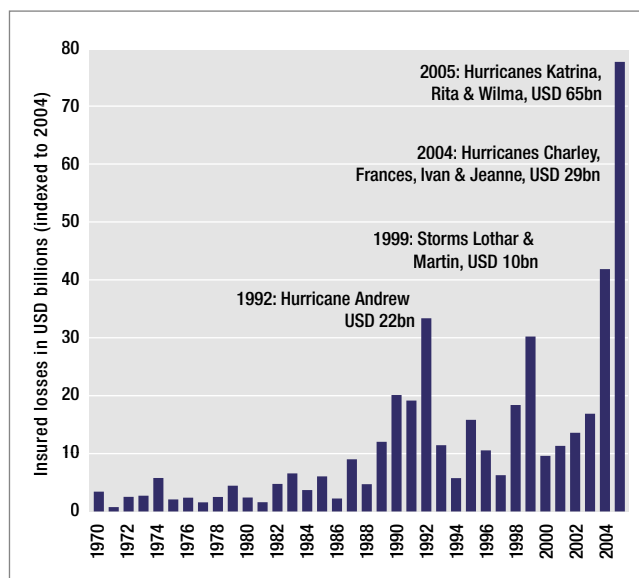
As the principal carriers of global property risk, insurers and reinsurers have a strong understanding of the physical and financial impacts of natural catastrophes. Apart from direct property risks, there are potential risks to human life and health, and the potential risk of legal liabilities as victims of catastrophic events seek compensation from those considered responsible.

Insurance losses provide a useful measure of the increase in weather-related events. It is interesting to note that the loss of assets as a result of a catastrophic event is not included in GDP, a misleading omission when evaluating the direct economic impacts of climate change. Ironically the rebuilding after a catastrophic loss has a net positive impact on GDP. It is therefore valuable to consider other measures to assess the impact of climate change on our communities.

In Australia, 19 out of the 20 largest property insurance losses since 1967 have been weather related, the largest being the April 1999 Sydney hailstorm (\$A2 billion in 2005 dollars). Australia is prone to bushfires, cyclones, hail, storms and flood, all of which are expected to increase in frequency and/or intensity due to climate change.

Globally, 37 of the 40 largest insured losses from natural catastrophes since 1970 have been weather related, as shown in Figure 2. The total economic cost of Hurricane Katrina in 2005 is estimated at US\$135 billion, including up to US\$45 billion insured losses. Whilst the increase in insured losses from natural catastrophes cannot be directly linked to man-made climate change, indeed the increase in insured losses is mostly due to demographic changes and insurance penetration, the tendency toward more extreme weather events is well established in the scientific literature.

FIGURE 2: GLOBAL INSURED LOSSES FROM WEATHER RELATED NATURAL CATASTROPHES, 1970-2005



The cost of catastrophic weather events has exhibited a rapid upward trend in recent decades. An important part of this trend is related to socio-economic factors, although climate variability and climate change (both natural and man-made) contribute.

Source: Swiss Re sigma catastrophe database. US\$ billions adjusted to 2005 prices.

It is important to appreciate that insurers are not just concerned about these 'mega-events'. As an example, localised events linked to wind speeds of 50+ knots are relatively frequent across much of Australia. Research by IAG indicates that for a 25% increase in wind speed beyond 50 knots, insured losses increase by up to 650%.

Act early to slow the rate of climate impact

How Australian industries and economic systems cope with these impacts depends not only on the extent and rate of climate change, but on the capacity of industry to adapt. CSIRO concludes that reducing global GHG emissions will reduce the rate and magnitude of climate change, thereby allowing industries more time to adapt, and so more chance of success. Acting early to reduce emissions not only avoids damage, but buys time.

CSIRO has concluded that reducing emissions from developed countries by 60% or more by 2050 as part of an international response would prevent some of the worst-case scenarios of climate change in Australia.

TABLE 1: IMPACTS ON AUSTRALIA FROM GLOBAL TEMPERATURE RISES (ABOVE CURRENT LEVELS)

CSIRO has identified that certain Australian systems are highly vulnerable to climate change. Loss of unique natural environments, increasingly scarce water supplies and more frequent extreme weather events will have significant implications for a number of important Australian industry sectors and the economy.

Temp rise	Tourism	Water and Primary Industries	Infrastructure and Insurance
>4°C	<ul style="list-style-type: none"> Most Australian vertebrates lose 90 to 100% of their core habitat 	<ul style="list-style-type: none"> Extreme rainfall in Victoria increases by 25% 	<ul style="list-style-type: none"> Peak electricity demand in Adelaide, Brisbane and Melbourne increases by 9 to 25% 180 days a year above 35°C in SA and NT '100-year' storm tides along Victoria's east coast 30% more frequent
>3°C	<ul style="list-style-type: none"> Distribution of Great Barrier Reef species shrinks by 95% 65% of Reef species lost in Cairns region Snow-covered alpine area shrinks by 20 to 85% '60 day' snow cover declines by 40 to 95% 	<ul style="list-style-type: none"> 55% loss of Eucalyptus core habitat Timber yields in southern Australia rise by 25 to 50%, but fall by same margin in North Qld and the Top End Australian net primary production falls by 6% Flow in the Murray-Darling falls by 16 to 48% 	<ul style="list-style-type: none"> Dengue fever transmission zone reaches Brisbane and possibly Sydney Temperature-related deaths of people over 65 rise by 144 to 200% Oceania experiences a net loss of GDP
>2°C	<ul style="list-style-type: none"> 97% of the Great Barrier Reef bleached 80% of Kakadu freshwater wetlands lost 	<ul style="list-style-type: none"> Pasture growth slows by 31% Macquarie River Basin (NSW) flows fall by 5 to 35% Livestock carrying capacity in native pasture systems falls by 40% 	<ul style="list-style-type: none"> Temperature-related deaths of people over 65 rises by 89 to 123% Road maintenance costs in Australia rise by 17%, despite a decline in South Australia '100-year' storm tides along Victoria's east coast 15% more frequent Tropical cyclone rainfall increases 20 to 30%, as wind speed increases 5 to 10% Forest fire danger rises 10% across Australia
>1°C	<ul style="list-style-type: none"> 81% of the Great Barrier Reef bleached Vertebrates in the World Heritage Wet Tropics lose 90% of their core habitat. 	<ul style="list-style-type: none"> Melbourne's water supply falls 7 to 35% Murray-Darling flows fall 12 to 25% Queensland fruit fly spreads south 40% loss of Eucalyptus core habitat 	<ul style="list-style-type: none"> Height of '100-year' storm surge at Cairns rises 22%, doubling the flooded area Storm surge rises 25% along Victoria's east coast Double the people exposed to flooding in Australia and New Zealand
<1°C	<ul style="list-style-type: none"> Snow-covered alpine areas shrink by 10 to 40% Vertebrates in the World Heritage Wet Tropics lose half their habitat 	<ul style="list-style-type: none"> 14% of Victoria's marine invertebrates lose habitat Droughts in NSW 70% more frequent and more widespread Wheat production increases with temperature rises up to 3 to 4° C, if precipitation also increases; but export value declines. 	<ul style="list-style-type: none"> Melbourne's water supply falls 3 to 11% 18% more days above 35°C in SA Extreme rainfall 10 to 20% more intense in NSW Electricity infrastructure suffers 3% decrease in transmission efficiency Demand for natural gas heating in Melbourne falls Peak electricity demand in Melbourne and Sydney falls by up to 1%, and rises in Adelaide and Brisbane by 2 to 5%

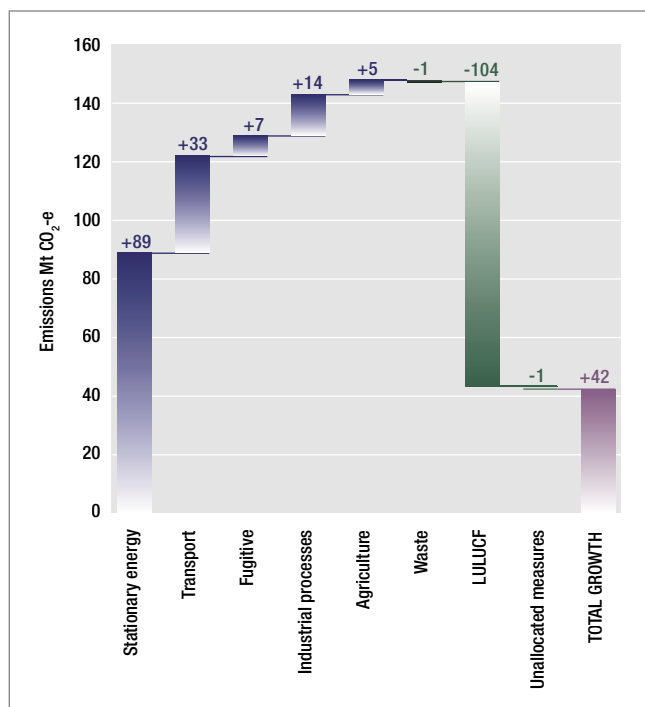
Source: CSIRO Marine and Atmospheric Research (Preston BL and Jones RN), Climate Change Impacts on Australia and the Benefits of Early Action to Reduce Global Greenhouse Gas Emissions, 2006.

Rising greenhouse gas emissions in Australia

Scientific modelling suggests that by significantly reducing global GHG emissions, the rate of climate change can be slowed and the magnitude of the impacts reduced. In evaluating an acceptable forward pathway for Australia's GHG emissions, it is clear that emissions are rising and are projected to continue rising for some time. This is a business concern as there is no certainty as to how, when or at what cost Australia's emissions pathway will be changed in line with calls for future deep cuts. This level of uncertainty will delay investments in low emission technologies.

The Australian Government has committed and is well on track to meeting its Kyoto target of 108% of 1990 emissions by 2012⁹. This is largely because there is now much less land clearing in Queensland and New South Wales. The relative contributions of different sectors to the Kyoto target are shown in Figure 3. However, reduced land clearing is a one-off opportunity, and Australia will need new strategies to keep further emissions growth in check.

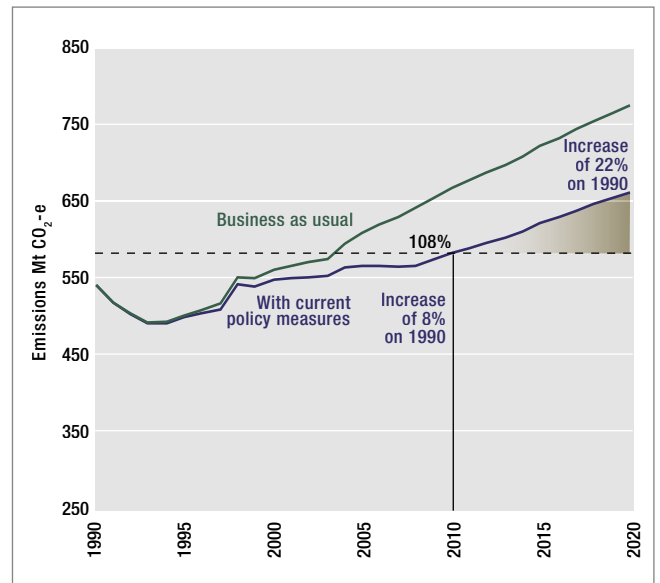
FIGURE 3. CHANGE IN AUSTRALIAN EMISSIONS BY SECTOR: 1990 TO 2008-12



Australia is well on track to meet the Kyoto target of 108% of 1990 by 2012. From a starting base of 543Mt, emissions are projected to increase by 42 Mt. The effect of rising energy emissions are largely offset by decreased land clearing and an increase in forestry.

Source: Australian Greenhouse Office, Tracking to the Kyoto Target, 2005

FIGURE 4. AUSTRALIAN GHG EMISSIONS PROJECTED TO 2020



Australia's 2020 greenhouse gas emissions forecast shows significant growth from 1990; 90% of which comes from the stationary energy sector. Indicatively, if the 108% target was extended to 2020, an additional 77Mt of abatement per year is required by 2020 beyond current measures.

Source: Australian Greenhouse Office, Tracking to the Kyoto Target, 2005

Figure 4 highlights the challenge to deliver future deep cuts in greenhouse gas emissions. Australia's GHG emissions are rising and this trend is projected to increase until at least 2020. By 2020, national emissions are projected to reach 22% above 1990 levels, even with current measures delivering significant abatement. Most of this increase will come from the stationary energy sector which is projected to rise to 170% of 1990 levels by 2020⁹.

Other sectors are also contributing to Australia's increase in emissions. For example, transport emissions are projected to rise to 159% and agricultural emissions to 116% of 1990 levels by 2020.

If Australia is to achieve deep cuts in the future in line with scientific evidence that significant global reductions can slow the rate and magnitude of climate change, national emissions must stabilise and then fall over coming decades."

By 2020, the Government projects national emissions will increase by 22% over 1990 levels, even with current measures delivering significant abatement.

Economic case for early action

In conjunction with CSIRO and the Allen Consulting Group, the Roundtable evaluated a range of possibilities for the long-term reduction target to be used in the economic modelling study. The Roundtable looked to current international thinking on this complex issue. The UK Prime Minister Tony Blair has adopted a target of 60% reduction by 2050 following advice from the Royal Commission on Environmental Pollution in the United Kingdom. This is consistent with widely disseminated and well known long-term target analysis work from Sweden, the European Union and the United States^{10,11}. For the purposes of this project, it was agreed to model a 60% reduction in emissions by 2050 relative to 2000 levels.

Some will think that this target is impossible given the magnitude of the task, but this is not the case. Given the broad consensus to act, it is critical to understand the nature of policy, technological and behavioural drivers that would allow such a target to be reached while maintaining strong economic growth.

This research is ground-breaking work. It is the first time that the economic viability of achieving such a goal has been tested and published in Australia. This modelling approach provides stakeholders with an illustrative example of future scenarios to better understand the dynamic linkages between industry growth, energy production and use, GHG emissions and the Australian economy.

Modelled scenarios

The research modelled two scenarios and a base case. In the base case, Australia and the world undertake no additional measures from 2005 to reduce GHG emissions. This base case leads to Australian emissions growth at just below 1.0% per year, reaching an increase of approximately 80% above current levels by 2050. This is a reference case only, does not factor in the economic impacts of climate change on Australian industry, and is an unlikely international or domestic response.

In the modelled scenarios, Australia acts with other developed countries to meet the emissions goal for 2050. Developing countries commence abatement action from 2030. This is consistent with the principles of the United Nations Framework Convention on Climate Change and the recent conclusions of the 2005 G8 Plan of Action from Gleneagles.

Two trajectories were specified as alternate pathways to meet the same total emission reductions over the time period – an early action scenario with a carbon signal introduced in 2013 and a delayed action scenario which assumed that the carbon signal would be delayed until 2022. In the early action scenario, a 60% reduction in Australia's emissions by 2050, relative to 2000, was specified. The delayed action scenario was designed to equal the same cumulative abatement task over the period. The cumulative abatement task under both scenarios to 2050 was approximately 13 billion tonnes of CO₂e.

It is important to consider that the Allen Consulting Group's modelling does not incorporate the economic benefits of cutting GHG emissions to reduce the rate of climate change, for example reduced extreme weather events. As such, the modelling is a cost-effectiveness assessment, indicating the economic costs of reducing a quantity of emissions rather than a cost-benefit analysis which would also seek to value the benefit of minimising climate change.

Full details are available in the Allen Consulting Group report¹², *Deep Cuts in Greenhouse Gas Emissions: Economic, Social and Environmental Impacts for Australia*.



Key results of the economic modelling*

The research found that it is possible to deliver these significant emission reductions at an affordable cost.

Early action can also buy flexibility by keeping a range of policy options open. In the event that scientific evidence demands that action to reduce GHG emissions must be accelerated, Australia will be better positioned as a result of the early action taken.

By adopting the precautionary principle and acting early, the economic impact under the early action scenario by 2020 would be modest.

The results are illustrated in Figures 5 and 6 and the key findings of the economic modelling are summarised below:

- **Achieving a 60% reduction in greenhouse gas emissions from year 2000 levels by 2050 is possible while maintaining strong economic growth**

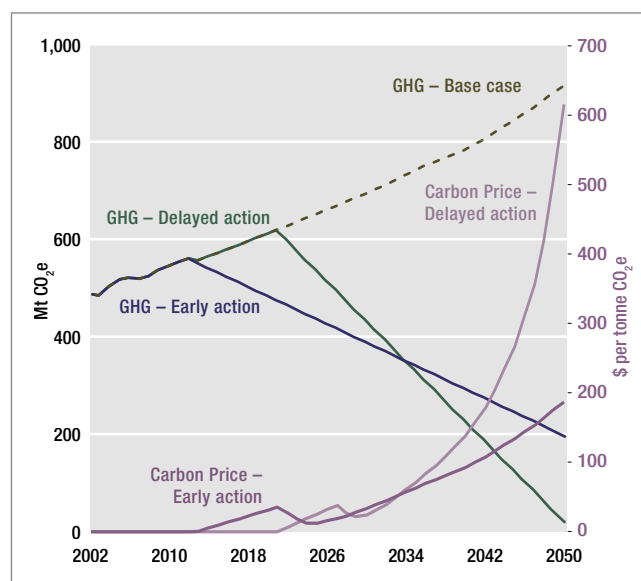
Under the early action scenario the deep cuts in GHG emissions are delivered while GDP grows strongly at an average 2.1% pa over the period to 2050, in comparison with the base case in which GDP grows on average by 2.2% pa.

This early action scenario would provide an estimated \$2 trillion GDP in 2050, meaning that Australia would then be about three times wealthier than in 2002.

- **Economic impact by 2020 under early action would be modest**

Under the early action scenario, the economic impact by 2020 would be modest; the GDP projected for early action is \$1.095 trillion compared with \$1.110 trillion in the base case (and delayed action) in 2020.

FIGURE 5. COMPARING SCENARIOS – EMISSIONS PATHS AND CARBON PRICES TO 2050



A carbon price signal is introduced in 2013 in the early action scenario and in 2022 in the delayed action scenario. As the abatement task in each scenario becomes more difficult the carbon price increases.

Source: Allen Consulting Group, Deep Cuts in Greenhouse Gas Emissions. Economic, Social and Environmental Impacts for Australia, 2006

- **Delayed action may lead to a major disruptive shock**

Delaying for just 9 years has a significant negative impact – under the delayed action scenario, the deep cuts are achieved but on a steeper trajectory from 2022 which in turn limits GDP growth to an average 1.9% pa over the period to 2050. Not only would the economic costs be substantially greater under the delayed scenario, but the costs would be concentrated over a much shorter period which may lead to a major disruptive shock to the Australian economy.

The research found that it is possible to deliver these significant emission reductions at an affordable cost.

* All real estimates are measured in 2002 constant prices

- **Early action favours employment growth compared with delayed action**

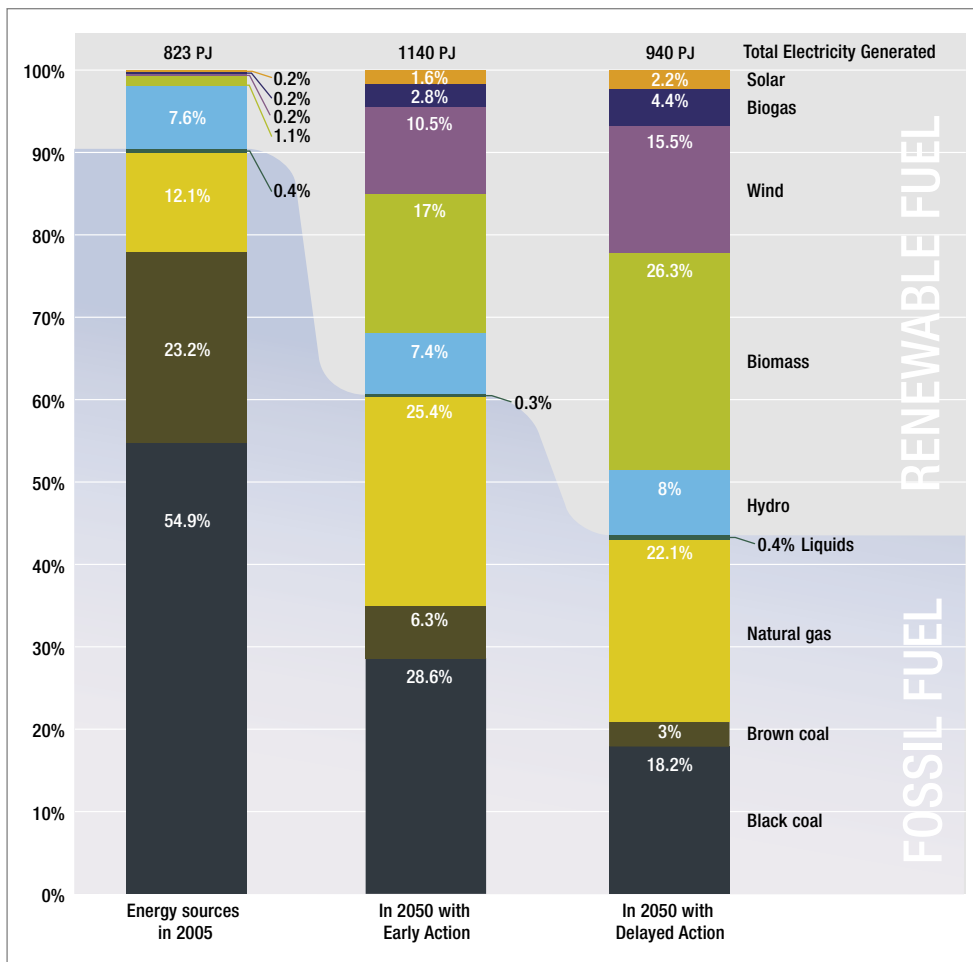
Under the early action scenario, employment growth is 38.7%, compared with 36.2% under a delayed action scenario. A total of over 3.5 million jobs are created in the period from 2013 to 2050 under the early action scenario. This equates to 250,000 more jobs than if action were delayed.

- **Electricity price impacts are lower under early action than delayed action**

Under the early action scenario, electricity costs are lower as business invests earlier in a wide range of low and zero emission technologies. Early market uptake of technology leads to cost reductions through greater economies of scale and market experience. This

provides a wider portfolio of cost-effective technologies that can be used to meet the target. More expensive zero and low emission technologies are required on an accelerated basis in the delayed action scenario to meet the deep cuts. As a result, future electricity price rises are three times higher.

FIGURE 6. COMPOSITION OF ELECTRICITY GENERATION IN 2005 / PROJECTED IN 2050.



A wide portfolio of technologies will be required to make deep cuts in emissions. By 2050 in both future scenarios, most of Australia's electricity generation is supplied by fossil fuels with CCS and renewable energy.

Note: The 'solar' generation sector refers to the amount of energy saved by the use of solar hot water systems. It does not include other solar technologies.

Source: Allen Consulting Group, Deep Cuts in Greenhouse Gas Emissions. Economic, Social and Environmental Impacts for Australia, 2006

Recommendations

CSIRO research has confirmed that Australia is particularly vulnerable to climate change. The impacts on the economy are projected to be significant and widespread.

CSIRO research also found that reducing global GHG emissions may reduce the rate and magnitude of climate change. Acting early to reduce emissions may not only avoid damage, but can buy time to adapt to a harsher and more varied climate.

The Allen Consulting Group's research demonstrated that it is possible to deliver significant reductions at an affordable cost.

By acting early, Australia will retain the flexibility to implement policies that will limit disruptive shocks to the economy. Importantly, the research also found that the longer we delay taking action, the more expensive it becomes to implement the reductions needed to avoid dangerous climate change. Minimising policy uncertainty around near and long-term emission limits is very important to ensure timely investment in the infrastructure required to support the Australian economy and maintain our international competitiveness.

Internationally, governments are developing agreements to reduce GHG emissions and promote energy technology development, through for example the G8 Plan of Action, the United Nations Framework Convention on Climate Change and associated Kyoto Protocol, and the Asia-Pacific Partnership on Clean Development and Climate. However there is currently no international agreement to limit GHG emissions beyond 2012.

It is critical that major economies now develop domestic responses that can balance the uncertainty of future international agreements and emerging scientific knowledge against the need to make informed investment decisions.

Australian business is looking to the Australian Government to implement a policy framework that will accommodate this fine balance. Achieving such an outcome would also enhance our ability to influence negotiations for international action. Australia has a major role to play in these negotiations, driven by our vulnerability to climate impacts and our economic reliance on greenhouse-intensive fossil fuels.

Near-term policy implications

The research findings from CSIRO and the Allen Consulting Group have a number of near-term policy implications for Australia.

Technology will be a key aspect of future emissions reductions but a broader solution will be necessary. It is not possible merely to wait for the emergence of new technologies. Professor Warwick McKibbin of the Australian National University has suggested that *"...at the same time as encouraging technology you also have to change the behaviour of consumers and industry. Putting a price on carbon, a reasonably low price, in my view, is going to encourage technological innovation, is going to encourage alternative sources of energy, it's going to encourage conservation"*¹³.

In the immediate future this will require the mobilisation of existing best available technologies and resources to begin curbing emissions. Such near-term action will also signal to markets to invest in longer-term solutions and will raise public awareness. Demand management will be an important element of delivering cost-effective abatement by reducing emissions growth and driving a more energy-efficient economy.

The November 2005 G8 Climate Conference¹⁴ in London acknowledged that *"Major investment is needed in energy infrastructure to meet energy needs and to tackle climate change. The majority of this investment will come from the private sector. Clear policy signals are needed to channel it towards lower carbon technologies ... The challenge is to create the incentives for private sector investment, including through market-based instruments and carbon finance. 'Long, loud and legal' frameworks can accelerate the commercialisation of cleaner technologies"*.

A multi-track approach will be required by the Australian Government, supported by the State and Territory Governments. The Roundtable recommends that Governments work with business and the community to frame policies on three fronts. Firstly, consistent with the conclusions of the G8, a 'long, loud and legal' framework is required to establish a price signal and deliver immediate and cost-effective emission reductions. Such a framework will also facilitate the investment in large scale infrastructure, for example base load generation, because investors will be more willing to commit under this type of policy regime. Secondly, innovation and investment in emerging and breakthrough technologies must be encouraged to deliver deeper cuts in the future. Thirdly, Australia must build national resilience to mitigate the adverse affects of a changing climate.

By acting early, Australia will retain the flexibility to implement policies that will limit disruptive shocks to the economy.

Roundtable recommendations

The Roundtable has developed an integrated package of recommendations which will create the necessary investment conditions to enable Australia to reduce GHG emissions while maintaining strong economic growth.

Design a 'long, loud and legal' framework to establish a price signal

Committing to an aspirational long-term goal will clearly signal the direction of future government policy and therefore allow investors to better assess their risks and opportunities. It will also allow flexibility to assess the adequacy of current action in line with emerging scientific knowledge and international agreements.

A near-term binding target is an important milestone to achieving a long-term goal. A binding target provides the necessary certainty to underpin near-term investments and the incentive to factor carbon risk into business and community decisions.

Importantly, it also provides a signal to the private sector for research and development of new technologies that will deliver reductions in the medium and long term.

- 1** Set a long-term aspirational goal for Australia to significantly reduce greenhouse gas emissions as our contribution to a global effort designed to avert dangerous climate impacts.
- 2** Set a short-term binding target for Australia in 2020 to facilitate a smooth transition to a low-carbon economy and as a milestone towards achieving the long-term goal.

The results of the Allen Consulting Group's research show that a price signal is an effective tool to deliver significant emission reductions. There are a range of possible market mechanisms available to deliver this price signal, including emissions trading. In a range of environmental commodity markets, for example the US sulphur dioxide program, emissions trading has been demonstrated to achieve the lowest cost path to a given policy target.

In its 2004 Energy White Paper¹⁵, *Securing Australia's Energy Future*, the Australian Government noted that should an effective global response be in prospect, the government will consider an emissions trading scheme, since emissions trading provides '*better resource allocation and the greatest flexibility*' in responding.

Market mechanisms can be designed to provide a least cost pathway and certainty of greenhouse reductions.

- 3** Introduce a national market-based carbon pricing mechanism to deliver cost-effective emission reductions:
 - Clearly signal a framework by 2007
 - Design the mechanism to deliver comprehensive national coverage by 2013
 - Link the mechanism to the binding 2020 target and the long-term aspirational goal
 - Design the mechanism to allow for international linkages
 - Until international linkages are established, employ transparent policies to maintain international competitiveness of trade-exposed sectors
 - Re-state the no-disadvantage principle for early action to reduce emissions.

Prior to the implementation of a national market-based carbon pricing mechanism, a 'no indemnity' policy for future GHG emissions is required in order to accelerate new investment in infrastructure to meet growing demand. This would reduce investment risk by ensuring a level playing field where every project takes account of the full cost of its emissions.

- 4** Make a public statement that government will not provide an indemnity against future carbon risk and investors will be required to fully manage their own exposure.

A clear implication of the research is that businesses, governments and households must use energy more efficiently. In addition to a national price on carbon, complementary near-term measures are required to manage demand and improve energy efficiency.

5 Accelerate efforts to manage energy and reduce GHG emissions:

- Build on the National Framework for Energy Efficiency process by mandating best practice performance standards for buildings, vehicles, fuels and appliances
- Develop one clear framework for GHG emission and abatement reporting among all governments to better identify opportunity and risk
- Coordinate a national consumer awareness program on climate change in line with other successful campaigns such as water conservation.

Encourage innovation and investment in emerging and breakthrough technologies

Emerging and breakthrough technologies will underpin the longer term, deep cuts in emissions.

In order to ensure that these technologies are developed and ultimately deployed, business will play a major role. The research shows that in order to reduce emissions significantly, low and zero emission technologies must be mobilized across the economy, with electricity supplied almost entirely from fossil fuels with carbon capture and storage as well as renewables, hydrogen fuel cells for transport and the development of a methane vaccine for livestock.

The Australian Government has committed to technology development under the Low Emission Technology Demonstration Fund (LETDF), Solar Cities and the Asia-Pacific Partnership on Clean Development and Climate. The key will be to unlock private sector investment in order to deploy the low-emission technologies at a commercial scale, sufficient to reduce costs to acceptable levels.

6 Engage with business and the community to expand fiscal incentives to encourage deployment of emerging and breakthrough technologies for power generation and transport to build scale and reduce costs, such as tax credits, accelerated depreciation and programs like the Low Emission Technology Demonstration Fund.

7 Build modelling capacity in Australia sufficient to estimate the full economic cost of climate change and provide a cost-benefit analysis for future mitigation and adaptation actions.

8 Create a stronger science and technology culture through targeted school and university campaigns, and increased funding for centres of excellence to support the development and deployment of breakthrough technologies in Australia.

Build national resilience to the impacts of climate change

To protect against unavoidable climate change impacts in Australia, CSIRO has confirmed that we must adapt now to build resilience. Such resilience will be required in our national infrastructure, our natural habitats, resource management and across the economy.

9 Develop, fund and implement a national strategy to build resilience and reduce vulnerability to climate impacts by fully integrating adaptation into development and planning processes to address, for example, building codes, water resources, health responses, biodiversity, heritage areas and climate-dependent industries.

Conclusions

The Roundtable views climate change as a critical business issue that warrants precautionary, prudent and early action. If we act early, Australia can afford the policies needed to achieve deep cuts in its emissions. Early action will also keep our policy options open.

By contrast, delayed action will increase the cost of action, the risks to climate, and the likelihood of a disruptive shock to our economy.

The Roundtable hopes that the commissioned research and this report will lead to a better understanding of the business implications of climate change and that all stakeholders will work together to develop effective policy frameworks and market conditions for our sustainable future.

By acting early, we will all benefit.

If we act early, Australia can afford the policies needed to achieve deep cuts in its emissions. By acting early, we will all benefit.



Roundtable members



“With size and influence comes responsibility. A business of our size has a responsibility to show leadership on issues that could materially impact not only our operations, but the countries in which we operate and the customers we serve. One such issue is Climate Change.”

Gerry Hueston – President, BP Australasia

BP is one of the world's largest energy companies, employing approximately 100,000 people and operating in over 100 countries worldwide. Our main activities are the exploration and production of crude oil and natural gas; refining, marketing, supply and transportation of crude oil and petroleum products; and the manufacture and marketing of petrochemicals. We also have a growing presence in alternative and renewable forms of energy, including gas, hydrogen, solar and wind power. As a major supplier of energy, we believe we must find and implement solutions to climate change. In 1997, we became the first in our industry to state publicly that precautionary action is justified. The next year, we launched a programme which reduced greenhouse gas (GHG) emissions from our operations by around 10% between 1998 and 2001. Since then, we've taken further action to manage our GHG emissions. Today, we focus not only on operational emissions from our production facilities, chemical plants, refineries and other operational activities, but also product emissions generated by our customers when they use the fuels we sell.

www.bp.com.au



“At Insurance Australia Group we are working to reduce risk in the community. One of the largest single sources of risk for the community arises from natural catastrophes and the frequency and ferocity of these natural catastrophes is growing due to climate change. Hence, IAG has a keen interest in working with other businesses, our customers, the government and the community to reduce the impacts of climate change.”

Michael Hawker – CEO, Insurance Australia Group

Insurance Australia Group Limited is Australasia's leading general insurance group, employing around 12,000 people, insuring more than \$850 billion worth of assets and writing annual gross premium of more than \$6.6 billion. Some of Australasia's most respected brands are members of the Group, including NRMA Insurance, SGIC, SGIO, CGU and Swann Insurance in Australia and State Insurance and NZI in New Zealand. The Group also has interests in China, Thailand, Malaysia and Singapore. The Group's core purpose is to pay claims, manage costs, understand and price risk, and reduce risk in the community.

www.iag.com.au



“As one of Australia's largest energy companies, we believe that as demand for energy grows, significant new investment in gas production and power generation will be critical. The absence of a clearly defined long-term framework for applying a carbon cost is a major impediment to investment decisions, particularly in power generation. It is therefore timely for the Australian Government to signal the introduction of a market based mechanism to value carbon in order to reduce policy uncertainty and thereby encourage investment in a manner which is more likely to produce better economic and environmental outcomes.”

Grant King – Managing Director, Origin Energy

Origin has a heritage of over 140 years of operation in Australia and is one of Australia's leading providers of energy and energy related products and services, with significant positions in exploration and production, power generation, retail and trading, as well as investments in and management of distribution networks. Origin supplies natural gas, LPG and electricity to over 2 million customers throughout Australia, New Zealand and the near Pacific. Origin believes energy producers and consumers must acknowledge that we are now operating in an environment increasingly constrained in its ability to absorb greenhouse gases without unacceptable environmental impacts. In response to this, Origin has established a comprehensive range of strategies and actions and publicly reports our performance against these goals in our Sustainability Reports.

www.originenergy.com.au



“Evaluating and managing the effects of natural catastrophes has always been one of the primary concerns of the (re)insurance industry. In coming years, we will face a new challenge: developing and implementing strategies and business solutions to deal with climate change and a carbon-constrained future. As one of the world's leading reinsurers, Swiss Re is taking a proactive approach in addressing the issue of climate change. We are doing this not only by tackling our own footprint by reducing operational emissions, but also by understanding the potential risks, raising awareness on the climate issue and developing new products and services for a carbon constrained world”

Keith Scott – Head of Australia & NZ, Swiss Re

Swiss Re is one of the world's leading reinsurers and the world's largest life and health reinsurer. The company operates through more than 70 offices in over 30 countries. Swiss Re was founded in Zurich, Switzerland, in 1863 and has operated in Australia since 1956. Swiss Re offers a wide variety of products to manage capital and risk, from traditional reinsurance products to insurance-based corporate finance solutions and supplementary services for comprehensive risk management. www.swissre.com



"Being a sustainable company is simply good business. Fundamental to securing a sustainable future business is understanding and addressing climate change. Visy is taking action now by reducing energy and water use, by producing recyclable and environmentally sound packaging, by recycling and by producing alternative energy. We also seek to address climate change by working with others and contributing our expertise and experience to developing appropriate solutions that will secure a better environment and a better economy for Australia."

Harry Debney – CEO, Visy Industries

Visy Industries was established in Melbourne, Australia in 1948 and has grown to become one of the world's largest privately owned paper recycling and packaging companies. In 2006, Visy employs more than 8000 people and operates more than 130 packaging factories and recycling sites across Australia, New Zealand and in the South East and Mid West of the United States. Visy Industries is committed to recycling and the environment. In 2000, 2001, 2002, 2003 and 2004 Reputex judged Visy as having the best environmental reputation out of Australia's top 100 companies. In 2004, Visy was awarded the Gold Banksia Award for environmental leadership. www.visy.com.au



"Unless we establish a strong policy framework for managing national greenhouse gas emissions, Australian business will be hesitant to invest in cleaner technologies or to tap emerging market opportunities while continuing to face all the financial risks which climate change represents. The phased introduction of a market-based carbon pricing mechanism would provide an important impetus for investment and support for greenhouse gas emission reductions at lowest practical cost, while not compromising competitive growth"

David Morgan – CEO, Westpac

Founded in 1817, Westpac was the first company and the first bank to be established in Australia. Today, Westpac is one of the biggest banking organisations throughout Australia, New Zealand and the Pacific region, with offices in key financial centres around the world. Westpac employs over 27,000 people, serves 8.3 million customers and has a market capitalisation of \$39 billion as at 30 September 2005. Westpac was recently acknowledged by the Minister for Environment and Heritage in recognition of its long-standing and continued contribution to greenhouse management in Australia. Over the past decade, Westpac has reduced its total greenhouse gas emissions by around 35% by actively managing resource usage. www.westpac.com.au



"At first glance a collaboration between environmentalists and business looks an unlikely alliance. But when it comes to one of the greatest challenges facing our economy and our ecology – climate change – we have a common purpose. ACF is pleased to be working together with businesses to find effective ways for Australia to address this great and urgent challenge."

Don Henry – Executive Director, Australian Conservation Foundation

ACF is Australia's leading national not-for profit environment organisation and is funded almost entirely by individual membership and donations. Since 1966, ACF have focussed on the most important and urgent environmental problems, seeking change with lasting political, economic and social support. ACF works with the community, business and government to protect, restore and sustain our environment. ACF has over 40,000 members and supporters. In addition to our work with the community, business and government, ACF uses 100% green electricity in its owned and managed buildings and offsets air and vehicle travel-related emissions. www.acfonline.org.au

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Glossary

ABARE	Australian Bureau of Resource Economics
AGO	Australian Greenhouse Office
Asia-Pacific Partnership on Clean Development and Climate	An international agreement between Australia, India, Japan, the People's Republic of China, South Korea, and the United States to co-operate on development and transfer of technology which enables reduction of greenhouse gas emissions, enhances energy security and addresses air pollution.
Base load generation	Power station operating more than 90% of the time
Bleaching, coral	Coral bleaching is a symptom of the stress on coral reefs. Prolonged bleaching can lead to the widespread death of coral organisms but if the stress is mild, corals can recover from bleaching.
Carbon price signal	A monetary value imposed on carbon dioxide emissions for the purpose of creating an incentive to reduce emissions and/or a penalty on those who create CO ₂ emissions. A carbon price signal is created through government policy and may take the form of a carbon tax, an emissions trading scheme or an indirect charge such as a fuel production/use tax.
COAG	Council of Australian Governments
CCS	Carbon capture and storage: technologies to mitigate climate change by capturing carbon dioxide (CO ₂) from large point sources such as power plants and storing it in appropriate underground sites, for example saline aquifers. Also called 'geosequestration'.
CO₂	Carbon dioxide: the most important anthropogenic greenhouse gas.
CO₂e	Carbon dioxide equivalent: a measure used to compare the emissions from various greenhouse gases based upon their global warming potential. For example, the global warming potential for methane is 21 times that of carbon dioxide. This means that emissions of 1 million metric tonnes of methane are equivalent to emissions of 21 million metric tonnes of carbon dioxide.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
ESAA	Energy Supply Association of Australia Limited
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GJ	Gigajoule: a measure of energy, 10 ⁹ Joules
GL	Gigalitre: 1,000 million litres
G8	The Group of Eight (G8) consists of Canada, France, Germany, Italy, Japan, the United Kingdom, the United States of America, and the Russian Federation.
Kyoto Protocol	Signed in 1997, the Kyoto Protocol is a binding amendment to the United Nations Framework Convention on Climate Change (UNFCCC). The Protocol shares the Convention's objective, principles and institutions, but commits industrialised Parties to individual, legally-binding targets to limit or reduce their greenhouse gas emissions.
LETDF	Low Emissions Technology Demonstration Fund: an Australian Government initiative to support the commercial demonstration of technologies that have the potential to deliver large-scale greenhouse gas emission reductions.
LULUCF	Land use, land use change and forestry
Mt	Megatonne: million tonnes
PJ	Petajoule: a measure of energy, one million gigajoules
R&D	Research & development
UNFCCC	The United Nations Framework Convention on Climate Change is an international treaty signed at the Earth Summit in 1992. The treaty aims to avoid 'dangerous' levels of climate change.

