

# THE LIMITS TO ADAPTATION TO CLIMATE CHANGE

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## THE LIMITS TO ADAPTATION TO CLIMATE CHANGE

The best of mitigation will leave Australians dealing with a lot of climate change.

Those who come after our generation will have no choice but to adapt.

But to what will they be adapting? And what will be their chances of sustaining and building upon the fabulous legacy of ten thousand years of human civilisation and two hundred years of modern economic growth that was left to our generation and which we ourselves have been able to extend?

These are the questions that I will discuss this evening. The climate within which Australian and human civilisation will advance, stagnate or decline through the lives of our children and grandchildren and beyond will be determined by how we think about and respond to the risks of climate change over the next decade.

A false dichotomy is sometimes drawn between adaptation and mitigation, as if these were alternative responses to climate change.

As I explained in Chapter 8 of the Review, mitigation is the first and most important element of an adaptation strategy. The cost of adaptation and whether an adaptive response is likely to be effective at all depend on the extent of climate change.

The range of possible global mitigation and therefore climate outcomes that flow from Australia's and other countries' contributions remains wide. The Cancun Agreements in December 2010 provide the framework within which we will all be working and within which our various contributions will interact with and encourage and discourage each other. The future of climate change depends on the actions that all substantial countries take within that framework.

The climate outcomes from Cancun cannot now in mid-2011 be defined even in broad brush because commitments so far within that framework say little about what happens after 2020, Chapter 4 of my final report suggests that the 2020 commitments could lead to atmospheric concentrations of greenhouse gases of 550 or 650 parts per million—most likely leading to temperature increases of 3°C or 4°C. It is still possible that the Cancun pledges could evolve into a set of commitments that meet the Cancun temperature objective of holding the temperature increase to below 2°C. And it is still possible that the current concerted but limited action will discourage the world's sovereign states to an extent that current actions are abandoned and people in future face an increase in global temperatures of around 6 degrees this century and more in later years. The bad end of the range of possibilities covers outcomes that make it unrealistic to think that a national policy response can be coherent or even relevant. Beyond a certain point government would be overwhelmed by the impacts of climate change.

We are already feeling negative impacts of climate change when the increase so far is less than 1°C since pre-industrial times. Some impacts are affecting Australia directly—for example, those deriving from extreme weather events. Others are being felt through such international developments as the effects of intensification of extreme weather events on food prices. How will Australians in future manage 2°C, which for the moment seems a lower bound on a wide range of possibilities?

Even an increase of 2°C above pre-industrial levels would have significant implications for the distribution of rainfall in Australia, the frequency and intensity of flood and drought, the intensity of cyclones and the intensity and frequency of conditions for catastrophic bushfires.

The difference between 2°C and 3°C was examined in detail in the 2008 Review. It is large—large enough for it to be in Australia's interests to make the extra effort required as its fair share of a global mitigation effort to bring greenhouse gas concentrations to 450ppm. And every degree upwards from three degrees is worse. There is no point at which we can say that so much damage has been done that there is not much point in putting effort into stopping more.

### **The Immediate Impact of Four Degrees**

Let us say that the International Energy Agency is right, and that in the absence of a decisive change in policies from those currently pledged within the Cancun agreements we are headed towards the atmospheric concentrations of greenhouse gases that would give us a temperature rise of around 4°C. The scientists at this conference will provide up to date information from the science on the effects of such a temperature increase, so I will do no more than touch on some of the outcomes of earlier research that were reported in my 2008 Review and 2011 Update.

A global average temperature rise of 4°C from pre-industrial levels (3.5°C above 1990 levels) is well outside the relatively stable temperatures of the last 10,000 years, which have provided the environmental context for the development of human civilisation. We would be in unknown territory for modern humans, and probably for our species at any time in history.

A temperature increase of 4°C above pre-industrial levels would give an 85 per cent probability of initiating large-scale melting of the Greenland icesheet, putting us on an irreversible path towards around seven metres of sea level increase beyond the considerable thermal expansion. It would trigger the lower threshold for initiating accelerated disintegration of the west Antarctic icesheet, with irreversible tendencies towards an additional six metres. We would be getting into territory in which the responses of parts of the much larger east Antarctic ice sheet became unpredictable. It would generate changes to the variability of the El Niño – Southern Oscillation, and the upper threshold for terrestrial sinks such as the Amazon rainforest becoming sources of carbon

rather than sinks. It would put 48 per cent of species at risk of extinction. Ninety per cent of coral reefs would be placed above critical limits for bleaching, and the prospects for Ningaloo and the Great Barrier Reefs would be dismal.

Chapter 1 of the 2008 Review and Update paper 1 defined four types of costs of climate change: Type 1 costs (measurable effects through markets), Type 2 (effects through markets for which precise data are not available), Type 3 costs (the risk that outcomes may turn out to be on the bad side of the averages used in the Type 1 and Type 2 calculations), and Type 4 costs (environmental, heritage and other values that are not measurable in the usual metrics of market exchange). The sum of these costs would be large. The analysis undertaken in the 2008 Review established that the costs of Australia doing its fair share in a global mitigation effort would be amply justified by avoidance of these costs (Type 1 and Type 2) and possibilities (Type 4).

The largest costs, however, would be the avoidance of the Type 3 costs—the risk of outcomes that were worse than the average of expectations from the mainstream science. Even at 450 ppm or average expectations of 2 degrees, there are risks of highly adverse outcomes. Increases of greenhouse gas concentrations above 450ppm and 550ppm introduce risks of highly disruptive impacts extending to the catastrophic.

### **Adapting to Four Degrees, and the Limits to Adaptation**

Beyond doing as much as we can on mitigation, there are two main building blocks for a productive response to the adaptation challenge. The first is to make sure we have a strong, flexible economy, with smoothly functioning markets. The second is to make sure that governments, businesses and households have sound information about possible impacts of climate change on various regions and activities.

These are the most valuable things that we could bequeath those who come after us as they do their best in a world of climate change. Adaptation policy is first of all about doing these things well.

It is an obvious point, but true, that the high probability of dangerous climate change strengthens the reasons for Australia making sure that it has a strong and flexible economy based on a well-educated and adaptive people.

Climate change strengthens the importance of Australia quickly getting back onto a path of strong productivity growth, built on efficient markets and effective economic policy-making institutions that are able to define and implement policy in the national interest.

Climate change is bound to impose shocks and hard times on Australians and other people who come after us. Some of the shocks and hard times will come from the direct effects of climate change on us, and others from the effects on other countries that are important to us. Australians in future will do better if they

are working with a productive economy, which is in a strong fiscal position in preparation for a shock, and has the structural flexibility that comes from well-regulated markets.

These strengths are less likely to be tested beyond their limits the more effective global action has been in constraining climate change.

Doing our fair share in global mitigation will have a cost—and in the early years a net cost before the benefits of avoided climate change are brought to account. It is important that this cost is the lowest that it can be.

Here the advantages of carbon pricing over regulatory or direct action are twofold. First, the immediate and direct sacrifice of some productivity growth for mitigation will be much smaller if a carbon price encourages millions of Australians to find, and sometimes to invent, ways of reducing emissions at lowest cost, rather than having a few political leaders and their advisers and close associates identifying clever ideas for direct action. Second, and of fundamental importance, the many interventions involved in making large reductions in emissions through direct action would encourage the return to the old-style Australian political economy. When we need to remove the great Australian complacency of the early 21st century, a regulatory approach to mitigation would entrench and extend it.

As with reductions in emissions, adaptation to climate change will be more effective and lower in cost the more individual Australians and enterprises as well as governments are involved in working through the choices, anticipating problems before they arrive, and taking into account all of the risks in their investment decisions.

Soundly functioning markets assist households, communities and businesses to respond effectively to the impacts of climate change. Markets provide the most immediate and well-established avenue for addressing many of the uncertainties posed by climate change.

Australia's prime asset in responding to the adaptation and mitigation challenges that lie ahead is the prosperous, open and flexible market-oriented economy that has emerged from reform over the last quarter century. Government can facilitate adaptation by continuing to promote broad and flexible markets, and seeking to correct remaining barriers to their efficient operation.

Some domestic and international markets for particular goods and services will be especially important to Australia's adaptation response. These markets may require increased policy attention to remove barriers that limit the ability of markets to harness efficient adaptation. Included in this category are markets for insurance and finance, water and food.

However, there are limits to the extent of climate change within which each of these markets is effective.

Households and businesses are able to manage many risks effectively through the insurance and financial markets. As the frequency and intensity of severe weather events increase with climate change, demand will rise for related insurance and financial services.

The recent innovation and deepening in insurance markets shows their considerable potential to promote adaptation to climate change. By its nature, however, conventional insurance is of limited value when an adverse event is likely to have similar impacts over wide areas of the world. Nor is conventional property insurance of much help when the uncertainty mainly involves the timing rather than the extent of an impact.

An example is sea-level rise if it were to become clear that the melting of the Greenland icesheet had become irreversible. It would then be inevitable that large numbers of coastal properties would be inundated, but uncertainty would remain about the timing of the loss. There might then be scope for developing new property insurance products that share characteristics with traditional life insurance. Life insurance covers the risk of timing of death, although the fact of eventual death is itself certain. The development of innovative products that matured on loss of property and that would provide the means of buying housing elsewhere if the insured event occurred may be seen as having value and could be developed by the commercial insurance sector. The commercial viability of such instruments would depend on insurance companies being able to develop a balanced portfolio of insurance and financial risks in a world of climate change. But no portfolio would be resilient against the costs of meeting many large claims from a single source or correlated sources associated with the unhappier end of the range of possible climate change.

The challenges for rural and urban water supply result from the interaction of climate change with increased demand from growth in population and economic activity. The limited scope of markets has complicated the task of allocating water to its most valuable uses.

Australia's rural water market is the result of many years of reform, but some barriers to efficient operation remain. While extraction of in-stream flows has been regulated and subsequently subject to a price, access to groundwater and surface flow has often been left as a common property resource, with predictable consequences.

Barriers to efficient water management in a changing climate persist. For example, in water markets, regional restrictions on trading remain a significant barrier. Severe water shortages in urban centres have led to the development of a number of desalination plants in Australia over the past few years, at high cost. The Productivity Commission has questioned the cost-effectiveness of some of this expenditure. Would wider market exchange of water, with

desalination plants competing with bids from a range of sources including long-distance storage, have produced a good result at lower cost? In the nature of market exchange, we would only find out by trying it, but the general experience is that market processes often generate results that are surprisingly good.

But here, too, there are limits to the effectiveness of a market for water. A sound market will not be able to avoid highly disruptive outcomes if precipitation falls sharply in regions that are important to human activity much or becomes much more variable or if run-off is greatly diminished by increased temperatures.

In the absence of effective and ambitious global action, deep participation in international trade in food as an importer as well as an exporter is going to be important for Australian food security. This is going to require the easing of inhibitions about the import of food. This will be stressful for many rural Australians in particular, but the alternatives will be worse. The importance of free trade in food to food security in a world in which there has not been effective and strong mitigation is discussed in Update paper 4 and Chapter 10 of the 2011 Review Update.

After a flexible economy with efficient markets, sound information on the impacts of climate change is the second element of a sound foundation for effective adaptation to climate change. Sound information will allow informed people and enterprises and governments at all levels to see problems in advance and to develop low-cost responses to them. On the other hand, people and firms and governments responding to crisis will make decisions without the benefit of long reflection and consideration of alternatives to what the crisis seems to demand.

Here I should draw attention to another cost of so-called 'scepticism' about climate change science beyond its interference with the development of sound mitigation policies. If many Australians are persuaded that the mainstream science is wrong or unreliable then they are denied information that is essential to the exercise of sound judgments about decisions that affect the quality and cost of adaptation.

As the average rainfall declines sharply with each passing decade in the south-west of Australia, a farmer who shares the scientific knowledge that is the common heritage of humanity will make different decisions about land use than one who thinks that a series of dry autumns is a passing phase. The regulators of power transmission in a state that has just been devastated by a bushfire during what would once have been described as once-in-a-century conditions will make different decisions if they know from science that these conditions will now arrive with awful frequency.

Improvement of applied climate science and dissemination of the outcomes will not assist adaptation decisions by those who have closed their minds to uncomfortable reality. As is the case with denial of science in many areas—Professor Peter Doherty in the 2009 Festival of Ideas at this University asked us

to consider denial on immunisation and transmission of AIDS as parallels to climate science denial—the isolation of some people from reality can damage the adaptive response for others in the community.

In any case, we need more and better information on the likely impacts of climate change on various parts of Australia, and we need that information to be readily available for those who require it for decisions on many things. There are several aspects of the applied climate science that work out differently here than in the northern hemisphere. As the leading country of science in our hemisphere, we will have to do a lot of the science ourselves.

There are obvious limits to the extent to which costs of large impacts can be avoided through knowing about them in advance and making early preparations for them.

Some of the necessary regulatory roles of government intersect with adaptation to climate change. The government as owner of some types of infrastructure, as regulator of others and with responsibility for land-use planning will necessarily be at the centre of many adaptation decisions. Sound regulatory decisions—for example in relation to zoning of residential land—can avoid much waste of resources. However, the costs of sound regulation would be high if anticipated climate change effects were large.

Climate change is a significant and additional pressure on ecosystems and biodiversity in Australia. It will affect ecosystems and biodiversity by shifting, reducing and eliminating natural habitats. In Australia, many species of flora and fauna are at risk from rapid climate change because of their restricted geographic and climatic range. Where ecosystems and species have low tolerance for change, altered climatic conditions can trigger irreversible outcomes such as species extinction.

Just as greenhouse gas emissions without a carbon price represent a market failure, the decline in Australia's biodiversity can be attributed at least in part to a failure to correct through public policy the market's failure to value the natural estate. This failure, combined with the vulnerability of Australian ecosystems to climate change, provides a strong argument for the establishment of market mechanisms to ensure the resilience of Australia's ecosystems. For example, the Henry tax review pointed to the important role government can have in protecting biodiversity and ecosystems through specified payments, for example, in management agreements with landholders.

There is increasing private philanthropic interest in maintaining biodiversity, but government is likely to remain the major source of funds to conserve biodiversity. Separate but complementary incentives for carbon sequestration and other ecosystem services will allow the respective benefits to be sold in separate markets, with landowners selling into both and making decisions that maximise total incomes and benefits to themselves.



Sound policies to preserve biodiversity in the light of climate change along these lines would be effective against moderate climate change. Above some limit, however, diverse ecosystems would be overwhelmed by increases in temperature and other manifestations of climate change.

### **Things Fall Apart**

I began the final chapter of my 2008 Review by noting that when human society receives a large shock to its established patterns of life the outcome is unpredictable in detail but generally problematic. Here I was referring to adverse outcomes beyond those represented by Type 3 effects that I have already introduced—beyond the adverse impacts of a specific kind within the probability distributions of impacts from the mainstream science. I refer to the costs associated with the fracture of human institutions when they are subject to stress that exceeds their capacity to absorb change.

When human society receives a shock that exceeds its capacity to adjust, things fall apart.

I noted that the initial financial shocks that hit Australia in the 1890s, central Europe in the 1930s, or Indonesia in the 1990s were substantial, but turned out to be small in comparison to the chain of events that followed. In themselves, these shocks could have been expected to cause a pause in growth, but not one that would throw history from its course. But each shock was large enough to exceed some threshold of society's capacity to cope with change. In each case, what might have been a recession of substantial but ordinary magnitude became a great depression. Total output fell by a fifth or more. The associated social convulsions changed political institutions fundamentally and as permanently as human institutions can be changed. They shifted the whole trajectory of economic growth.

I was writing then before the critical phase of the Great Crash of 2008 was precipitated by the collapse of Lehman Brothers in September 2008. The timely, powerful and concerted fiscal and monetary expansion in the substantial economies in late 2008 and through 2009 prevented the worst possibilities from that immense financial shock. Nevertheless, the shock of the Great Crash to European and United States financial and political institutions has left a long-term legacy of economic underperformance that has led to loss of incomes that greatly exceeds the scale of the original shock, and which may yet prove too large for stability in globally important national and international institutions.

Unmitigated climate change, or mitigation too weak to avoid dangerous climate change, could give human society a shock larger than any coming from fractures in the global financial system.

The case for strong mitigation is a conservative one. Even at the levels of mitigation embodied in the objectives of the Cancun agreements, the

challenges could be considerable. In the absence of mitigation, we can be reasonably sure that they would be bad beyond normal experience.

We know that the possibilities from climate change include shocks far more severe than others in the past that have exceeded society's capacity to cope, and which have moved society to the point of fracture.

Here we are talking about global fracture. To be sure, there is a possibility that a shock from weakly mitigated climate change could unhinge Australian political and economic stability. But even if there were no such direct effect, there will be no islands of stability in Melbourne or Mildura if sea level rise displaces from their homes a substantial proportion of the people of Bangladesh and West Bengal, and many in the great cities of Dhaka, Kolkata, Shanghai, Guangzhou, Ningbo, Bangkok, Jakarta, Manila, Ho Chi Minh, Karachi and Mumbai. The problems of unmitigated or weakly mitigated climate change will be for all humanity.

If changes in monsoon patterns and the flows of the great rivers from the Tibetan plateau disrupt agriculture among the immense concentrations of people that have grown around the reliability of water flows from the beginning of human civilisation, it will not just be a problem for the people of India, Bangladesh, Pakistan, Vietnam, Myanmar and China.

The threats to the stability of the institutions that underpin modern civilisation will be more difficult to manage because many of the shocks from climate change will come in sudden large events or series of events. The risks of sea level rise may suddenly be precipitated in an extreme climatic event—for example, a storm surge from a cyclone in the sea of Bengal or across Southeast Asia. The risks to agriculture may be manifest sharply in the effects of drought or flood in a number of major food producing countries, causing global food prices suddenly to rise way beyond anything in earlier experience. Such shocks would pose special challenges to institutional stability.

### **The Australian Policy Decision in Global Context**

The climate change policy package announced by the Prime Minister of Australia three days ago will have its impact through the role that it plays in a global mitigation effort. It is the global policy effort that will determine how far actual emissions and temperature increases fall below those that would result from “business as usual”—that is, in the absence of policies that change the relationships among economic growth, the energy intensity of economic activity and the emissions intensity of energy use.

Analysis of the policy effort that is required begins with calculations of what emissions growth would be in the absence of policy change. Update paper 3 of my climate change review, and Chapter 2 of the Update's Final Report, discuss emissions growth under “business-as-usual”.

The conception of business-as-usual that I apply in Update paper 3 and chapter 3 is elusive. It is emissions as they would be in the absence of any policy change, past or future, that alters the relationship between emissions and economic activity. It is easily understood. It is clear from the way that the material has been used by some readers that I was unsuccessful in explaining what I meant by “business-as-usual”. For example, the Leader of the Opposition in a speech at this University on July 1 used my projections as the basis for what Chinese emissions were likely to be in future, rather than as projections of what they would have been in the absence of policies, past or present, that changed the trajectory of emissions growth. Such misunderstandings can have their origins either in poor presentation of material, or in poor reading of it, or in a combination of both. I regret my own contribution to the misunderstanding, and seek here to draw attention to and to restate the premises of the projections in a way that is clear to all readers.

I said on p21 of the Final Report:

“So what kind of energy use and emissions growth would emerge from a Platinum Age if there were no climate change or mitigation? Answering this question is an artificial exercise but provides essential perspective on the global mitigation challenge. The task is artificial because established mitigation policies have already bent the trajectory of future emissions significantly downwards. Business-as-usual emissions in many developed countries and in the major developing countries, most notably China, are now a thing of the past. Regrettably, as we will see, they are not so obviously a thing of the past in Australia”.

Hopefully the basis of the business-as-usual projections is now clear.

My business-as-usual projections are based on comprehensive reworking of the expectations for economic growth in the three biggest developing countries—China, India and Indonesia—in a growth accounting framework. These projections can be overlain on the central points of the probability distributions on temperature increases from the mainstream science to indicate likely global temperature increases under my particular and apparently misunderstood conception of “business-as-usual”. Such an exercise suggests that the world under “business-as-usual” would have been heading towards five or six degrees this century and more after that.

One cannot say anything about the extent to which future policy may shift climate change from this course on the basis of fulfilment of pledges on emissions reductions to 2020 within the Cancun agreements, unless one has a set of principles within which one can relate pre-2020 to post-2020 commitments. I suggested a set of principles in the 2008 Review, and

developed them in the Final Report in line with the structure of pledges in the Cancun agreements. In brief, developed countries would accept commitments to reduce emissions within a “contraction and convergence” framework. China would deliver on its commitment to reduce the emissions intensity of output 40 to 45 percent between 2005 and 2020. Other developing countries would accept emissions intensity targets that are as close as possible to the ambition of the Chinese targets. When a developing country’s emissions per capita reached the (falling) average levels of the developed countries, it would accept targets for absolute reductions within a contraction and convergence framework along the lines of the developed countries. The parameters of the commitments would be calibrated to achieve agreed climate objectives.

At least a general understanding of principles along these lines will be a necessary condition for concerted, strong global mitigation. Developments in policy frameworks within the major developing countries and at Copenhagen and Cancun are consistent with the approach that I propose.

My Review Update explained that the international community reached an international agreement at Cancun. It is not the agreement towards which Australia and some other countries had been working. It is based on “pledge and review”: each country would pledge to reduce its emissions by an amount that it judged to be appropriate, there would be agreed arrangements for monitoring, verifying and reporting progress against commitments, and each country would revise its commitments from time to time in the light of developments.

I noted that the “pledge and review” of voluntary commitments could not do some things that would be achieved through an effective, legally binding international agreement. Pledge and review had the essential virtue that it was acceptable to the United States and the largest developing countries, when a binding agreement was not. It provided a vehicle for substantial developing economies to move beyond the restrictive undertakings that had been made to them at Kyoto.

I noted that the difference in practice between legally binding and voluntary international agreements was less in practice than the words suggest. And there had been other areas of international agreement in which progress had both been larger and more certain when built around voluntary rather than legally binding commitments. For example, after the non-binding Bogor declaration on open trade and investment in the Asia Pacific region there had been strong progress towards the agreed trade liberalisation objectives in all of the Western Pacific economies (Australia, New Zealand, Japan, Korea, China, Chinese Taipei, and the ASEAN countries). Trade liberalisation stopped when some Asia Pacific countries sought to negotiate legally binding preferential trade agreements.

The pledges at Cancun are substantial. They take world emissions growth substantially below the “business-as-usual” trajectory. It is early days, but the

early signs are that substantial progress is being made towards them, including in China and the United States. The International Energy Agency's interpretation that they shift us to a four degrees warming trajectory is not inconsistent with the evidence—and this is a substantial shift from the “around six degrees” towards which we had been heading under my version of “business-as-usual”.

But there are other valid interpretations of the evidence. If interpreted within the modified contraction and convergence framework that I have proposed, they are consistent with achievement of much higher levels of ambition—even the two degrees objective that was agreed at Cancun. Everything depends on what happens from now on.

What happens from now on will grow out of the dynamics of implementation of the Cancun agreements. The first condition for progress towards strong mitigation outcomes is that countries deliver on their Cancun pledges. If progress is being made, and it is demonstrated that the economic cost of progress is manageable, a base will have been laid for lifting ambition. Australia's existing policy provides for strengthening of targets in line with evidence that other countries are implementing strong commitments. The Australian government's announcement three days ago will be encouraging to others, including in the United States. It is important that we are open to information about progress in other countries, so that we can adjust our level of ambition in the light of stronger international action.

This is the way that progress can be made within the “bottom up” approach to international action that has been defined within the Copenhagen agreements. Of all my Review's discussion about international action, the statements about the United States government's Cancun conditional pledge have drawn the most extreme and bitter reaction. I said that the United States' government's conditional pledge to reduce emissions by 17 percent between 2005 and 2020 (16 percent from 2000) should be taken seriously, that the President of the United States and his senior advisers were seeking to achieve the minus 17 percent by other means after its preferred instrument of an emissions trading scheme had been blocked in the House of Representatives. I acknowledged that opponents of the United States government had been seeking to defeat the President's new approach to reducing emissions (as well as on other things), but that so far they had been unsuccessful. The United States government understood that the alternative, mostly regulatory approaches would be more expensive than an emissions trading scheme would have been, but that the Cancun agreements left them free to apply the instruments of their choice in reducing emissions and they would use that freedom to secure major reductions in emissions in other ways. The United States (like Australia) was receiving some help in reducing emissions from a huge increase in availability of gas which was being used to replace coal for generating electricity, and (unlike Australia) from lower economic growth. The Federal government's efforts were being supported by mitigation measures in many states, to be joined in early 2012 by an emissions trading scheme in California.

I reported on the elaborate arrangements that had been put in place to apply a shadow price on carbon in regulatory decisions administered by the Environment Protection Agency and other arms of government. When my description of developments in United States policy and practice were contested by some participants in the Australian policy debate, I used a presentation at a conference at this University on June 30 to put on the public record the authority upon which I had relied in my judgements about the United States government's policies. I described the personal communications with President Obama's Secretary for Energy Steven Chu. One Australian newspaper thought it more newsworthy to repeat the belief of one of its journalists that the United States Government wasn't to be taken seriously, than to report on United States policy that had their origin in the most senior direct advisers on climate change to the President of the United States, amongst them the most eminent scientist ever to have sat around the Cabinet table of a national government.

Another line of criticism of my approach to determining Australia's fair share in commitments within the Cancun agreements that few countries (outside the half billion people of Europe—around half the people in the developed world) were seeking to reduce emissions through carbon pricing.

My main point is that carbon pricing reduces emissions at much lower costs to households and businesses and to national economic performance than achieving the same reductions through direct action.

In his speech at this University on July 1, the Leader of the Opposition, Tony Abbott, accepted that Australian economists favoured carbon pricing over direct action as the low-cost means of reducing emissions, but noted a famous Danish famous journalist's preference for alternative approaches. One of Australia's best economic journalists, in reporting the Leader of the Opposition's remarks, associated the eminent American international economist Jagdish Bhagwati with these remarks of the Leader of the Opposition. I stress that the specific references to Bhagwati came from the journalist and not from the Leader of the Opposition.

Bhagwati is at once the best and wisest on trade policy in the American economics profession and an economist whom I do not presume to be wrong when he adopts a position that is different from mine. I take his views seriously, so asked him to comment the views attributed to him. Jagdish has asked me to share the following with the Australian community as his views on carbon pricing:

“Professor Bhagwati has written to me that he personally favours carbon emission taxation.

In particular he favours it over ad hoc actions (urged by the anti-globalisation lobbies) like subsidising local production as against importation of specific products

based simply on the assertion that imports “obviously” add to carbon emissions. He cites the DFID (UK) study which showed that the total carbon emissions for a bunch of cut flowers imported from Africa led to less emissions than when imported from Amsterdam. The latter emitted more because the flowers were grown in greenhouses.

Only a general carbon tax which applies to emissions equally from fuel in transportation and in energy used in greenhouses would avoid such mistakes. In fact, the lesson from the failure of postwar planning is precisely that, given millions of transactions in a modern economy, you simply cannot plan for each transaction specifically.

Second, he favours a carbon tax over cap and trade with tradeable quotas. The reason is that the latter inevitably turns into differential subsidies to different emitters, depending on what quotas they get for free – whereas the amount of such selective differentiation would be less for a carbon tax (since even price measures can be diluted by special interests through exemptions).

William Nordhaus told him that Stu Eisenstadt (the lawyer and brilliant bureaucrat who is involved in making US environmental policy) had told Nordhaus (who favours, like most economists, the carbon tax) that a carbon tax would put lawyers out of work since lawyers are lobbyists who work to get greater permits for their clients and therefore favour the cap and trade solution!

Besides, the differential subsidy involved in cap-and-trade unless all permits are auctioned off, amounting to a carbon tax, would clearly be actionable under the 1995 SCM Code and would almost certainly invite action from other nations if the country using the cap-and-trade solution does not seek to impose import taxes that do not (as the US Congress seems hell bent on doing. As does the French PM Sarkozy)”.

So there it is, ungarnished and in full; the views on the carbon tax of Professor Jagdish Bhagwati of Columbia University, New York. Those of you who came to hear me this evening can share some wisdom of America’s leading trade economist as well.

## **Conclusion**

Australians in future will have to manage the world as they find it. We may be leaving them with a difficult task. We should seek to avoid leaving them with an impossible one.

The first thing that we can do to avoid leaving them an impossible world is to do everything we can to increase effective global mitigation. It is important that we understand the contemporary context of international cooperation through the Cancun accords. Here the key to success is for countries that have been lagging behind in the global mitigation effort move faster, and in so doing encourage others (and despite prominent interpretations to the contrary, the Productivity Commission report neither sought to address nor gave an opinion on whether Australia was doing its fair share in current international mitigation efforts).

It is only through a sustained and effective iterative effort over a considerable period of time that the world will achieve the levels of reductions in greenhouse gas emissions that avoid four degrees and worse.

The Australian announcement last Sunday places us in a position to contribute our fair share to early stages of the required iterative global effort.