

# TARGETS AND TRAJECTORIES

# 12

## Key points

Australia should indicate at an early date its preparedness to play its full, proportionate part in an effective global agreement that 'adds up' to either a 450 or a 550 emissions concentrations scenario, or to a corresponding point between.

Australia's full part for 2020 in a 450 scenario would be a reduction of 25 per cent in emissions entitlements from 2000 levels, or one-third from Kyoto compliance levels over 2008–12, or 40 per cent per capita from 2000 levels. For 2050, reductions would be 90 per cent from 2000 levels (95 per cent per capita).

Australia's full part for 2020 in a 550 scenario would be a reduction in entitlements of 10 per cent from 2000 levels, or 17 per cent from Kyoto compliance levels over 2008–12, or 30 per cent per capita from 2000. For 2050, reductions would be 80 per cent from 2000 levels or 90 per cent per capita.

If there is no comprehensive global agreement at Copenhagen in 2009, Australia, in the context of an agreement among developed countries only, should commit to reduce its emissions by 5 per cent (25 per cent per capita) from 2000 levels by 2020, or 13 per cent from the Kyoto compliance 2008–12 period.

Is it possible to secure effective international action to hold atmospheric concentrations of greenhouse gases at 550 ppm, or 450 ppm (with overshooting), or less? How should Australia define and offer its proportionate part in the global effort? What should we do in the interim if it takes time to secure effective international action?

In the remainder of the Kyoto period, ending in 2012, Australia should ensure that it meets its Kyoto targets. It should have no great difficulty in doing so. Any adverse surprise over the next few years is unlikely to be so large that it cannot comfortably be met by the purchase of international permits. During this period, Australia should work within the international community to secure a global agreement around a firm emissions concentrations goal. Australia should make it clear that it is prepared to play its full, proportionate part in achieving that goal.

Beyond the Kyoto period, Australia's central approach on targets and trajectories must be linked to comprehensive global agreement on emissions reductions, for four reasons. First international agreement is urgent and essential.

Second, agreement is possible if Australia and some other countries attach enough importance to it. Third, a comprehensive global agreement is the only way to remove completely the dreadful political economy risks, to Australia and to the global trading system, of payments to trade-exposed, emissions-intensive industries. Fourth, international agreement lowers the cost of Australian mitigation and so allows us to be more ambitious about the reduction in emissions.

## 12.1 Determining our conditional and unconditional targets

The analysis presented in chapter 11 suggests that Australia's long-term interests lie in the pursuit of global action to return greenhouse gas concentrations to 450 ppm or less—even though the momentum of growth in emissions means that these concentrations can only be reached with temporary overshooting of the target concentration.

Although the goal is clear, the path to success is not.

Australia's actions now and our commitments to reducing our emissions will make a difference to whether the world has any chance of returning to 450 ppm. This global objective will not be achieved easily. There is just a chance of success. What may look improbable today may just become possible tomorrow, if we do not delude ourselves about the difficulties of the task, and are realistic about each step that we take. There is no time for complacency or for unrealistic expectations.

### 12.1.1 Setting conditional targets

Australia must be willing and ready to play its part in a coordinated and cooperative international effort to reduce greenhouse gas emissions. Our targets must be specified within an international framework that, when all of its parts are added up, is consistent with the desired objective. If we are not prepared to pay our fair share in the cost, then we cannot expect other countries to do so. To make an unrealistically low offer in the international negotiations is to negate the prime purpose of our own mitigation, which is to facilitate the emergence of an effective agreement.

Conversely, committing to interim targets for Australia that are unrealistically or disproportionately ambitious in the absence of an international framework (that recognises abatement and makes available opportunities for trade in emissions entitlements), is likely to be costly and difficult to achieve. It would become an example of the problems of mitigation and not of mitigation's good prospects. A vacuous commitment that denies economic reality would be as damaging to international negotiations as an unrealistically low offer that denies scientific urgency.

These issues are not unique to Australia.

The Review's modelling of the global time path to a 450 ppm objective (with overshooting), presented in Chapter 9, while closely consistent with the G8 goal agreed in July 2008 of 50 per cent reduction of global emissions by 2050, is sobering. The awful arithmetic of developing country emissions growth in the

Platinum Age, and the current state of mitigation policy in all countries, raise serious questions about whether this goal can be credibly agreed in current circumstances.

Achieving the objective of 450 ppm would require tighter constraints on emissions than now seem likely in the period to 2020. A 450 ppm objective would require an emissions reduction commitment by developed countries of 32 per cent by 2020 over Kyoto/2012 levels, or around 5 per cent reductions per year. The only alternative would be to impose even tighter constraints on developing countries from 2013, and that does not appear to be realistic at this time.

The awful arithmetic means that exclusively focusing on a 450 ppm outcome, at this moment, could end up providing another reason for not reaching an international agreement to reduce emissions. In the meantime, the cost of excessive focus on an unlikely goal could consign to history any opportunity to lock in an agreement for stabilising at 550 ppm—a more modest, but still difficult, international outcome. An effective agreement around 550 ppm would be vastly superior to continuation of business as usual, even if it were to become a final resting point for global mitigation.

An achievable agreement built around 550 ppm provides a staging platform for more aggressive reduction at a later date. In contrast, an unrealistic agreement, nominally embodying higher ambition, but with no prospects of implementation as agreed, may be an instrument of disillusionment. This conclusion is not the triumph of despair. It is the Review's appraisal of what might be achievable when the sum of the parts must come together to form a successor to the Kyoto agreement. It is based on the view that no agreement will take the world forward unless its components add up to the solution defined for each stated objective.

It is possible that the Review is wrong in its judgment about what is achievable at Copenhagen. To allow for that possibility, the Review confirms its recommendation in the supplementary draft report—that Australia should offer to play its full, proportionate part in a global agreement designed to achieve 450 ppm with overshooting. It should offer to reduce its emissions entitlements in 2020 by 25 per cent within an effective global agreement that, on realistic assessment, adds up to the 450 ppm overshooting scenario.

Pending the completion of the international discussions on post-Kyoto arrangements, it is better not to focus on a single trajectory, but to have a set of possibilities, the choice among which will be determined in an international context. This set of possibilities will be bound by Australia's 'conditional' offers:

- a 10 per cent (or 30 per cent per capita) reduction from 2000 levels by 2020 within a global agreement aimed at stabilising emissions at 550 ppm (or 17 per cent in absolute terms from Kyoto compliance over 2008–12 to 2020)
- a 25 per cent (or 40 per cent per capita) reduction from 2000 levels by 2020 within a global agreement aimed at returning emissions to 450 ppm (or by one-third in absolute terms from Kyoto compliance over 2008–12 to 2020)

- an Australian commitment between the 450 and 550 position, corresponding to a global agreement in between.

These conditional commitments are consistent with the framework derived in Chapter 9. Over the longer term, they would respectively require 80 and 90 per cent absolute reductions (or 90 and 95 per cent per capita reductions) from 2000 levels by 2050.

The proposed targets for Australia correspond directly to the trajectories that Australia would need to adopt as its fair share of the international emissions reduction burden. They are calculated within an internally consistent framework compatible with global agreement around specified emissions concentrations objectives. The numbers expressed in absolute terms from a 2000 base turn out to look less onerous for Australia than for other developed countries in the early years, because they are based within a rigorous framework calibrated in per capita allocations of emissions rights. Australia's population, because of this country's longstanding and large immigration program, has been and will be growing much faster than populations in other developed countries. In addition, Australia's 2008–12 Kyoto targets allowed it to increase emissions. The targets are no less onerous than entitlements for other developed countries when examined within a framework of principle designed to add up to specified global mitigation outcomes, and to have a chance of success across the international community. They are no less onerous—and can be seen as being more onerous—when comparisons are made on a per capita basis, or on the absolute reduction from Kyoto compliance in over 2008–12 to 2020.

These reductions proposed for Australia would be fully consistent with the range of emissions reductions that received prominent attention at the UNFCCC Conference of the Parties in Bali in 2007 (see Box 12.1).

### **Box 12.1 The Bali numbers**

While 2000 is a relevant comparator for Australia since it is the base year for the Commonwealth Government's announced emissions targets, 1990 has been emphasised in international discussions.

At the 2007 Bali climate change negotiations, a particular range of emission reductions received prominent attention. It was proposed that Annex I countries consider emissions reduction targets in the range of 25 to 40 per cent by 2020 over 1990 levels. This target range stems from an IPCC analysis for a 450-type trajectory. The equivalent range for a 550 trajectory is 10 to 30 per cent (see IPCC 2007: 776).

The emissions reduction targets for Annex I countries modelled by the Review are fully consistent with these Bali ranges, but at the lower end because of the limited mitigation by developed countries to date. Relative to 1990, Australia's proposed targets are at the average for developed countries.

There are advantages for Australia if the world commits itself at some time to a credible agreement that adds up to the objective of 400 ppm. This would

require agreement on and progress towards a 450 objective, with a subsequent lift in ambition. The path to 450 ppm may travel through a credible agreement on and progress towards 550 ppm. The path to 400 ppm can only travel through a credible agreement on and progress towards 450 ppm.

The ultimate achievement of returning concentrations to 400 ppm is likely to depend on the commercialisation of technologies that can remove carbon dioxide from the atmosphere. This is a technical possibility at this time, notably through a range of bio-sequestration options. Such options may become commercially realistic through a combination of high carbon prices and support for research, development and commercialisation.

### 12.1.2 The challenges of policy setting in a world of partial mitigation

For now, there is no comprehensive international framework for reducing emissions when the Kyoto agreement ends in 2012. Each jurisdiction is left to signal its intentions in the absence of a coordinating framework.

Strong Australian mitigation outside an effective international agreement would be deeply problematic. It would impose domestic costs that are higher than they would be if similar national targets were pursued in the context of an international agreement. It has the potential to leave our traded sector at a competitive disadvantage, for no worthwhile environmental benefit. This reality opens the way to political pressure for exemptions and countervailing payments that could seriously increase the costs of mitigation.

Developed countries agreed in Kyoto that they would move first on mitigation, for reasons that have some validity or at least resonance today.

This is the context in which the world's developed countries agreed in the Kyoto discussions to take mitigation steps ahead of developing countries. Australia, and the United States, agreed to be among the developed countries that acted ahead of developing countries to reduce emissions. This is an obligation that we have already undertaken to fulfil along with the other developed countries. If there were no comprehensive global mitigation agreement out of Copenhagen, there is value in Australia playing its part in keeping the prospect of eventual agreement alive, by being prepared to act with other developed countries. It should take the first step in the expectation that this will only be necessary for a period that is short, transitional and directed at achievement of global agreement. The first step would be taken in the expectation that the ad hoc policy world can quickly be brought to an end—replaced by the cooperative arrangements that are necessary to reduce the risk of dangerous climate change to acceptable levels.

In the ad hoc world, other developed countries will be in the same position as Australia. Each country will adopt its own trajectory and implement its own policies. There is no guarantee that these policies will be well coordinated or integrated. The potentially adverse consequences for the global climate and for internationally efficient resource allocation will be significant.

What we do now will have a bearing on the likelihood of international cooperation in the near future. We, with other developed countries, help to keep the chances of eventual effective international agreement alive, by unconditional commitment to emissions reductions. We do so through the interim emissions reduction targets that we are prepared to adopt ahead of an international agreement.

### 12.1.3 Interim targets in the ad hoc policy world

The Commonwealth Government's policy of reducing emissions by 60 per cent from 2000 levels by 2050 provides the basis for Australia's unconditional commitment in a world of ad hoc national policies.

There is no reason to suggest that other trajectories would be superior to a linear reduction in emissions from 2013 to 2050. A well-designed market (see chapters 13 and 14) that maximises opportunities for trade among participants, at a point in time and intertemporally, will allow cost-reducing variations in annual emissions.

The Review therefore suggests that the interim target for Australia be defined as the first step along a linear path from 2012 towards meeting the Government's stated goal of reducing emissions by 60 per cent from 2000 levels by 2050. This unconditional policy commitment requires a reduction of emissions by 5 per cent from 2000 levels by 2020. This equates to a 25 per cent reduction in per capita emissions from 2000 levels. It implies an absolute reduction of 13 per cent from Kyoto compliance levels over 2008–12 and 2020. This compares with the European Union's recently announced unconditional offer, which in corresponding terms equates to reducing per capita emissions by 17 per cent from 2000 levels by 2020.

Comparable commitments should be expected from other developed countries when international negotiations reach their moment of decision in Copenhagen in late 2009.

In the modelling results presented in section 12.7, this partial mitigation scenario is referred to as the 'Copenhagen compromise'. This describes the situation in which, by December 2009 (or in meetings that follow immediately afterwards), it has not been possible to secure a comprehensive agreement on emissions reductions. Nevertheless, developed countries have endorsed a successor agreement to the Kyoto Protocol and developing countries have also adopted the kinds of approaches envisaged in the Bali Roadmap (see chapters 9 and 10).

If this was all that was achieved in a Copenhagen compromise and it was seen as an end point, it would be a disappointing conclusion. Opportunities to hold risks of dangerous climate change to acceptable levels diminish rapidly from 2013 if no major developing economies accept constraints to hold emissions significantly below business as usual by that time.

The proposed set of conditional and unconditional offers, or interim targets, are summarised in Table 12.1. The reductions required by 2050 are shown in Table 12.2 and the reductions trajectories are shown in Figures 12.1 and 12.2.

**Table 12.1 Summary of interim targets in 2020 (per cent)**

	Conditional offers		Unconditional offer
	450 ppm scenario	550 ppm scenario	Copenhagen compromise
<b>Emissions entitlement reduction commitment for 2020 relative to 2000</b>			
Reduction in total emissions	-25	-10	-5
Per capita reduction	-40	-30	-25
<b>Emissions entitlement reduction for 2020 relative to 2008–12 Kyoto compliance</b>			
Reduction in total emissions	-32	-17	-13
<b>Emissions entitlement reduction commitment for 2020 relative to business as usual in 2020</b>			
Reduction in total emissions	-39 to -44	-25 to -31	-22 to -27

Note: Two figures are used to compare Australia's allocation to a business-as-usual world: the no-mitigation scenario, as modelled in GTEM; and the lower 'with measures' projections of the Australian Government (Department of Climate Change 2008), which give a more accurate measure of additional policy effort required.

**Table 12.2 Reductions in emissions entitlements by 2050 for policy scenarios (per cent)**

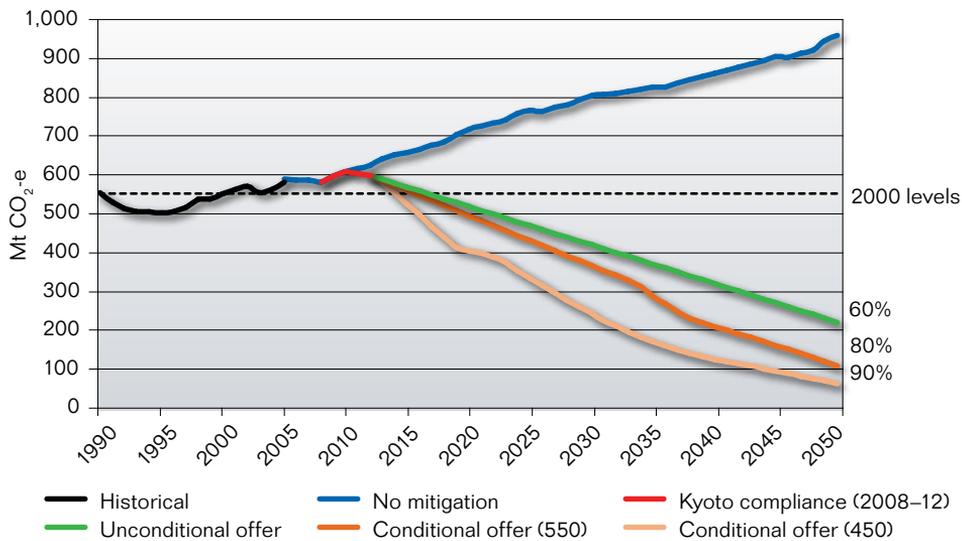
Scenario	450 ppm scenario	550 ppm scenario	Copenhagen compromise
<b>Emissions entitlement reduction commitment for 2050 relative to 2000</b>			
Reduction in total emissions	-90	-80	-60
Per capita reduction	-95	-90	-75
<b>Emissions entitlement reduction for 2050 relative to 2008–12 Kyoto compliance</b>			
Reduction in total emissions	-90	-82	-63
<b>Emissions entitlement reduction commitment for 2050 relative to business as usual in 2050</b>			
Reduction in total emissions	-93	-89	-77

Note: It is unlikely that the Copenhagen compromise would be viable as a long-term outcome lasting to 2050. Even if it is the best outcome to emerge from the December 2009 meeting of the Conference of the Parties, it can be expected to be subsumed into a broader, more ambitious agreement at some future time.

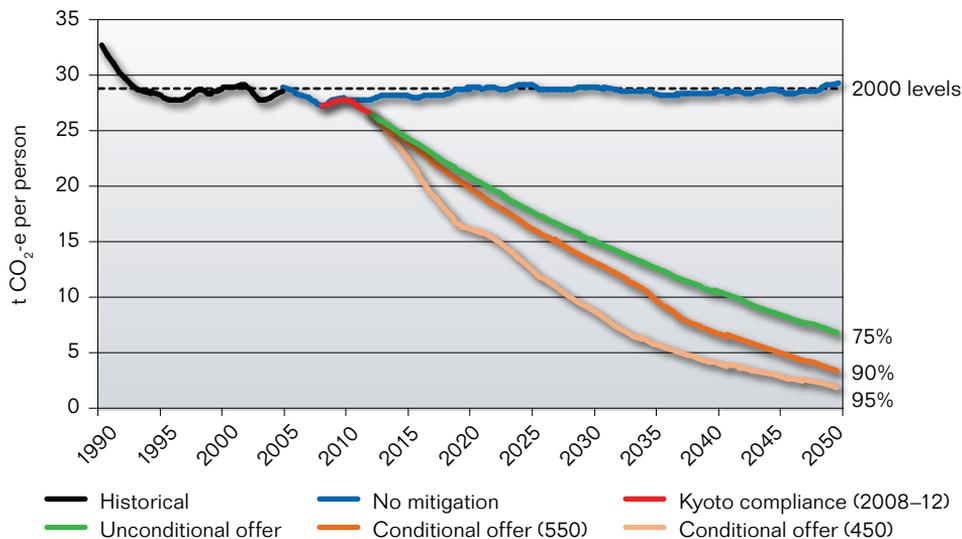
The emissions reductions highlighted in tables 12.1 and 12.2 and figures 12.1 and 12.2 represent the required reduction in net emissions—that is, actual (or physical) emissions produced in Australia less any emissions entitlements purchased internationally. The comprehensive agreements that would accompany

the 450 ppm or 550 ppm outcome would allow for broad trade in international permits (though opportunities would be affected by the extent to which individual countries adopt market-based mechanisms). This would, for any given level of emissions reduction, be expected to provide for lower cost abatement than could be expected under the narrower agreement represented by the Copenhagen compromise.

**Figure 12.1 Australian emissions reductions trajectories to 2050 (reduction in total emissions)**



**Figure 12.2 Australian emissions reductions trajectories to 2050 (per capita reduction)**



Note: The no mitigation scenario for figures 12.1 and 12.2 is as modelled in GTEM.

In the unlikely event of complete failure of agreement at Copenhagen, and in the absence of any subsequent framework agreement (even among developed countries), and therefore in the absence of clear rules and opportunities for international trade in permits, it would make little sense for Australia to impose quantitative emissions limits. Under this 'waiting game' scenario, Australia's best option would be to continue with the emissions trading scheme, and with the rising fixed carbon price of the transitional period described in Chapter 14, until international agreement or 2020. Continuing an emissions trading scheme would help to keep hopes alive of an international agreement, at reasonable cost, until all opportunities for progress had been exhausted. Current commitments by the governments of developed countries attach low probability to failure of the Copenhagen meeting even to secure an agreement among developed countries.

## 12.2 The benefits of global cooperation

The unilateral adoption of emissions reduction policies by individual countries has been a way of getting global mitigation started. Developments in the European countries, North American and Australian states and provinces, and in Japan, New Zealand and China have helped to establish momentum in global mitigation. We have a stronger base for moving towards effective global action than we would have had if every country and state had waited for a comprehensive global agreement. Indeed, the early actions have made it possible now to contemplate an effective global agreement. Pending international agreement, it will be helpful for individual countries to move forward unilaterally, so long as this is within policy frameworks that are designed to integrate productively with an emerging international agreement.

Nevertheless, unilateral mitigation in an ad hoc world creates problems of deep political economy for every well-intentioned government.

Unilateral mitigation in an ad hoc world is more expensive for a given degree of emissions reduction. It allows only limited international trade in emissions entitlements, and therefore does not guarantee that mitigation will be undertaken in the parts of the world at which it can be achieved at lowest cost.

Differences in carbon pricing across countries will distort the location of production and investment in trade-exposed, emissions-intensive industries. This would generate dreadful political economy problems in countries seeking to undertake mitigation, as companies seek shielding and preferment in relation to the carbon price. The domestic political economy pressures flow into the international sphere and create risks of new kinds of trade protectionism.

Once there is a comprehensive international agreement, many aspects of mitigation change for the better. Trade in entitlements between countries that have accepted emissions targets becomes possible. Countries that are able to reduce emissions below agreed trajectories are able to sell surplus entitlements to countries that are above their trajectories. This tends to equalise across countries the cost of emitting, removing distortions associated with the trade-exposed

industries. Countries in which mitigation costs are high are able to buy entitlements from countries in which mitigation costs are low. This increases economic welfare in the buying and selling countries alike.

Countries with comparative advantage in emissions-intensive industries are able to acquire entitlements to allow the expansion of those industries. This will be profitable for them, so long as they still have comparative advantage after taking the carbon externalities into account. This could be especially important for Australia. With comprehensive carbon pricing, the international prices of emissions-intensive goods and services would rise. Countries with comparative advantage in an emissions-intensive industry, after taking the costs of carbon into account, and firms with competitive advantage after taking the costs of carbon into account, would remain in and expand production, and buy permits on the international market to cover any domestic shortfall. The cost of the permits would be covered, more or less depending on the range of relevant elasticities, by the increase in the international price of the final product. Countries with comparative advantage in emissions-intensive goods and services would become net importers of permits, and their domestic emissions would exceed their allocations.

Emissions-intensive export industries in which the emissions intensity of production is lower in Australia than in its main competitors in international markets may expand exports and production under comprehensive agreements. The products of the sheep and cattle industries may be examples, where Australian producers are spared the emissions costs of heated barns and grain feeding in winter.

On the other hand, in any trade-exposed industry in which production is naturally more emissions-intensive in Australia than in major competing countries, output and exports will tend to contract under arrangements that generate comparable carbon pricing across countries. Aluminium might be an example. The competitiveness of Australian production from coal-based electricity may decline for a period, relative to production from hydro-electric power and natural gas in the rest of the world. This would involve economically and environmentally efficient contraction of Australian production. If this were to occur, any attempt to slow its natural progress would increase the cost of Australian emissions reduction.

None of this happens smoothly in an ad hoc world. There is a risk of carbon leakage, from countries with strong to countries with weak mitigation regimes. In an ad hoc world the management of political economy pressures arising from trade-exposed, emission-intensive industries is a dreadful problem for every country. Chapter 14 provides a framework within the Australian emissions trading scheme for addressing this dreadful problem.

The risk is banished in a world of comprehensive agreement, even if the degree of restraint on emissions is much more severe on some countries (developed) than others (developing). Trade in permits will establish comparable carbon pricing, even if some countries face more demanding emissions reduction trajectories than others.

All countries have powerful interests in moving quickly into a world of comprehensive carbon constraints, even, within reasonable limits, one in which the commitments to emissions reductions are tighter on themselves than on some other countries.

There is one other complication in comparing costs and benefits for Australia of mitigation in an ad hoc world and under comprehensive agreements. Global mitigation will shift demand away from fossil energy sources unless and until there is commercially successful sequestration of the carbon dioxide exhaust from combustion. Australian export volumes and export prices, and therefore output and incomes, will fall with international mitigation. Countries that import fossil fuels, like the United States, face an opposite and happier prospect. For them, import prices fall and real incomes rise as a result of global mitigation. This is a significant factor in raising the cost of mitigation to Australia under a comprehensive agreement relative to the ad hoc world. Australia's status as the world's largest exporter of the world's most emissions-intensive major energy source makes it especially vulnerable to international mitigation agreements to which it is not a party.

It is in Australia's strong self-interest to engage actively in bringing about a cooperative and comprehensive international framework for reducing emissions. This will require Australia, along with other developed countries, to adopt targets and trajectories, conditionally and unconditionally, as steps along the path to resolution of the prisoner's dilemma of international action on climate change.

## 12.3 Solving a diabolical problem in stages

The diabolical problem of climate change has many elements. Two seem to make it intractable: uncertainties about the science of climate change and the costs of mitigation; and the prisoner's dilemma constraining international collective action.

### 12.3.1 The delusion of delay

Uncertainty about the benefits (in this case, the benefits of avoided climate change) and the costs of major structural changes in the economy constrain change and reform in many areas of policy. The uncertainties are particularly wide with climate change. They are compounded by the long time periods over which both the costs and benefits are expected to work their ways through the economy and society.

Uncertainties about the science of climate change and the cost of mitigation can be reduced by research, which requires time, and by new observations made available by the passing of time.

But the science, and the realities of emissions growth in the absence of mitigation, show that we do not have time. The world is rapidly approaching points at which high risks of dangerous climate change are no longer avoidable. We would delude ourselves if we thought that scientific uncertainties were cause for delay. Such an approach would eliminate attractive lower-cost options, and diminish the chance of avoiding dangerous climate change.

### 12.3.2 Solving the prisoner's dilemma: move by move

The prisoner's dilemma of international collective action on climate change is daunting. Time is an essential element in any resolution of the policy problem. But with every year that passes without cooperative action, the range of options diminishes.

Only an international agreement that is perceived by all parties as fair in its distribution of the burden across countries has any chance of being accepted. The analysis undertaken by this Review indicates that all major emitters, including rapidly growing developing countries, will need to be parties to such an agreement. To be widely accepted, principles to guide the allocation of a global emissions budget across countries will need to be simple, transparent and readily applicable.

As noted in Chapter 8, the incentives facing individual delegations in a single, large, multilateral negotiation are not conducive to reaching sound agreement. Each country will try to secure a 'better deal' than others, with equity concerns figuring large and incentives for free-riding working against cooperative outcomes. Countries' circumstances and interests in the negotiations differ widely, and geopolitical considerations interfere. The dominant outcome is a low common denominator.

Australians can think of many reasons why their situation is different from that of other developed countries, and why their emissions reduction targets should be less demanding. So can people from every other country. There will be no progress towards an effective international agreement if each country lays out all of the special reasons why it is different from others, and why it should be given softer targets. When climate change negotiators from any country list reasons why their country has special reasons to be treated differently, we should be quick to recognise that they, and the countries they represent, intentionally or not, are preventing effective international agreement.

The underlying free-rider problem can only be solved through a repeated game with signalling and learning (Axelrod 1984), and in agreements that are individually and collectively rational, and considered fair (Barrett 2003). This requires close communication between sovereign parties, to allow disparate perspectives to be reconciled and confidence in collective action to be developed. But this requires time, and time is running out. Without strong action by both developed and major developing countries alike between now and 2020, it will be impossible to avoid high risks of dangerous climate change.

In such circumstances, the only way through the constraints is to make a start on domestic and international action, along paths that may now be feasible, but which in themselves do not lead quickly to ideal outcomes. Early action, even if incomplete and inadequate, on a large enough scale, can buy time and begin building the foundations for effective collective action.

But any old action will not help. To buy time and to help build the foundations for effective collective action it has to be well conceived in domestic and international terms. Actions that have high costs for minimal effect are likely to inhibit rather than build domestic support for effective mitigation. In the international sphere,

policy initiatives that create tensions between countries over perceptions of equity, or that set in train protectionist actions and responses, will corrode rather than build confidence in collective action.

For these reasons, the best response for now may not see immediate movement to an agreement designed to solve the global warming problem once and for all. Progress will be made by designing an interim objective large enough to keep open the better options for avoiding high risks designed well to achieve its limited goals at low cost, that builds confidence that international cooperation is possible in this difficult area, and that encourages and allows time for the accumulation of the knowledge needed to reduce uncertainty about the science and about the costs of mitigation. This is the context in which the Review has framed its recommendations on targets and trajectories.

The details of the targets and trajectories the Review recommends in section 12.1 will not be the best for all time. They are the best that are available to us now.

In the context of well-designed domestic policies on emissions reduction, encompassing correction of market failures in response to prices being placed on emissions as well as to the emissions prices themselves, and carefully conceived international policies, our interim targets will lay the foundations for effective additional steps. Those steps will become easier to take as confidence grows in the knowledge base for strong policy action and in the feasibility of effective international action.

The first step, built around immediately moving on to a path of global emissions designed to stabilise concentrations of greenhouse gases at no higher than 550 ppm, is large and far-reaching enough to keep open the possibility of avoiding high risks of dangerous climate change. It is only the first step. But it is an essential first step.

It would be wonderful if the international political constraints eased to the point that a detailed proposal that 'added up' to a credible commitment to achieve the 450 objective could be put on the table at Copenhagen, and agreed by all parties. It is more likely that a detailed proposal that 'added up' to 550 could be agreed. It is of great consequence to the prospects of strong mitigation that at least this substantial but lower outcome be achieved.

## 12.4 Hastening progress towards greater emissions reductions

The interim targets recommended in section 12.1, although they will not be the best for all time, represent a realistic staging post for the more ambitious reductions required to avoid dangerous levels of climate change. If an agreement based on stabilisation of atmospheric concentration at 550 ppm were realised at Copenhagen, or soon after, and came into effect at the conclusion of the Kyoto period, it is likely that clear evidence of progress would emerge within a few years.

Confidence in the regime would build as the benefits of international trade in emissions entitlements became evident; as investment appreciably increased in research and development and the commercialisation of new, low-emissions technologies; and as the measured rate of emissions growth began slowing in accordance with the global trajectory shown in Figure 9.3.

This would encourage hope and provide reason for revisiting the initial agreement and lifting the level of ambition in global emissions reductions. Progress should be reviewed regularly (annually or biennially) in order to seize opportunities for adopting more ambitious targets—possibly beginning as soon as five years from the initial agreement.

Existing and new institutional arrangements in Australia and internationally will be required to support the objective of hastening progress towards more ambitious emissions reductions. The Australian institute of climate change policy research proposed in Chapter 15 will be the obvious point of integration between Australian and international monitoring and research efforts.

Whether existing global governance structures under the aegis of the UNFCCC and the IPCC are adequate for these purposes will be tested by their ability to deliver a comprehensive agreement to replace the Kyoto agreement from 2013.

## 12.5 Moving from a 550 to a 450 goal

Would it be possible for the world to start on a 550 stabilisation path and then move to a path consistent with a lower ultimate stabilisation objective? Say the world agreed to a 550 stabilisation path, as in the Review's modelling up to 2020, and then switched to the 450 path. If it were to make good the slower start by 2050, to avoid additional overshooting, illustrative calculations suggest that the 450 ppm global emissions reduction target of 50 per cent by 2050 over 2000 would increase to 64 per cent. Clearly, it would be better for the world to be on the 450 ppm path from the start. It would be better to move on to the new, more ambitious part earlier (say, 2015) than later (2020). A 2015 shift would make the reduction to 2050, without additional overshooting, about 55 per cent. But being on a 550 ppm path keeps hope alive for a 450 ppm path.

Other possibilities could also be considered to improve the chances of the world eventually returning the atmospheric concentration of greenhouse gases to 450 ppm or less, even after a slow start. The 450 ppm path could allow for greater overshooting than modelled here (up to 530 ppm), and for return to the 450 ppm level early next century rather than this century. Such approaches could hold the 2050 reduction requirement to 50 per cent, but carry larger environmental risks.

## 12.6 Does Australia matter for global mitigation?

Only effective global action can solve the climate change problem. Australia is the source of only about 1.5 per cent of global greenhouse gas emissions. So does Australian action matter?

If our own mitigation efforts had no effect at all on what others did, we could define our own targets and trajectories, and approaches to their realisation, independently of others' perceptions or reactions. We could enjoy the benefits of reduced risk of climate change from others' actions, without accepting our share of the costs. The optimal level of Australian mitigation effort—the level that would maximise the incomes and wealth of Australians—is easily calculated. It would be zero. That is not far from the stance of Australian policy until recent times.

Australia's relevance to the international policy discussion has been apparent in the period since early 2001. The fact that Australia had joined the Bush administration in not ratifying the Kyoto agreement that we had each negotiated was a key fact in the American domestic discussion. Australia was presented as evidence that the Bush administration was not alone among developed countries.

All countries, Australia and the United States among them, agreed at United Nations meetings in Kyoto in 1997 that all developed countries would accept certain obligations. While the Review's analysis demonstrates that a substantial majority of the future growth in emissions will come from developing countries (Chapter 3), the international community has agreed that the first steps in mitigation would be taken by developed countries. This gives every developed country a veto on substantial progress on global mitigation: The failure of any one of them to do what it said it would do would make it unlikely that the necessary later steps would be taken by major developing countries. We played that veto card.

Whether we like it or not, Australia matters.

There are more general reasons why Australia may be influential to global outcomes.

There is a role for countries of substantial but moderate weight—for 'middle powers'—in taking the initiative in leading global diplomacy on issues in which they have major interests. Global warming passes the interest test for Australia, as we are likely to be the developed country that is most damaged by a failure of effective global action. Australia—at times for good and at times for ill—has demonstrated on many issues at many times in history that it is effective in a 'middle power' diplomatic role, developing ideas to shape international cooperation, and persuading others that cooperation is in their own interest. The APEC group of countries is one example.

Australia has some unusual diplomatic assets in the developing countries that are centrally important to successful global mitigation policy. Chinese policy is crucial to a successful global outcome. A history of close and productive cooperation on domestic and international policy through the reform period gives Australia a strong base for cooperation with China. Our close and well-developed

relationships with Indonesia (the world's third largest emitter of greenhouse gases in absolute terms) and Papua New Guinea (a large emitter in per capita terms and one playing a global leadership role among less developed countries on greenhouse gas emissions policies) raise special opportunities.

The world, and especially developing countries, need examples of countries making successful transitions to low emissions while maintaining economic growth. Australia's established market economy and economic dynamism, with particular skills and natural resources in areas of special importance to the low-carbon economy, will be assets in making a successful transition, showing that it can be done.

Although it may miss our attention, others notice, and think it relevant, that Australia's economic strength in the early 21st century derives to a considerable degree from our higher terms of trade associated with the strong economic growth in Asian developing countries. They notice that strong growth in the Asian economies, and exceptional Australian prosperity, is the other side of the coin to the heightened urgency of the global warming problem.

Because Australia matters, we cannot contribute positively to an effective global agreement, and at the same time pick a trajectory for our own country's emissions reductions that keeps costs low for us, without assessing whether this would be consistent with a global agreement to solve the problem.

If there is to be an effective global agreement, it is not open to Australians, any more than to people from any other country, to pick and choose among principles according to what suits them best in a particular and narrow context. The corollary of the focus on per capita allocation of emissions rights for interim targets discussed above and in Chapter 9 is acceptance of long-term global allocation rules built around eventual convergence across countries in per capita entitlements. This is the source of the required 80 per cent reduction in Australian emissions (90 per cent reduction per capita) from 2000 levels by 2050 under a 550 scenario and 90 per cent reduction in Australian emissions (95 per cent reduction per capita) from 2000 levels by 2050 under a 450 scenario.

Such an approach, with these consequences, is in Australia's national interest. It is in Australia's national interest because the costs of accepting the approach are manageable and because it provides the best chance of reaching an international agreement that reduces the risks of dangerous climate change to acceptable levels.

It would help Australians to face some of these realities if we were more realistic about where we stand among developed countries in taking action to reduce greenhouse gas emissions. It is claimed by many Australians—some who want their country to be in a leadership position, and some who do not—that we are, or are about to be, ahead of other developed countries on greenhouse gas abatement.

Australia is in no danger of leading the world in greenhouse gas mitigation. In comprehensive national efforts at mitigation, it ranks behind all of the 27 countries of the European Union.

In practical policy innovation to reduce emissions, Australia ranks behind a number of states of the United States, including the largest, California, with its pervasive and costly regulatory approach. The national governments of Japan, New Zealand, the United States and the European Union have engaged in a range of partial activities to reduce emissions. In all of these countries, there are domestic debates about national abatement initiatives at similar stages to our own.

What the rest of the world notices most about Australian emissions is that ours are the highest per capita in the OECD; that over the past several decades they have been growing faster than those in other OECD countries; and that while in 1971 the emissions intensity of Australia's primary energy supply was similar to the OECD's as a whole, in recent years it has been more than one-third higher (see Figure 7.7). There are good reasons why Australia became relatively more dependent on a high-emissions source of energy—coal—while the remainder of the OECD was reducing the proportionate role of coal and increasing the contributions of low-emissions energy, including nuclear. But whatever the reasons, they are not easily reconciled with the idea that Australia is leading the world in emissions reduction.

It is often said in Australia that developing countries are strongly resistant to reductions in emissions and that it is unrealistic to expect them to participate in global constraints on emissions. This is too simple. China's selective withdrawal of export rebates within its value added tax, its export taxes on a range of energy-intensive products, its discouragement of expansion of energy-intensive industries and its specific regulatory constraints on investment in steel, aluminium and cement production add up to more substantial constraints on the most emissions-intensive industries than would occur in Australia in the early years of an emissions trading scheme. China's active encouragement of low-emissions sources of power (hydroelectric, wind, nuclear, biomass, biofuels) goes beyond current Australian efforts. These measures stand alongside a domestic policy commitment to reduce the energy intensity of economic activity by four percentage points per annum until 2020. Data released by the Chinese Government in August 2008 show the energy intensity of Chinese GDP falling by 3.7 per cent in 2007 (Xinhua 2008)—the first sign of good intentions on energy intensity being reflected in policy outcomes.

Among other developing countries, Papua New Guinea's prime minister has asked his country's newly established Climate Change Office to prepare an analysis of ambitious mitigation targets: a reduction in emissions of 50 per cent by 2020, and carbon neutrality by 2050. The Indian Government is well-known for its declamatory statements resisting commitments to reduce emissions until developed countries have gone much further. But if we listen carefully, it has also said repeatedly that it is prepared to commit itself not to increase its per capita emissions above developed country levels. India has long emphasised that convergence towards equal per capita entitlements would need to be a central part of any international agreement in which developing countries accepted constraints on emissions. Many developing countries have said they would be prepared to do more if there were commitments from developed countries to support transfer of low-emissions technologies and climate change adaptation strategies.

It is easy to be cynical about statements of good intentions by others, as it is easy for them to be cynical about ours. There is a possible path to an effective international agreement if we observe carefully what others are doing, listen to what others say they are prepared to do, and note the conditions for action. We need to listen as well to others' perspectives on our own policies and practices.

Australia matters. What we do matters. When we do it matters. It would be ill-advised to take action with costs to ourselves that is meant to assist the emergence of a good international agreement, but to do it too late to have a chance of avoiding high risks of dangerous climate change. What we do now, in time to influence the global mitigation regime from the end of the Kyoto period, is of high importance. What we do later runs the risk of being inconsequential in avoiding dangerous climate change.

## 12.7 Interim targets

To represent a world in which there is a more ad hoc approach to global mitigation than that assumed in Chapter 11, the Review separately and independently modelled a scenario in which Australian mitigation action is undertaken before there is a comprehensive international agreement. The modelling of this so-called Copenhagen compromise scenario was undertaken in order to assess the costs of adopting the interim target discussed in section 12.1.

An additional scenario was also modelled, the so-called waiting game. This scenario represents the unlikely event that the Australian emissions trading scheme is implemented in 2010 without any clarity about an international agreement (partial or comprehensive).

The Review's modelling assumptions are discussed in Box 12.2, with a fuller account of the modelling assumptions, methodology and results available on the Garnaut Review website at <[www.garnautreview.org.au](http://www.garnautreview.org.au)>.

### Box 12.2 Modelling assumptions

In each of the scenarios all sectors were assumed to be covered by the mitigation policy from the commencement of the modelling period. All prices in the modelling are in 2005 dollars.

Under the 450 ppm and 550 ppm global mitigation scenarios of Chapter 11, globally coordinated mitigation action begins in 2013 with unlimited trading in permits between countries. In the lead-up to 2013, all countries, including Australia, are assumed to continue on business-as-usual growth and emissions. Australia meets its Kyoto commitments. From 2013, the carbon price is determined through global trade in emission entitlements, the volume of which follows the trajectory shown in Figure 9.3.

### Box 12.2 Modelling assumptions (*continued*)

In the ‘Copenhagen compromise’ scenario, a fixed price permit system is introduced in 2010 at \$20 per tonne of CO<sub>2</sub>-e rising at 4 per cent per annum until 2013. From 2013, the carbon price is assumed to float in accordance with Australia imposing a linear reduction in emissions from 2012 to achieve a 60 per cent reduction in emissions from 2000 levels by 2050. Unlimited trading in international permits is assumed, with the international permit price set at \$40 per tonne of CO<sub>2</sub>-e in 2013 and rising at 4 per cent per annum.

In the 550 ppm, 450 ppm and Copenhagen compromise scenarios, all industries are assumed to have access to unlimited permits from 2013. This provides for domestic emissions reduction targets to be met by abatement undertaken domestically or through the purchase of international permits. The global carbon price acts as a cap on the price of domestic permits.

Under the ‘waiting game’ scenario, the same fixed price regime is imposed, but it remains in place as no trade is assumed available in the absence of an international framework agreement.

Shielding of Australia’s major trade-exposed, emissions-intensive industries is only required under the Copenhagen compromise and the waiting game scenarios. Shielding under the Copenhagen compromise is provided through the redistribution of permit auction revenue, capped initially at 20 per cent of revenue between 2010 and 2013, and thereafter declining by 1 percentage point per annum. This decline is intended to simulate an increasing number of countries adopting emissions reduction policies between 2013 and 2020. The model assumes that all remaining revenue is transferred to households as a lump-sum payment.

Under the waiting game scenario, shielding is provided to the extent required to maintain output from shielded industries at a constant share of the economy. The value of shielding is capped in each year at 30 per cent of total permit revenue.

#### 12.7.1 The costs of meeting our interim targets

In determining the costs of the various policy scenarios, economic outcomes were compared with the reference case of Chapters 3 and 7 that projects the global and Australian economy, assuming that there is no climate change and no climate change mitigation policy. Abstracting from the effects of climate change is a reasonable assumption in the short term. Different approaches are required when modelling the longer-term implications of policy in Chapter 11.

Table 12.3 shows the macroeconomic outcomes for all modelled scenarios to 2020.

**Table 12.3 Modelling results in 2020 for policy scenarios**

	Conditional offers		Unconditional offer	
	450 ppm scenario	550 ppm scenario	Copenhagen compromise	Waiting game
<b>Emissions entitlement reduction commitment for 2020 relative to 2000 (per cent)</b>				
Reduction in total emissions	-25	-10	-5	–
Per capita reduction	-40	-30	-25	–
<b>Deviations from reference case in 2020 (per cent)</b>				
GDP	-1.6	-1.1	-1.3	-0.9
GNP	-2.0	-1.5	-1.4	-0.9
Consumption	-2.4	-1.8	-1.6	-1.2
<b>Carbon price in 2020 (\$)</b>				
Domestic	60.0	34.5	52.6	29.6

Note: Prices are denominated in 2005 Australian dollars.

These results have two clear implications.

First, the overall cost to the Australian economy from tackling climate change is manageable and in the order of one to two-tenths of 1 per cent of annual economic growth. Australia can readily afford to make unconditional and conditional policy commitments of reducing emissions by 5 per cent and 10 per cent in 2020 from 2000 levels, respectively (equivalent to per capita reductions of 25 per cent and 30 per cent, respectively).

Second, there are clear benefits from broadening the level of international cooperation in implementing mitigation policy. Australia can significantly increase its mitigation effort at negligible additional cost if the broadest possible agreement can be reached by the global community. The broader the opportunities for low-cost abatement, the lower the overall cost for Australia.

The higher carbon price under the Copenhagen compromise relative to the price observed under the 550 ppm scenario reflects more limited access to low-cost abatement opportunities in a world in which there are ad hoc arrangements. The higher permit price in the 450 ppm scenario derives from the substantially greater level of emissions reduction and the subsequent scarcity of permits.

### 12.7.2 The effect on the costs of interim targets of varying some major design features

The partial mitigation scenarios are predicated on a range of assumptions. From a policy perspective, the most notable of these relate to sectoral coverage, use of permit revenue, international trade in permits, and shielding of highly affected trade-exposed, emissions-intensive industries.

The modelling assumes full coverage of all sectors from the outset of the scheme. All permits are auctioned. Some of the revenue is used to assist highly emissions-intensive industries in the traded sector, with all remaining revenue returned to households.

The Review undertook preliminary analysis of varying the assumptions in relation to the ability of Australian emitters to partake in a global permit market and the consequences of using shielding policies.

Trade in international permits is found to be of particular importance and benefit to the overall economic effects of meeting an emissions reduction objective. For example, adopting emissions reduction targets such as those in the Copenhagen compromise but artificially restricting access to an international permit market would result in a much higher permit price by 2020. The higher price is explained by forcing abatement in areas of domestic activity that would otherwise have been unnecessary and could have been achieved at lower cost in other countries. This has adverse effects on macroeconomic measures such as GDP and GNP.

Preliminary analysis on the whole-of-economy implications of providing assistance to trade-exposed, emissions-intensive industries was also examined. This analysis shows that in the presence of a quantitative constraint on emissions, macroeconomic variables such as GDP and GNP in 2020 are hardly affected at all by shielding trade-exposed, emissions-intensive industries. Shielding was found to result in higher levels of activity in emissions-intensive industries, removing potentially cheap forms of abatement. This redistributes the burden of abatement across other parts of the Australian economy, at potentially higher cost, or through the purchase of more permits internationally.

The effects of shielding on households and consumption will depend on the foreign ownership structure of trade-exposed, emissions-intensive industries. In the modelling, shielded industries are assumed to have large foreign ownership shares, particularly the metals manufacturing sectors. As a result, shielding reduces income available for domestic consumption. While consumers are bearing the full cost of shielding (they receive less permit revenue as a result of the shielding), they receive only a portion of the (restored) profit as shareholders.

The Review did not model the transaction costs associated with alternative compliance arrangements for the emissions trading scheme. This could turn out to be a substantial deadweight loss on the economy, particularly in relation to the treatment of trade-exposed, emissions-intensive industries in an ad hoc policy world. If this issue is not handled well, uncertainty will affect the supply price of investment. It will lead to a diversion of management effort into rent-seeking behaviour rather than the pursuit of low-emissions production processes. It could potentially lead to a wide corrosion of good economic governance. In the worst of circumstances, it could turn out to be as expensive as the costs of mitigation itself.

## 12.8 Implications for an Australian emissions trading scheme

It will be important for Australia to put in place, from 2010, the architecture that will deliver emissions reductions at the lowest possible cost to the domestic economy. Great care must be taken now as consideration is given to the design of a domestic emissions trading scheme. This is the necessary centrepiece in Australia's effort to reduce emissions.

There is, however, a risk to the stability of the emissions trading scheme if the form of the post-Kyoto international agreement remains unknown at the time of the scheme's commencement. The time between the start of the domestic emissions trading scheme and a successor international agreement is best viewed as a transitional period in which the price of permits should be fixed.

In addition to avoiding unproductive interaction between the early period of a new trading system and Australia's participation in crucial global negotiations, fixing the price of permits will provide a less anxious environment for implementing the globally efficient approach to assistance to trade-exposed industries as noted in section 12.2.

The preferred principles for, and design features of, Australia's emissions trading scheme are discussed in greater detail in Chapter 14.

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