

## 4 National emissions trajectory and target

This chapter lays out the national emissions targets for 2020 and 2050, and maps the strategy and pathway to achieve those targets. It also discusses the implications for the price of carbon and the costs to the economy of the proposed targets.

The Government has committed to a long-term goal of reducing Australia's greenhouse gas emissions to 60 per cent below 2000 levels by 2050. The national emissions trajectory is the rate and timing of emissions reductions to achieve that target. The 2020 national emissions target range (the 'medium-term target range') and the indicative trajectory have two important functions: signalling to the world the efforts that Australia is making to reduce emissions (including compliance with existing international obligations), and allowing all Australian businesses and households to develop strategies to manage their energy use and efficiently reduce their emissions. This is particularly important to businesses that are major energy users or direct emitters with a liability under the Carbon Pollution Reduction Scheme (the Scheme). In deciding on the shape of the national emissions trajectory, the Government will take into account not only the 2020 and 2050 goals, but also the need to create a smooth path to them.

In the Green Paper, the Government sought feedback on how the trajectory and target range should be defined and communicated. In parallel, the Australian Treasury and others analysed the economic impacts of various national and international emissions reductions scenarios for the Government and for the Garnaut Climate Change Review. The results of these analyses, which were published in *The Garnaut Climate Change Review: Final Report* (September 2008) and *Australia's Low Pollution Future: The economics of climate change mitigation* (October 2008), are relevant to decisions on the level of the target range and the national emissions trajectory.

Having considered submissions in response to the Green Paper, the analyses of economic impacts, and responses to this analysis, the Government has decided on a medium-term target range to reduce emissions by between 5 and 15 percent below 2000 levels by 2020, and an indicative national trajectory to give immediate guidance on the likely levels of emissions reductions in the first three years of the Scheme. These commitments are complemented by an unambiguous statement that Australia's national interest will be best served by a comprehensive global agreement to stabilise atmospheric concentrations of greenhouse gases at around 450 parts per million of carbon dioxide equivalent (ppm CO<sub>2</sub>-e) or lower, and that should such an agreement emerge, Australia would establish post-2020 targets to ensure that it makes its full contribution to more ambitious global action.

This chapter does not discuss Scheme caps and related issues. That information is in Chapter 10.

- Section 4.1 of this chapter discusses factors considered in setting the target range and indicative trajectory.
- Section 4.2 discusses the trajectory strategy and the medium-term (2020) target range for emissions reduction, including the results of modelling by the Treasury and the Garnaut Final Report.
- Section 4.3 discusses the nature of the indicative national trajectory.
- Section 4.4 discusses the expected carbon price implied by the medium-term target range and the indicative national trajectory.

## 4.1 Issues in setting targets and trajectories

In the Green Paper, the Government set out criteria against which the Scheme design would be assessed. These criteria are also useful tools in setting targets and trajectories. In setting the target range and the trajectory, the Government has considered the following relevant criteria:

- *Environmental integrity.* The target range and trajectory together should catalyse a policy response that delivers genuine reductions in global emissions and drives the transformation of the Australian economy to a low-carbon future. The environmental integrity of a target is described by the actual emissions reductions it achieves. A very ambitious target or a steep trajectory holds out the prospect of greater environmental benefits, but if they are too ambitious or too steep there is a risk that society will decide that sacrifices to reach the target are not worth making. An overambitious target that is not achieved has less environmental integrity (and effectiveness) than a realistic target that can be achieved and built upon in future years.
- *Economic efficiency.* Achieving emissions reductions at the lowest long-term cost maximises our ability to respond to climate change. It is important to achieve our environmental goals as efficiently as possible and get the maximum value out of our mitigation efforts. To do otherwise would waste resources and reduce our ability to respond in the future. See Box 4.1 for a discussion of economic efficiency in the context of emissions reduction policy.
- *Flexibility.* There are inherent uncertainties in climate change science and in the global social and political response to climate change. Policy must be able to respond to changing circumstances in a way that is timely and appropriate. Therefore, policy settings need to provide both medium-term flexibility and clarity for decision making in the short term.
- *International objectives.* Targets and trajectories should support Australia's international negotiating objectives and be consistent with international obligations, including trade and climate change treaties. The target range is a central means by which Australia signals the efforts we are prepared to make as part of global endeavours to reduce the impacts of climate change.

- *Accountability and transparency.* Business will make investment decisions and householders will make lifestyle choices based on the target range and the trajectory. Decisions on targets and trajectories should be well based and subject to public scrutiny.
- *Fairness.* As discussed in Chapter 1, while the case for action on climate change is clear, there will be costs. The costs should be spread as equitably as possible across the economy, and no-one should shoulder more than their fair share of them.

Many who made submissions to the Green Paper raised these criteria in relation to the target range:

Credible and achievable emissions reduction trajectories and caps should be set through a rigorous and transparent process underpinned by modeling and research which assesses the economic, social and environmental impacts. Trajectories and caps should be technically and environmentally feasible and provide the basis for a smooth, long-term transition to a low-emissions economy recognising the unique features of the Australian economy, international progress in emissions reduction and our contribution to global emissions. (ExxonMobil, Submission 254, p. 4)

To be a credible player in the global effort to avoid catastrophic climate change Australia needs to reduce carbon pollution by at least 30 per cent by 2020 (from 1990 levels) and should increase our commitment to 40 per cent if other developed countries do the same. (Australian Conservation Foundation, Submission 809, p. 3)

A well designed [emissions trading system] must be efficient, effective and equitable in the long term and, importantly, must ensure a smooth and orderly economic transition in the short–medium term. Failure to ensure an orderly transition could have widespread and potentially long lasting adverse economic impacts. (Energy Supply Association of Australia, National Generators Forum, Energy Retailers Association of Australia and Australian Pipeline Industry Association, Submission 715, p. 1)

#### **Box 4.1: How economic efficiency applies to reducing emissions**

In general terms, economic efficiency is realised when nothing more can be achieved using the resources available. A system can be considered economically efficient if it produces goods or services at the lowest possible per-unit cost, or if no one can be made better off without making someone else worse off, or if output cannot be increased unless inputs are also increased.

Economic efficiency will be enhanced when policy settings encourage flexibility and focus efforts to reduce emissions on least-cost options. This is a central reason for adopting market-based approaches, such as emissions trading.

The key efficiency issues in setting the trajectory and the medium-term target range are achieving efficient risk management and managing the pace of economic adjustment. Where risk and uncertainty are significant, as is the case in responding to climate change, efficiency will be best achieved when risks are assigned to those who are best placed to judge, act on and manage those risks.

Governments and the private sector have different strengths in judging and managing the risks or likelihoods of different climate change impacts. Neither has a clear advantage in assessing likely future global emissions reductions. National governments control whether they sign future international agreements and take on specific obligations. Businesses have less control over emissions targets or carbon prices, but have many options for managing uncertainty (ranging from reducing emissions and energy use in their operations to using financial instruments) and can choose the best options to fit their circumstances.

Given these different strengths, and the inherent uncertainties associated with climate change, it would not be efficient to allocate all risk either to government or to the private sector. Shifting the full burden of risk management to government would weaken commercial incentives to reduce emissions, would reduce economy-wide efficiency, and could reduce the environmental integrity of the Carbon Pollution Reduction Scheme.

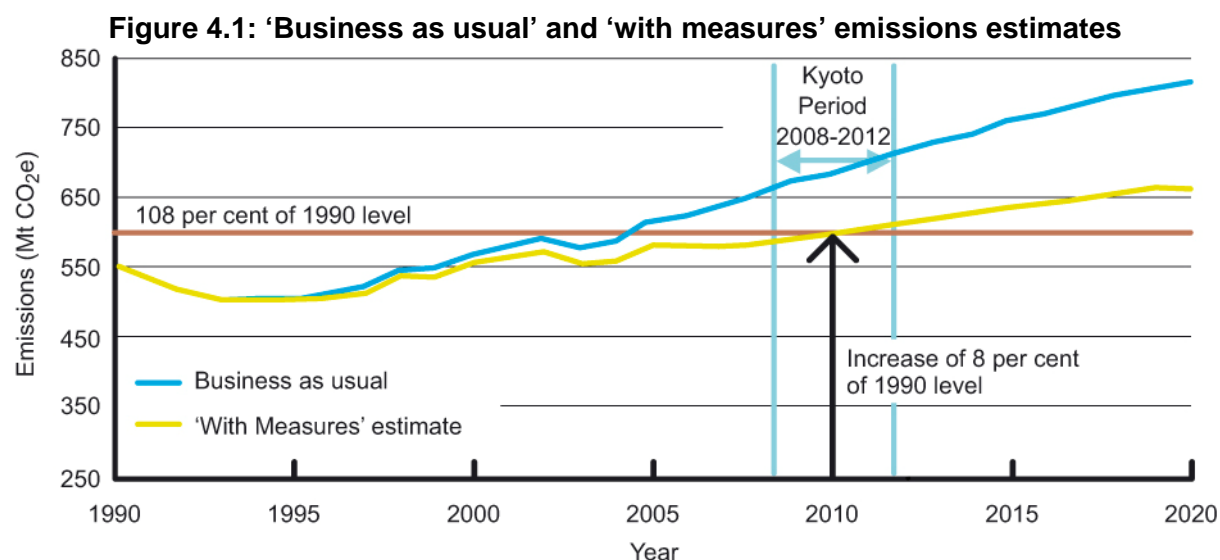
Government should be clear about its policy intent and the processes involved in determining emissions reductions over time. It is appropriate for the Australian Government to put boundaries around the scope and pace of economic adjustment over the next 10 to 15 years. The Government will also provide support for those disproportionately affected by the introduction of the Scheme, through such means as the Climate Change Action Fund, the tax and payments system, and other complementary measures.

#### **4.1.1 Current and projected emissions**

An additional important factor in setting the medium-term target range and the trajectory is the projected level of emissions in the absence of any policy action. Australia's greenhouse gas emissions are published each year in the National Greenhouse Gas Inventory (NGGI); and in February 2008, the Department of Climate Change also published *Tracking to the Kyoto target 2007: Australia's greenhouse emissions trends 1990 to 2008–2012 and 2020*.

Projections in *Tracking to the Kyoto target* used a combination of 'top-down' and 'bottom-up' models. For key sectors, such as stationary energy, the projections used a

multiple-model approach, in which the sectoral projection is taken as the average of three independent projections made using different sector models. The overall projection for Australia was produced from the sum of the individual sectoral projections. Figure 4.1 shows an estimate of Australia's future emissions under current policy settings.



Source: Department of Climate Change, *Tracking to the Kyoto target 2007: Australia's greenhouse emissions trends 1990 to 2008–2012 and 2020, 2008*.

Table 4.1 shows Australia's National Greenhouse Gas Inventory for 2005–06 and preliminary estimates of the likely inventory in 2006–07 and 2007–08.

Table 4.2 shows Australia's likely emissions position in 2007–08, based on the estimated national inventory.

**Table 4.1: National Greenhouse Gas Inventory, 2005–06 (actual) to 2007–08 (estimate)**

| National greenhouse gas inventory (megatonnes) | 2005–06 <sup>a</sup> | 2006–07 <sup>b</sup> | 2007–08 <sup>b</sup> |
|--|----------------------|----------------------|----------------------|
| Energy—combustion of fuels                     | 366                  | 372                  | 377                  |
| Energy—fugitive emissions                      | 34                   | 35                   | 36                   |
| Industrial processes                           | 28                   | 30                   | 31                   |
| Waste  | 17                   | 17                   | 17                   |
| Agriculture                                    | 90                   | 86                   | 88                   |
| National inventory total <sup>c</sup>          | 536                  | 540                  | 550                  |

(a) Department of Climate Change, *National Greenhouse Gas Inventory 2006*, Commonwealth of Australia, 2008.

(b) Preliminary estimates.

(c) National Inventory excluding land use, land use change and forestry. Net emissions from the land use, land use change and forestry sector were estimated to be 40 Mt in 2006.

**Table 4.2: Likely net emissions position, 2007–08**

| Item (megatonnes)  |                 | 2007–08 <sup>a</sup> |
|--|-----------------|----------------------|
| National inventory total <sup>b</sup>                                    | (1)             | 550                  |
| National assigned amount under the Kyoto Protocol:                       |                 |                      |
| Assigned amount per year <sup>c</sup>                                    | (2)             | 592                  |
| Projected adjustments to assigned amount:                                |                 |                      |
| Article 3.3: Deforestation, afforestation and reforestation <sup>d</sup> |                 | -23                  |
| Articles 6, 12,17: Flexibility mechanisms                                |                 | n/a                  |
| Total projected adjustments  | (3)             | -23                  |
| Net assigned amount  | (4) = (2) + (3) | 569                  |
| Net balance  | = (4) – (1)     | +19                  |

(a) Preliminary estimates.

(b) National Inventory excluding land use, land use change and forestry. Net emissions from the land use, land use change and forestry sector were estimated to be 40 Mt in 2006.

(c) Australia's Initial Report under the Kyoto Protocol, revised submission 2008.

(d) As projected for the average of each year in the first commitment period in 'Tracking to Kyoto 2008'—this projection is subject to significant uncertainty.

Since 1995 emissions have been increasing at a trend rate of around 1 per cent a year<sup>1</sup>, although there is significant annual variability — emissions can vary by up to 5 per cent each year.<sup>2</sup> Many factors drive this variability, including changes in economic activity, population and commodity prices; the characteristics of coal, oil and gas being extracted; and natural climate variability. For example, emissions change during drought mainly because there are fewer cattle and sheep, but also because there is less water available for hydro-electricity generators, which increases emissions from fossil-fuelled stationary energy generation. On the other hand, if water shortages result in less water available for cooling in some coal-fired power plants, this can lower emissions. Variation in emissions from land-use change is also affected by the area of land cleared each year and the prevailing weather conditions (for example, whether it was a drought year or a wet year).

Having ratified the Kyoto Protocol, Australia is committed to restraining its national emissions to an average of 108 per cent of 1990 levels across the first commitment period (2008 to 2012). In the event of a post-2012 international agreement, the specification of Australia's 2020 target range and the trajectory must take into account, both likely emissions variability and our international obligations, including any association with a post 2020 international agreement.

The medium-term target range will be achieved through a variety of measures, but primarily by the Carbon Pollution Reduction Scheme, which will set caps on emissions from covered sources in the economy. Scheme caps will be set in line with the trajectory, but there will always be a gap between the trajectory and the Scheme caps. Not all sources of emissions will be covered by the Scheme in its early years, and not all entities in covered emissions sources will emit more than the threshold amount for participation, so national emissions will generally be larger than the Scheme cap in any given year.

### 4.1.2 Parameters used in describing the trajectory and target range

Both the trajectory and the target range can be described using three related parameters:

- *Tonnes of carbon dioxide equivalent (t CO<sub>2</sub>-e)*. This is the internationally accepted measure for greenhouse gas emissions. It describes, for a given mixture and amount of greenhouse gases, the amount of CO<sub>2</sub> that would have the same global warming potential when measured over a specified timescale (generally 100 years). Box 4.2 has a full explanation of which greenhouse gases are covered.
- *As a percentage relative to a previous year*. Australia's Kyoto target, for example, is expressed as 108 per cent of 1990 levels, while the Government's long-term target is expressed as a 60 per cent reduction below 2000 levels. Because Australia's emissions in 1990 were almost the same as in 2000 (547.7 million tonnes<sup>3</sup> and 552.8 million tonnes<sup>4</sup> respectively), percentage reductions below 1990 and 2000 levels for Australian emissions are reasonably similar.
- *As a per capita percentage relative to a previous year*. This can sometimes provide a more meaningful comparison of emissions reductions relative to other countries, because it incorporates not only the absolute economy-wide change in emissions over a timeframe, but also the change in population. Per capita reduction targets below 1990 and 2000 levels are quite different, despite similar absolute levels of emissions in those two years, because of different populations in those years. Australia's per capita emissions were 32.1 tonnes per person in 1990 and 28.9 tonnes per person in 2000.<sup>5</sup>

Goals for greenhouse gas emissions reductions are sometimes described in terms of a desired global outcome; for example, 'stabilising emissions at 500 ppm CO<sub>2</sub>-e', 'limiting global temperature rise to 2 degrees Celsius' or 'avoiding dangerous climate change'. Such goals are only meaningful at a global level. The global atmospheric concentration of greenhouse gases and resulting temperatures will only be stabilised by global efforts to reduce emissions, which are the sum of national efforts. In practice, there is no direct link between one country's emissions reduction target in 2020 and global stabilisation at a certain long-run concentration, because stabilisation results from the aggregate of all countries' efforts over time.

#### **Box 4.2: Emissions covered by the Kyoto Protocol**

The Kyoto Protocol sets targets for reductions in national emissions of greenhouse gases. Australia's national emissions are a net amount: the amount of domestic emissions less any offsets purchased or sold outside our borders consistent with the Kyoto Protocol rules. Both the indicative national trajectory and the 2020 or medium-term target are expressed in terms of national emissions.

The greenhouse gases covered by the Kyoto Protocol are carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, hydrofluorocarbons, and perfluorocarbons. For accounting purposes, all six gases are measured in tonnes of carbon dioxide equivalent (t CO<sub>2</sub>-e). The sectors for which emissions are reported are energy, industrial processes, agriculture, waste, land-use change and forestry.

The first commitment period of the Kyoto Protocol is 2008 to 2012. For Australia's emissions monitoring purposes, this is taken as the financial years 2007-08 to 2011-12.

## 4.2 Determining the medium-term target range

The limit placed on national emissions will be a key part of Australia's response to climate change. The size of this limit and the timeframe over which it is applied, along with the level and nature of global action to reduce emissions, will have an important influence on the economic cost of climate change mitigation. The medium-term target range is a milestone on the way to the Government's stated long-term target of a 60 per cent reduction in greenhouse gas emissions by 2050.

The medium-term target range has a dual role: to create domestic momentum towards the long-term target, and to assist Australia in negotiating a global agreement by signalling the efforts that Australia is prepared to make in reducing emissions. The medium-term target range must balance the cost to the Australian economy with the benefits of contributing to global momentum in responding to the risks of climate change.

### Green Paper position

At the end of 2008, in the context of the White Paper, the Government would announce a medium-term national target range for 2020 that provides upper and lower bounds to give investors and market participants information on directions and retains sufficient flexibility for the Government.

### 4.2.1 Modelling the cost of mitigation

To inform the choice of a 2020 target range, the Government considered economic modelling of various possible scenarios. The Australian Treasury modelled four scenarios, both for the Government (referred to as the 'CPRS scenarios') and for the Garnaut Climate Change Review (referred to as the Garnaut scenarios). Results of the scenario modelled by Treasury were published as ALPF. The Garnaut Climate Change Review also carried out separate modelling exercises of two additional scenarios, which were also published in the Garnaut Final Report.

Both the Garnaut Final Report and *Australia's Low Pollution Future* presented results from a combination of three top-down, computable general equilibrium (CGE) models: the Global Trade and Environment Model (GTEM), the G-Cubed model, and the Monash Multi Regional Forecasting (MMRF) model. GTEM and G-Cubed are models of the global economy, whereas MMRF is a model of the Australian economy with state and territory level detail. The CGE models were complemented by a series of bottom-up sector-specific models for electricity generation, transport, land use change and forestry.<sup>6</sup> The analysis covered four key dimensions<sup>7</sup>:

- *Global*: rates and patterns of economic growth, technology development and emissions
- *National*: overall performance of the macro-economy and patterns of growth across industries, sectors, states and territories
- *Sectoral*: likely technological development and timing and scale of opportunities to reduce energy use and emissions
- *Household*: impacts on income, consumption and prices.

The Garnaut Climate Change Review worked closely with the Treasury to define the reference case (that is, ‘business as usual’ with no new policies to reduce emissions and assuming no impacts from climate change).<sup>8</sup> In the scenarios developed by the review, GTEM outcomes were used as an input into the MMRF model, which was augmented by bottom-up sectoral models. GTEM was extended using GIAM (Global Integrated Assessment Model) to model the interaction between the climate system and the economy in estimating global mitigation and climate change damages.

Results from the Treasury modelling present a range of measures when reporting high level results. The report focuses on gross national product (GNP) as the measure of economic welfare. GNP includes international trade and capital flows and, in a world with internationally linked emissions trading, captures the impact of importing and exporting emissions units.

### **Different assumptions, different results**

Care is needed when comparing modelling outcomes from different exercises. The extent to which modelling results can be compared depends on how similar the models’ methodologies and underlying assumptions are. It is also important to emphasise that, while economic analysis of emissions scenarios published during 2008 contains information about the likely increase in emissions, it is not an emissions projection tool.

It is also important to bear in mind the different purposes and emphases of different scenarios. The modelling results for the scenarios presented in the Garnaut Final Report and by the Treasury in *Australia’s Low Pollution Future* use consistent models but contain varying policy assumptions. The major differences in assumptions include the following:

- *Modelled avoided costs of climate change.* The Garnaut Final Report identified four types of climate change induced costs<sup>9</sup>:
  - Type 1: economic costs of ‘most likely’ climate impacts that are able to be quantified
  - Type 2: economic costs that cannot be estimated with confidence
  - Type 3: cost of the risks that climate impacts are more severe than median projections
  - Type 4: costs that are felt outside markets, such as loss of environmental systems and amenity, and international humanitarian impacts that do not affect Australian markets.

The Garnaut Review incorporated types 1 and 2 into its analysis. The review also included in its analysis the benefits to the economy of avoiding some of these costs.<sup>10</sup>

The Treasury work did not include the impacts of climate change or the benefits of mitigation.<sup>11</sup>

- *Modelled costs of emissions reductions.* The Garnaut Final Report and the Treasury both modelled the costs of emission reductions in the same way.<sup>12</sup>
- *Coverage.* The Garnaut Final Report scenarios assume that all sectors of the economy are covered by the mitigation policy from 2013<sup>13</sup>, whereas the CPRS scenarios assume

coverage based on the Green Paper (for example, the CPRS scenarios assume that the agriculture sector is excluded until 2015).<sup>14</sup>

- *International action*
  - The CPRS scenarios employ a multi-stage approach to international emissions trading.<sup>15</sup> Countries are divided into different groups and assumed to take on targets that gradually diverge from their emissions under the referent ('no action' scenario. From 2010, countries listed in Annex B to the Kyoto Protocol take equivalent mitigation effort to Australia from 2010. China and higher income developing countries take on targets from 2015. India and middle income developing countries take on targets from 2020. Lower income countries take on targets from 2025. International trade in permits is unconstrained from 2020 onwards.
  - Emissions allocations within each group, including advanced countries, are a uniform reduction from each country's reference case emissions. This results in total emissions allocations for each group of nations being between 50 per cent and 80 per cent below reference scenario levels by 2050. This allows emissions allocations for developing countries to continue to grow relative to current levels (albeit more slowly than in the reference scenario), before peaking and then declining in absolute terms. For example, China's allocation peaks around 2030, and India's allocation peaks around 2040, both at levels significantly above current emissions.
  - In contrast, the Garnaut Final Report scenarios assume that Australia will take on its proportionate share of global mitigation on a per capita basis.<sup>16</sup> The model allows for a transition period to enable the current unequal distribution of emissions across countries to 'contract and converge' to equal per capita entitlements in 2050. Global mitigation efforts commence in 2013 with unlimited trading in permits between countries. This represents a stylised optimal post-2012 framework.
- *Emissions-intensive trade-exposed industries.* The CPRS scenarios shield emissions-intensive trade-exposed sectors until 2020<sup>17</sup>, after which assistance is phased out, consistent with the preferred position expressed in the Green Paper. The Garnaut Review scenarios do not include any shielding of those sectors, as concerted world action to reduce emissions results in an emissions price emerging in all countries at the same time.
- *Fuel excise.* The CPRS scenarios offset the impact of an emissions price on transport fuels through fuel excise changes.<sup>18</sup> In contrast, the Garnaut Final Report scenarios assume that the emissions price impact on transport is passed through to consumers.
- *Renewable Energy Target.* The CPRS scenarios include the Renewable Energy Target so that 20 per cent of Australia's electricity comes from renewable sources by 2020.<sup>19</sup> The Garnaut Final Report scenarios assume that Australia does not have a Renewable Energy Target once emissions trading commences.<sup>20</sup>
- *Long-term emissions reduction target.* An emissions reduction scenario needs to specify both a start point and an end point in order to describe the shape of the path between the two points. The CPRS scenarios are consistent with the Government's stated 2050 target of a 60 per cent reduction below 2000 levels.<sup>21</sup> The Garnaut Final Report scenarios involve Australian emissions reductions to 80 per cent and 90 per cent below 2000 levels by

2050.<sup>22</sup> It is important to note that these 2050 targets are assumptions; they are not results of projections by the models.

### **Emissions reduction scenarios used for analysis**

The consequences of different national trajectories and international arrangements were explored through six stylised scenarios.

In the *Garnaut Waiting Game* scenario<sup>23</sup>, emissions trading is implemented in 2010 without any clarity about the long-term coverage or ambitions of the likely international agreement to reduce greenhouse gas emissions. This scenario does not include a 2020 target, and the carbon price is fixed. (The use of fixed carbon prices in an emissions trading scheme is discussed further in Chapter 15.) The aim would be to ‘keep hopes alive of an international agreement at reasonable cost, until all opportunities had been exhausted’.<sup>24</sup> The Garnaut Final Report suggests that this outcome is unlikely, given commitments by the governments of developed countries.

In the *Garnaut Copenhagen Compromise* scenario<sup>25</sup>, emissions trading commences with a partial (rather than a comprehensive) international agreement to reduce greenhouse gas emissions, and the carbon price is fixed between 2010 and 2013. Under this scenario, the Garnaut Final Report suggests that Australia would reduce greenhouse gas emissions by 5 per cent below 2000 levels by 2020. Like the Waiting Game scenario, the Copenhagen Compromise is assumed to be a transitional scenario that will be superseded by a more ambitious global agreement.

In the *Garnaut 550 ppm* scenario<sup>26</sup>, emissions trading begins with a comprehensive global emissions reduction agreement in place, centred on the long-term stabilisation of global atmospheric greenhouse gases at 550 ppm CO<sub>2</sub>-e. All countries take on obligations from 2013, with the per capita emissions allowances of fast-growing developing countries rising until they meet the per capita levels of the European Union and Japan, and then converging on equal global allocations by 2050. The Garnaut Final Report suggests that, under this scenario, Australia would reduce greenhouse gas emissions by 10 per cent below 2000 levels by 2020.

The *Garnaut 450 ppm* scenario<sup>27</sup> is similar to the Garnaut 550 ppm scenario, but the assumed global agreement is centred on long-term stabilisation at 450 ppm CO<sub>2</sub>-e. The Garnaut Final Report suggests that, under this scenario, Australia would reduce greenhouse gas emissions by 25 per cent below 2000 levels by 2020. Mitigation costs associated with the Garnaut 550 ppm and Garnaut 450 ppm scenarios were modelled by the Treasury, and the results were also published in *Australia’s low pollution future*.

*Australia’s low pollution future* presented a further two scenarios: the *CPRS – 5* scenario<sup>28</sup> and the *CPRS – 15* scenario.<sup>29</sup> These include the impact of the Scheme as presented in the Green Paper, and achieve reductions by 2020 of 5 per cent and 15 per cent, respectively, below 2000 levels. Both assume a staged approach to international action, with developing countries joining the system over the period from 2015 to 2025 as described above.

*Australia’s low pollution future* locates CPRS -5 in a global scenario that would stabilise global atmospheric greenhouse gases at around 550 ppm CO<sub>2</sub>-e by the end of the century; and CPRS -15 in a global scenario with stabilisation at around 510 ppm CO<sub>2</sub>-e.

## Key results from economic modelling

*Australia's low pollution future* found that all the emissions reduction scenarios modelled involved only slightly slower economic growth than the reference case.<sup>30</sup> Consistent with other Australian and international modelling, annual GNP (gross national product) and GDP (gross domestic product) growth is around 0.1 per cent lower over the period to 2050 than it would be without policy action. This results in per capita GNP (measured in 2005 dollars) rising from \$50,400 in 2008 to between \$54,700 and \$55,200 in 2020 across the four scenarios, rather than \$55,900 in 2020 in the reference case. GNP is 1.3 per cent to 1.7 per cent below the reference case in 2020 in the CPRS scenarios, and up to 2.0 per cent below the reference case in the Garnaut Final Report scenarios.

These impacts are equivalent to about four months of economic growth, implying that the level of economic activity achieved in January 2020 in the reference case would be achieved in April 2020 in the CPRS scenarios.

Table 4.3 summarises results from *Australia's low pollution future* and the Garnaut Final Report.

**Table 4.3: Summary of results of modelled scenarios**

|   | Reference case <sup>b</sup>               | Garnaut Waiting Game <sup>a</sup> | Garnaut Copenhagen Compromise <sup>a</sup> | Garnaut 550 ppm <sup>b</sup> | Garnaut 450 ppm <sup>b</sup> | CPRS – 5 <sup>b</sup> | CPRS – 15 <sup>b</sup> |
|---|---|-----------------------------------|--|------------------------------|------------------------------|-----------------------|------------------------|
| 2020 target (per cent below 2000 levels)  | No target (40 per cent above 2000 levels) | No target                         | –5   | –10                          | –25                          | –5                    | –15                    |
| 2020 target in per capita terms (per cent below 2000 levels)                              | No target (8 per cent above 2000 levels)  | No target                         | –25  | –31                          | –44                          | –27                   | –34                    |
| 2020 GNP per capita (2005 dollars)  | \$55,900                                  | Not reported                      | Not reported                               | \$55,000                     | \$54,700                     | \$55,200              | \$54,900               |
| GNP per capita increase 2010–2020 (per cent)  | +9.6                                      | Not reported                      | Not reported                               | +8.7                         | +8.3                         | +7.8                  | +7.3                   |
| 2020 GNP per capita, percentage from reference  | Not applicable                            | –0.9                              | –1.4                                       | –1.5                         | –2.0                         | –1.3                  | –1.7                   |
| 2020 carbon price (in 2005 dollars)   | Not applicable                            | \$29.60                           | \$52.60                                    | \$35                         | \$60                         | \$35                  | \$50                   |
| Assumed 2050 target (per cent below 2000 levels)  | Not applicable                            | No target                         | 60   | 80                           | 90                           | 60                    | 60                     |
| Potential long-term global CO <sub>2</sub> e stabilisation level (ppm CO <sub>2</sub> -e) | No stabilisation                          | Not reported                      | Not reported                               | 550                          | 450                          | 550                   | 510                    |

(a) *The Garnaut Climate Change Review: Final report*, 2008.

(b) *Australia's low pollution future*, 2008.

(c) *1565ppm in 2100 and rising*.

This analysis highlights that impacts on the Australian economy result from a combination of national and international factors, including Australia's emissions trajectory and policy arrangements, the level of global emissions reductions, and the scope and efficiency of global carbon trading arrangements.

The major finding of the Garnaut Final Report was that the long-term economic costs of inaction are greater than the costs of action.<sup>31</sup> That judgment was based on a detailed assessment of the costs to Australia of participating in global emissions reductions compared

to the benefits of that global action, including a range of benefits that were not able to be modelled. Importantly, however, the value of economic activity at the end of the century is higher with emissions reductions than without.

The modelling presented in *Australia's low pollution future* did not assess the benefits of reducing emissions. That report's major conclusions included the following:<sup>32</sup>

- the economic cost of reducing Australia's emissions will be small, although costs to sectors and regions will vary
- even ambitious emissions reduction goals will have limited impacts on global and national economic growth if they are achieved using broad-based, market-oriented policies
- early global action is less expensive than later action, and there are advantages for Australia in acting early if emissions pricing expands gradually across the world. Economies that defer action will face higher long-term costs as global investment is redirected to early movers
- a market-based approach allows robust economic growth into the future even as emissions fall, and many of Australia's industries will maintain or improve their competitiveness under an international agreement to combat climate change.

The Treasury's analysis suggests that participating in more ambitious global action would involve higher total costs but the differences across scenarios are relatively small, the total economic costs of achieving different targets are quite similar. Coupled with the findings of the Garnaut Final Report, this suggests that international willingness to reduce emissions will be a key factor in deciding the most appropriate emissions trajectory and medium-term target range for Australia.

#### **4.2.2 Minimising costs to the Australian economy**

A significant percentage of Australia's greenhouse gas emissions have their source in long-lived assets such as power stations, building energy use and vehicles. Reducing emissions across the economy will affect both the use of existing assets and decisions to invest in new ones. The pace of emissions reductions will affect the utility that the economy derives from existing assets. If emissions are reduced very quickly, there is a risk that the assets will be stranded, imposing an additional cost on the economy. Conversely, not reducing emissions quickly enough imposes a cost on other sectors. For new assets, investors need reasonable certainty about their liability for greenhouse gas emissions before they decide on investments. While investments will not be made without sufficient certainty, the provision of 'false certainty' risks stranding assets in later years.

The modelled economic impacts in Section 4.2.1 assume that the financial risk of carbon price uncertainty is efficiently allocated; that is, appropriate levels of risk are accepted by those who are best equipped to manage them. At the present time, carbon price uncertainty is significant, partly because there is little experience in the economy in pricing carbon, and partly because of uncertainty about the international pace and scale of emissions reductions in the next international commitment period.

Business' exposure to carbon price uncertainty will diminish over time, as businesses participate in emissions trading and 'learn by doing'. Businesses for which carbon and energy

prices are significant will draw on information from a wide range of sources in Australia and overseas to make their own judgments about the evolution of key climate policy settings, and will position themselves accordingly. Providing a clear signal of the Government's policy intent through the medium-term target range and the trajectory allows businesses to form judgments about medium- and long-term carbon prices and facilitates appropriate risk management. In addition, many Scheme design features, such as the price cap (Chapter 8), banking and borrowing of permits (Chapter 8) and international linking (Chapter 11), will help to minimise carbon price uncertainty at the start of the Scheme.

### **4.2.3 International signals**

Climate change is a global problem that requires a global response. Although international support for action on climate change has strengthened dramatically over the past decade, the size, distribution and coverage of emissions reductions under the next international agreement are highly uncertain. Australian businesses have already endured a long period of uncertainty about future carbon prices, delaying investment.

Australia is actively engaged in negotiations for an international agreement to reduce global carbon emissions, to take effect after the first commitment period under the Kyoto Protocol expires in 2012. The national emissions target will form an important part of those negotiations. National emissions targets signal two things: the broad level of global action that a nation considers desirable and achievable; and what that nation considers would be a reasonable contribution to the global effort.

Australia is committed to playing its full and fair part. Some have suggested that Australia should 'free ride' by asking more of other countries than we are prepared to do as part of a global response. That would be widely interpreted as a sign that we do not consider that cutting emissions would provide net benefits to all countries, and that we do not support ambitious global emissions reduction. Australia cannot afford to send such a signal.

A key finding of the Garnaut Final Report was that a fair and effective global agreement delivering deep cuts in emissions consistent with stabilising atmospheric concentrations of greenhouse gases at 450 ppm CO<sub>2</sub>-e or below would be in Australia's interests.<sup>33</sup> The logic and findings of the report also strongly suggest that global action towards this goal would also provide substantial global benefits. However, the report also found it unlikely that global commitment to an agreement centred on the 450 ppm goal would be achieved in the current round of negotiations, and that the most prospective pathway to the goal is to embark on global action that reduces the risks of dangerous climate change and builds confidence that deep cuts in emissions are compatible with continuing economic growth and improved living standards.<sup>34</sup>

The Government has no illusions about the size and complexity of the climate change challenges we face as a nation. Australia's highly variable climate and recent years of drought have made it easier for us to understand the costs of climate change, which are expected to be more severe for us than for most other developed nations. We are also beginning to understand that deep reductions in emissions are consistent with rising living standards and strong economic growth. But that understanding is not yet widespread among other nations, many of which are not yet ready to commit to the level of action required to achieve global stabilisation of atmospheric greenhouse gases at 450 ppm CO<sub>2</sub>-e or lower.

We should not delay Australian action while we wait for a perfect international outcome. Waiting for a firm international agreement before announcing a medium-term target would risk making economic adjustment to future emissions targets and carbon prices more difficult. Treasury modelling indicates that economies that act earlier face lower long-term costs<sup>35</sup> — around 15 per cent lower than with uniform international action. Australia can and should help to build the momentum required for a comprehensive global agreement by demonstrating, through the successful operation of the Scheme and other measures, that it is possible to integrate a carbon price into the economy and reduce emissions with only modest economic impacts. Importantly, the Kyoto Protocol acknowledges that, while all countries have a duty to reduce emissions, the distribution of effort should take account of national circumstances.

Some have argued that, because Australia's emissions are only a small part of the global total, we have little influence on the outcomes of any international agreement to stabilise global emissions. That position misunderstands the dynamics of global action. Australia is one of the top 15 nations in total national emissions, and among the top three in emissions per person (see Table 1.1 in Chapter 1). Together, these 15 nations produce 80 per cent of global emissions. This group, which includes many of the major developed and developing nations, will be centrally involved in deciding the shape and pace of global action. The international community has agreed that developed countries will act first to reduce emissions. This means that all developed countries have the capacity to block or slow progress towards global agreement, but also that developed countries will be able to catalyse greater global action. Showing that action to reduce emissions is consistent with rising living standards will be an important part of achieving an agreement by less developed countries to restrain their emissions in the future.

#### **Policy position 4.1**

The Government accepts the key findings of the Garnaut Final Report that:

- a fair and effective global agreement delivering deep cuts in emissions consistent with stabilising concentrations of greenhouse gases at around 450 parts per million or lower would be in Australia's interests
- achieving global commitment to emissions reductions of this order appears unlikely in the next commitment period
- the most prospective pathway to this goal is to embark on global action that reduces the risks of dangerous climate change and builds confidence that deep cuts in emissions are compatible with continuing economic growth and improved living standards.

#### **4.2.4 The medium-term target range**

The purpose of the 2020 target range and indicative trajectory is to provide guidance to businesses and households about future emissions reductions, as one of a number of factors influencing planning and investment decisions that are sensitive to future energy and carbon costs. In particular, the medium-term target range and trajectory will translate into the number of permits likely to be issued for the Scheme up to 2020.

Announcing and adhering to a single number for Australia's 2020 target would lock in the extent of our contribution before key aspects of an agreement are settled, including its overall ambition and the nature of other countries' commitments. To do so would also transfer financial risk from emitters and energy users to the Government and taxpayers. This would be economically inefficient, weakening the incentive for decision makers to seek out low-carbon strategies for their businesses and to consider a range of carbon price uncertainties and opportunities as part of their everyday decision-making. The alternative of announcing a defined range will encourage businesses to take different positions in the market, promoting efficient allocation of resources and smoother adjustment over time.

The Garnaut Final Report suggested that different targets could form the basis for emissions reductions pathways linked to international action.<sup>36</sup> Under that approach, Australia could proceed along one pathway towards a less ambitious target until the criteria for a second pathway to a more ambitious target were met, at which time Australia could switch pathways. A potential difficulty with that approach is that uncertainty about the scope and parameters of future international agreements makes it difficult to pre-specify precise pathways and mechanistic switching rules. The international situation is likely to contain ambiguities, which would result in a track-switching decision involving significant judgment and discretion, risking apparently arbitrary outcomes for those affected. Furthermore, as the pathways diverge, a switch may cause a large shock to the economy, even with a period of notice. As such, this approach provides adequate levels of certainty to those considering investment decisions.

Expressing the 2020 target as a defined range allows for the significant uncertainties about international arrangements beyond the first Kyoto commitment period, giving the Government flexibility to respond to changing circumstances and science while limiting the range of potential outcomes for business. The higher boundary of the range would represent Australia's minimum commitment to emissions reductions, even in the absence of international agreement for the period beyond 2012. The lower boundary would represent the extent to which Australia will accept tighter targets in the context of a comprehensive global agreement under which all major economies commit to substantially restrain emissions to achieve an ambitious stabilisation goal, and advanced economies take on reductions comparable to Australia's. However, the boundaries do not represent the distinct tracks (suggested by the Garnaut Review).

Adopting a target range of from 5 per cent to 15 per cent below 2000 levels would be consistent with modelling results from both the Garnaut Final Report and *Australia's low pollution future*, showing that the expected economic costs of reductions within that range are likely to be modest in aggregate. This range is also consistent with the view that near-term global action is likely to be less ambitious than Australia's desired long-term outcome.

The target is consistent with a wide range of global atmospheric stabilisation goals depending on the distribution of international efforts. The purpose of the range is to signal Australia's willingness to work towards a worthwhile global agreement that allows for more ambitious action over time as confidence increases and nations accept that deep cuts in emissions are consistent with strong continuing economic growth.

The Government considers that Australia's trajectory strategy, including the 2020 target range, is a credible and constructive contribution to achieving a long-term global solution capable of protecting the planet and promoting our national interest, which includes

supporting Australia's transition to a prosperous low-carbon future. In particular, it compares well to targets proposed by other countries. The 2020 target range will position Australia well to take on further emissions reductions that are likely to be needed beyond that time.

The duration of the commitment period of the next international agreement is not yet known, nor is the overall ambition of the goal for that period. The Government accepts that Australia has much to gain from a global agreement centred on stabilising emissions at 450ppm or lower levels, and will continue to advocate that such an agreement is desirable, while recognising the immediate priority is to ensure action commences so as to build confidence that deep cuts in emissions are compatible with continuing economic growth and improved living standards.

#### **Policy position 4.2**

The target range for emissions reductions to be achieved by 2020 will be from 5 per cent to 15 per cent below 2000 levels.

The range represents:

- a minimum (unconditional) commitment to reduce emissions to 5 per cent below 2000 levels by 2020 (projected to be a 27 per cent reduction in per capita terms)
- a commitment to reduce emissions by up to 15 per cent below 2000 levels by 2020 (projected to be a 34 per cent reduction in per capita terms) in the context of global agreement under which all major economies commit to substantially restrain emissions and advanced economies take on reductions comparable to Australia.

The Government recognises that ambitious global action is in Australia's national interest.

In the event that a comprehensive global agreement were to emerge over time, involving emissions commitments by both developed and developing countries that are consistent with long-term stabilisation of atmospheric concentrations of greenhouse gases at 450 ppm CO<sub>2</sub>-e or lower, Australia is prepared to establish its post-2020 targets so as to ensure it plays its full role in achieving the agreed goal.

### **4.3 The path to the medium-term target range**

The 2020 target range provides guidance on medium-term policy settings to reduce emissions. However, the pathway taken to reach the 2020 target range will be one of the principal determinants of the size of economic impacts of emissions reductions, particularly those resulting from the Scheme. To assist in setting the economy onto a smooth path and to ensure that the transition to a low-carbon economy takes place at the lowest possible cost, the Government will provide additional guidance by announcing a national emissions trajectory that begins the pathway towards the 2020 target range. After the Scheme commences, the national emissions trajectory will also be used to set caps on emissions for those sectors participating in the Scheme.

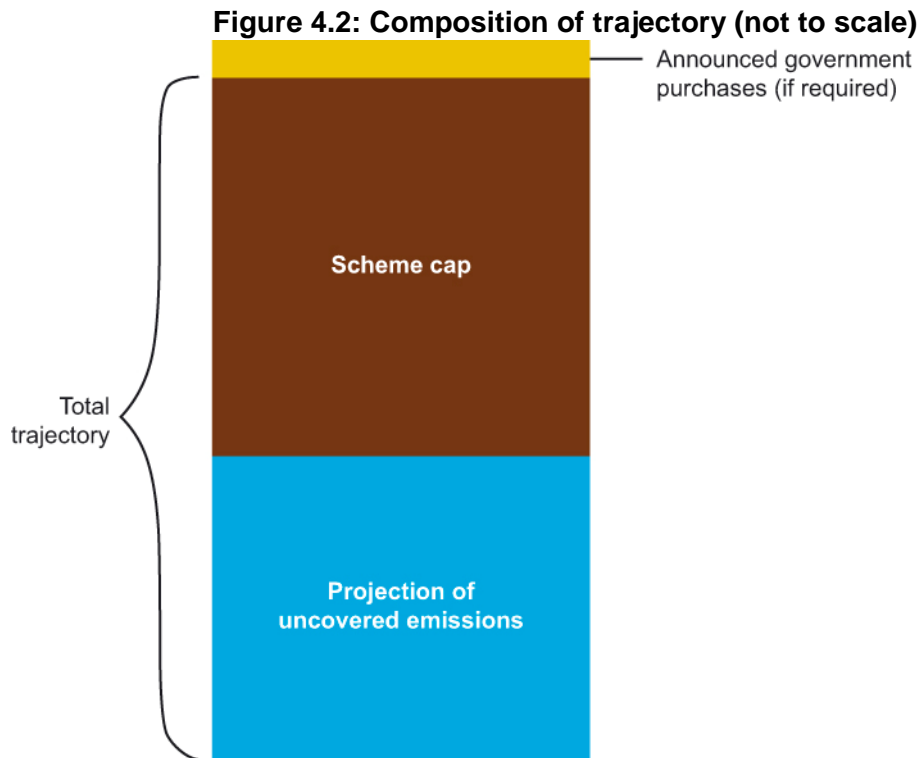
### Green Paper position

The Government would announce an indicative national emissions trajectory to provide broad guidance on the pathway towards the medium-term target range.

The Government would announce a minimum of five years of the indicative national emissions trajectory, to be extended by one year, every year, as required to maintain a minimum of five years guidance at all times after the commencement of the scheme.

At the end of 2008, in the context of the White Paper, the Government would announce the indicative national emissions trajectory for the period from 2010–11 to 2012–13, and in 2010 the Government would announce a further two years of the trajectory up to and including 2014–15, or to the end of any international commitment period, whichever is longer.

Figure 4.2 shows how the trajectory can be broken down in any one year.



The trajectory is not a projection of Australia’s expected annual emissions in the period it covers. It is a statement of the Australian Government’s policy intent for the period, and informs the mix of policy instruments used to deliver that goal. Through the Department of Climate Change, the Government will continue to monitor and analyse emissions and publish emissions projections, such as the *Tracking to the Kyoto target* report. Future trajectories will take account of those projections, especially in relation to uncovered emissions (which are less directly affected by a carbon price than emissions covered by the Scheme), but the trajectory is distinct both from projections of expected future emissions and from measures of actual past emissions, and is not intended to replace them.

### 4.3.1 Indicative trajectory or fixed annual targets?

To provide short- to medium-term policy certainty for business, the Government has undertaken to fix the Scheme caps for at least five years in advance (see Chapter 10). This will involve announcing the specific number of permits that are available for allocation or auction for each year.

The trajectory could be defined as a ‘firm trajectory’ with a specific quantity of emissions for each year, or as a multi-year budget with indicative amounts allocated to each year. A firm trajectory would involve setting a target for each year between the Scheme start and 2020, while a multi-year approach would involve defining a total quantity of allowable emissions over a number of years, and making an indicative (but not firm) allocation to each year within the period.

A firm trajectory would provide a simpler correspondence between the trajectory and the Scheme caps for a particular year, but could also result in fluctuations in emissions (for example, from drought or fire) being transmitted to the Scheme caps through the projections. It might also lead to an expectation that Australia’s international commitments would be reconciled against actual emissions on an annual basis, rather than over commitment periods as a whole (such as the five-year first commitment period for the Kyoto Protocol). This would involve unnecessary compliance activity, risk unnecessary year-on-year variation, and expose the Government to a range of uncertainties without improving the integrity or efficiency of overall policy settings. A firm trajectory with a target for each year would be incompatible with a 2020 target that is defined as a range rather than as a single number (as discussed in Section 4.2.4, it is desirable to set the 2020 target as a range).

An indicative trajectory is able to incorporate banking and borrowing of carbon pollution permits. It would represent Australia’s national ‘emissions allowance’, before any purchase or sale of other eligible compliance units, and before banking or borrowing of permits between years. Actual emissions could be higher or lower than the trajectory without compromising the overall aim of reducing emissions. In aggregate, the national trajectory would be expected to equal the total emissions Australia is allowed to emit in the corresponding commitment period under current and future international commitments.

Interpreting the trajectory as a multi-year, indicative commitment is likely to provide greater certainty to business, with firm annual Scheme caps being fixed at least five years in advance on the basis of the indicative trajectory amounts for those years. This will provide clear guidance, while allowing the Government to insulate Scheme caps from year-on-year fluctuations in projected uncovered emissions. The Government would remain accountable for ensuring that actual national emissions are consistent with Australia’s international commitments, including through the purchase of eligible international compliance units (for example, internationally assigned amount units, not carbon pollution permits) if emissions are above our assigned amount under an international agreement, or through the sale or banking of units if our emissions are below our assigned amount. This will ensure that actual emissions can be reconciled against the emissions trajectory for each successive multi-year commitment period.

### **Policy position 4.3**

The national emissions trajectory will be an indicative trajectory.

The national emissions trajectory represents the national emissions reduction commitment over the period covered by the trajectory as a whole. It is not a projection of expected actual emissions for that period.

#### **4.3.2 Length of the trajectory and timing of announcements**

If Australia's international commitments beyond the first commitment period of the Kyoto Protocol were known, the indicative trajectory could extend to the end of the next commitment period. However, the Government needs to balance the need for business certainty against the need for flexibility to adapt Australia's climate change mitigation efforts to future international targets. Some stakeholders made submissions to the Green Paper calling for the trajectory to be fixed for long periods, even as far away as 2050. However, that would constrain Australia's international negotiating flexibility and the Government's ability to pursue Australia's national interest. It would also transfer significant financial risk to taxpayers, as the Government would need to purchase compliance units internationally to reconcile any differences between actual emissions and international targets.

Because the trajectory is only indicative and the Scheme caps are fixed, the length of the trajectory is not critical; however, maintaining consistency between the indicative trajectory and Scheme caps announcements would be sensible. A five-year indicative trajectory strikes a reasonable balance between predictability and flexibility. To maintain a reasonable level of guidance, the indicative trajectory can be extended by one year, every year, from 2010 onwards, so that the trajectory for the current year and four future years are always known. In contrast to the Scheme caps, and because the trajectory is only indicative, there is no need for the trajectory to be legislated.

Because the nature of commitments beyond the first Kyoto commitment period is not yet known, it would be imprudent to extend the first trajectory much beyond the end of that period. Restricting the first indicative trajectory to the last two years of the Kyoto commitment period and the 2013 'tally up' year (during which Kyoto Protocol parties 'make good' any excess emissions) will ensure that Australia does not limit its international negotiating flexibility.

#### **Policy position 4.4**

The first indicative national emissions trajectory covers the financial years 2010–11 to 2012–13 inclusive.

In 2010, the Government will announce a further two years of the trajectory (financial years 2013–14 and 2014–15).

Thereafter, the Government will announce a further year of the indicative trajectory before 1 July each year, so that the indicative trajectory for the current financial year and at least four future financial years is always known.

Should Australia enter an international agreement beyond the Kyoto commitment period, the Government may announce an indicative trajectory to the end of that period.

The indicative national emissions trajectory will not be included in legislation.

### **4.3.3 Issues in deciding the trajectory**

A common recommendation in submissions to the Green Paper was that the Scheme should have a ‘soft’ or gradual start, beginning with a flatter emissions reduction trajectory that gradually becomes steeper over the life of the Scheme:

KPMG’s recommendation is for the Government to adopt a slow start to the introduction of the [Carbon Pollution Reduction Scheme] to ensure the creation of an effective and efficient market mechanism and allow time for business to adjust. This will put Australia on the pathway to a low emissions future while not overly compromising the economy should international agreements not be rapidly forthcoming. (KPMG, Submission 545, p. 4).

With more gradual emissions reductions at the beginning of the Scheme a convex trajectory will assist with transitioning to an emissions constrained environment. (Investor Group on Climate Change, Submission 697, p. 9).

Commerce Queensland also considers that a gentle start to emissions reductions is imperative, as it will minimise the potential for serious shocks while businesses adapt to the new economic reality of an economy with a carbon price. (Commerce Queensland, Submission 816, p. 4).

A number of design features supporting smooth adjustment (price caps, banking, borrowing and international linking) will be available to complement a ‘soft start’ through the choice of trajectory.

A ‘soft’ start to the Scheme necessarily means that the national trajectory would have a shallower slope at the beginning and become steeper in later years. A shallow trajectory in the first few years of the Scheme would also add to emissions reductions that need to be achieved in later years to achieve the Government’s medium-term and long-term target.

It is desirable that any part of the trajectory falling within the Kyoto commitment period is consistent with restraining Australian emissions to an average of 108 per cent of 1990 levels

across the period from 2008 to 2012, to avoid the need for direct government purchases of eligible international units.

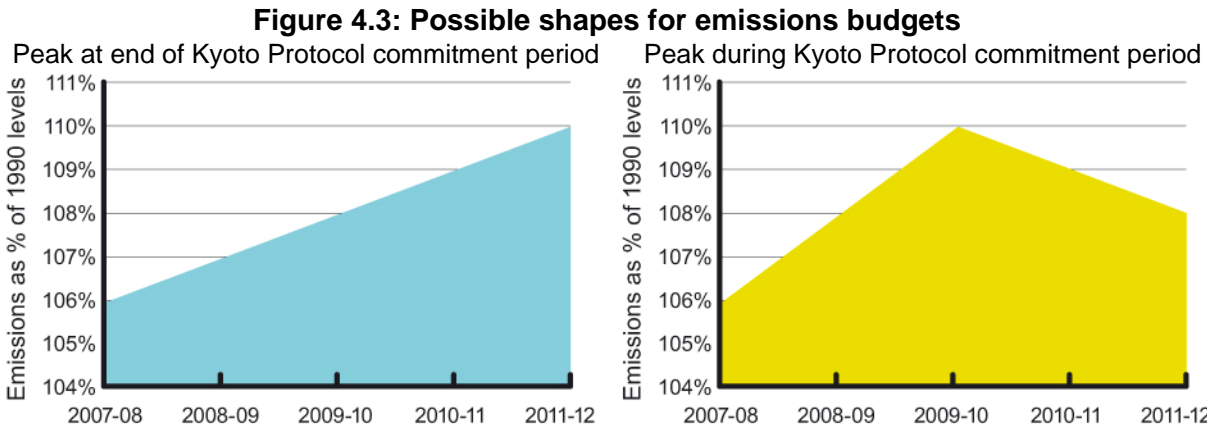
In 2013, the year after the Kyoto commitment period, Australia must ‘tally up’ its Kyoto Protocol accounts and make good on any excess emissions. It is unknown whether future international agreements will be structured in a similar way to the Kyoto Protocol, in that countries restrain their emissions to an average target percentage across a commitment period of a number of years, with a further year thereafter to balance the emissions books.

**4.3.4 The first indicative trajectory**

Current emissions projections (see Figure 4.3) indicate that Australia is likely to meet its Kyoto targets, but that emissions are on an upward path and, in the absence of new policy action, would continue to grow in the future.

The Scheme will be the centrepiece of the Government’s strategy to restrain the growth of emissions and position Australia for a low-carbon future. This will involve reversing the growth of Australia’s emissions, and putting the nation on a path consistent with the 2020 target range and a reduction of 60 per cent below 2000 levels by 2050. Managing this transition well should ensure that the required emissions reductions are achieved without unnecessary cost.

Emissions in Australia over the first Kyoto commitment period can be thought of as an emissions budget, which can be ‘allocated’ across the five years of the commitment period in a variety of ways. We are currently on an emissions trajectory that is trending up, with emissions lowest at the beginning of the commitment period and highest in the last year (see Figure 4.3 left hand panel). An emissions peak in the middle of the commitment period will provide a stronger signal of the Government’s long-term policy intent to reduce emissions by 60 per cent below 2000 levels, and allow for a smoother and more gradual pathway to the 2020 target range. Emissions in the final year of the period will be lower than otherwise, as shown in Figure 4.3 right hand panel.



Note: These figures are illustrative only and should not be interpreted as actual emissions trajectories.

The Government has calculated the first indicative trajectory by taking the likely net emissions position for 2007–08 (based on the figures in Section 4.1.2) and assigning the remaining emissions budget from the first Kyoto commitment period to the four remaining years of that period, on the basis that national emissions will peak with the introduction of the

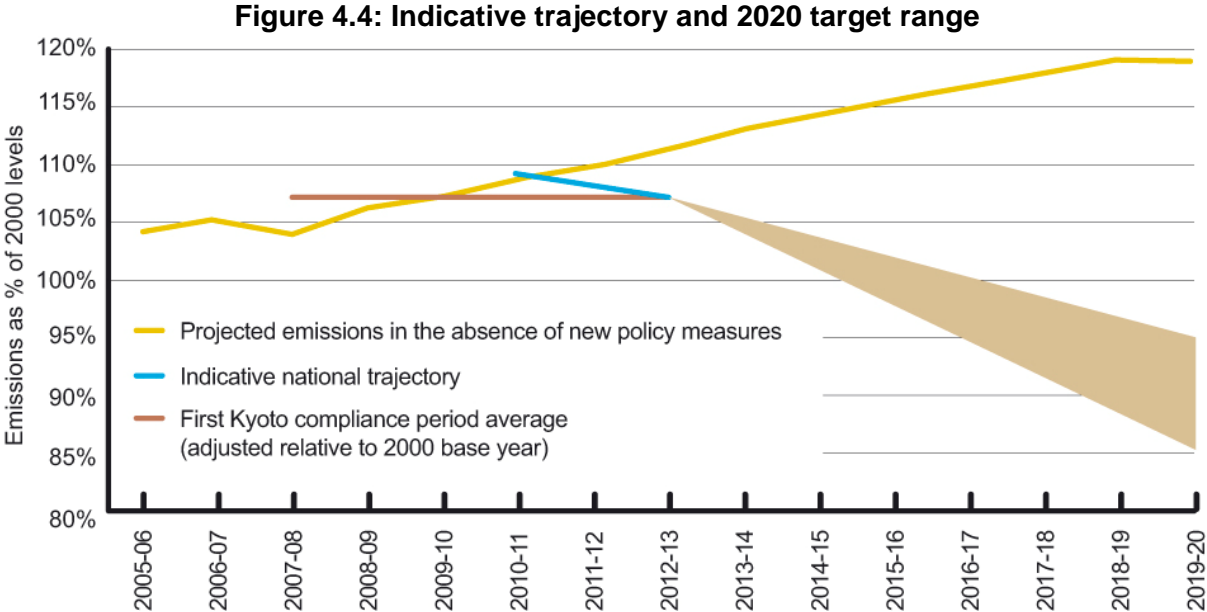
Scheme in 2010–11 and then trend downwards with relatively gentle reductions in the initial years. The level of the peak and gradient of the slope are consistent with Australia’s Kyoto Protocol target of 108 per cent of 1990 emissions on average over the first commitment period. The choice of this trajectory provides additional liquidity at the start of the Scheme to encourage banking of permits. This will help to provide more market depth and assist the management of carbon price uncertainty as the market is being established.

**Policy position 4.5**

The first indicative national emissions trajectory will be:

- in 2010–11, 109 per cent of 2000 levels
- in 2011–12, 108 per cent of 2000 levels
- in 2012–13, 107 per cent of 2000 levels.

Figure 4.4 shows the indicative trajectory and the 2020 target range compared to the emissions projections published in *Tracking to the Kyoto target*.



Sources:  
 2005–06 data published in the National Greenhouse Gas inventory, relative to a 2000 base year.  
 2006–07 and 2007–08 data from Tables 4.1 and 4.2, relative to a 2000 base year.  
 All other data based on projections published in *Tracking to the Kyoto target*, relative to a 2000 base year.

## The carbon price

Australia's emissions trajectory affects the economy in two ways: through the introduction of a carbon price (which alters the relative prices of goods and services that embody different amounts of emissions) and through the import or export of international compliance units (and corresponding flows of payments and income).

The level of the carbon price is an indicator of the degree and pace of economic adjustment in sectors that are exposed to the price. An emissions trading scheme, such as Australia's Carbon Pollution Reduction Scheme, creates the market conditions for a visible carbon price to emerge and helps to ensure that emissions reductions happen at the lowest cost in the sources of emissions covered by the Scheme. Other areas or aspects of the economy, such as direct emissions from agriculture in the years before 2015, may face a different 'shadow price' of carbon as a result of not being included in the Scheme, but being subject to complementary policies introduced to reduce emissions.

### 4.3.5 Factors influencing carbon prices

The price of carbon in the Scheme will be determined by the balance of supply and demand, or what market participants are willing to pay for carbon pollution permits. This will be influenced by a number of factors, including the following:

- *Demand for emissions-related goods and services.* Emissions occur as a by-product of other activities, such as electricity generation or air travel. If demand for electricity or air travel increases, those sectors will demand more permits. The scale of demand will be influenced by the cost of permits
- *Abatement opportunities.* The design of the carbon market gives liable entities a strong incentive to reduce their emissions where they can do so at a cost per tonne that is lower than the cost of buying permits. The main virtue of a quantity-based scheme is that it automatically calibrates required emissions reductions with the cost of achieving them through coordinated but decentralised decisions by market participants. For example, if the demand for electricity rises, more permits will be required unless it is cheaper for electricity producers to reduce the emissions intensity of their operations
- *The indicative trajectory, and projected uncovered emissions.* The Scheme caps will be determined from the indicative trajectory, and represent the domestic supply of permits
- *Banking and borrowing.* Allowing unlimited banking and limited borrowing of permits will affect when permits are used. Net banking is likely when the future carbon price is expected to be higher than the current price (plus the expected return on capital), and net borrowing is likely when the current price is higher than the expected future price
- *The 2020 target range.* The target range, and views on where the trajectory is likely to intersect with that range, will influence market views on likely future prices and, therefore, the degree to which participants choose to bank permits for future years
- *The international carbon price.* Allowing unrestricted imports of eligible international units and limited exports of carbon pollution permits will provide an effective cap on

- *Scheme coverage.* In the early years of the Scheme, not all sources of the economy's emissions will be covered, so a nominal allocation of permits will be made to uncovered sectors (see Chapter 10). When new sources of emissions enter the Scheme in later years, both the supply of and the demand for permits will increase. This will put downward pressure on the carbon price if the cost of abatement in the newly covered sources of emissions are lower than the existing carbon price, or upward pressure if the cost of mitigation is higher.

#### 4.3.6 Projected carbon costs for various emissions scenarios

Modelling by the Treasury for the Government, using the Scheme design outlined in the Green Paper and published in *Australia's low pollution future* suggests that market participants at Scheme commencement would be willing to pay about \$20—\$28 per carbon pollution permit (in 2005 dollars), where each permit represents one tonne of CO<sub>2</sub>-e. *Australia's low pollution future* also suggests that the carbon price would rise to between \$35 and \$50 per tonne in 2020 (2005 dollars), depending on whether emissions reductions were tracking towards the top or the bottom, respectively, of the 2020 target range.

Table 4.4 shows the different carbon prices projected by the modelling work conducted for the Garnaut Final Report and by the Treasury.

**Table 4.4: Modelled carbon prices in six scenarios**

|   | Garnaut Waiting Game <sup>a</sup> | Garnaut Copenhagen Compromise <sup>a</sup> | Garnaut 550 ppm <sup>b</sup> | Garnaut 450 ppm <sup>b</sup> | CPRS – 5 <sup>b</sup> | CPRS – 15 <sup>b</sup> |
|---|-----------------------------------|--|------------------------------|------------------------------|-----------------------|------------------------|
| Australian emissions trading commences (year)     | 2010                              | 2010                                       | 2013                         | 2013                         | 2010                  | 2010                   |
| 2020 target (per cent below 2000 levels)          | No target                         | –5   | –10                          | –25                          | –5                    | –15                    |
| Carbon price when (c) emissions trading commences | (see note d)                      | (see note d)                               | \$30                         | \$52                         | \$23                  | \$32                   |
| 2020 carbon price (in 2005 dollars)               | \$30                              | \$53                                       | \$35                         | \$60                         | \$35                  | \$50                   |
| Assumed 2050 target (per cent below 2000 levels)  | No target                         | 60   | 80                           | 90                           | 60                    | 60                     |

(a) Published in the Garnaut Final Report.

(b) Published in *Australia's low pollution future*.

(c) These figures are the nominal carbon price when emissions trading commences.

(d) Both the Garnaut Waiting Game and Copenhagen Compromise scenarios assume that emissions trading commences in 2012 with a fixed price of \$20 per tonne. In the Waiting Game scenario, the fixed price remains indefinitely, rising at 4 per cent a year, whereas in the Copenhagen Compromise scenario, the fixed price rises at 4 per cent a year until 2013, after which it floats freely.

Scheme design allows market participants to hold permits for future use. This means that participants are likely to hold permits if the increase in value of those permits is expected to be higher than for equivalent assets. This is called banking, and acts to raise the carbon price in the early years of the Scheme, but in the long run means that carbon prices are lower. Reflecting this behaviour, the Treasury modelling assumes that the emissions price grows by 4 per cent annually above inflation (representing a risk-free real rate of 2 per cent and a risk premium in the permit market of 2 per cent). Without banking, a lower price at the start of the

Scheme could be expected, but the price would also be expected to rise rapidly. The absence of banking would impose higher costs on the economy, forcing business collectively to meet an explicit annual cap. Banking is therefore a way of promoting smooth adjustment as the carbon price begins to be incorporated into the economy, as well as allowing abatement efforts to be allocated sensibly over time. It also provides a market signal about expected future prices: significant levels of banking would indicate that market participants expect deeper emissions reductions to be required in the future.

The projected carbon prices in Table 4.4 are somewhat lower than those currently seen in other carbon markets, particularly those in the European Union Emissions Trading Scheme (EU ETS). This is because the EU ETS currently has limited coverage and restricted access to international trade compared to the Scheme proposed in the Green Paper and modelled in *Australia's low pollution future*. The comparison table in Appendix B in this White Paper shows how the Green Paper Scheme design compares to the EU ETS design.

Comparison of the projected 2020 carbon prices in the different modelling scenarios underscores how important an eventual global agreement is to Australia. One of the significant differences between the Garnaut scenarios and the CPRS scenarios is the nature of the framework for mitigation action under which Australia begins a regime of emissions trading. For example, comparing the Garnaut Copenhagen Compromise to the CPRS-5 scenario shows Australia could achieve the same emissions reduction target at 2020 with quite different domestic carbon prices in that year (\$53 in the Copenhagen Compromise scenario, and \$35 in the CPRS-5 scenario: Table 4.4). While some of the difference results from other variations between the two scenarios (for example, the Garnaut Copenhagen Compromise scenario restricts access to banking whereas the CPRS-5 scenario has unlimited banking), it demonstrates the expected importance of a broader and deeper international carbon market, which would create access to lower mitigation opportunities in other regions, helping minimise the cost of achieving Australia's emission reduction goals.

Once the Scheme commences and the Scheme caps and other parameters are set, the price of permits will be determined by the market. Short- and medium-term permit prices will be determined by the Scheme caps and gateways, the cost of abatement in Australia, the price of eligible international units available through the global carbon market, and expectations about future prices relative to current prices. The design of the Scheme provides strong incentives to innovate and seek out least-cost abatement opportunities, but those features of the Scheme also mean that there will be a level of carbon price uncertainty inherent in its operation.

Linking the Scheme to international markets by allowing unrestricted imports of eligible international units will provide an effective cap on domestic carbon prices. This is also an important mechanism for ensuring that abatement is achieved at the lowest cost globally as well as nationally. Because Australia has a small and open economy and relatively fewer opportunities to reduce emissions than some other economies, the global carbon price and the flow of eligible international units into Australia are expected to become the primary determinant of the impact of the Scheme on the Australian economy in the medium term, as more Scheme participants choose to purchase compliance units from overseas.

One way to provide some certainty about the upper-end cost impacts of the Scheme is to set a price cap. A Scheme participant is generally assumed to be prepared to pay up to the price cap for a permit. If the cost of permits rises above the cap, a Scheme participant will be able to access the price cap rather than buy permits. This will provide a safety valve against possible

high-end price volatility and also set an upper limit on the potential economic impact of the Scheme. The price cap is discussed further in Chapter 8.

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- 1 Department of Climate Change, *Tracking to the Kyoto Target 2007: Australia's Greenhouse Emissions Trends 1990 to 2008-2012 and 2020*, Commonwealth of Australia 2008.
  - 2 Department of Climate Change, *Tracking to the Kyoto Target 2007: Australia's Greenhouse Emissions Trends 1990 to 2008-2012 and 2020*, Commonwealth of Australia 2008.
  - 3 Australian Government's Initial Report under the Kyoto Protocol, Update, 21 October 2008, available at [http://unfccc.int/national\\_reports/initial\\_reports\\_under\\_the\\_kyoto\\_protocol/items/3765.php](http://unfccc.int/national_reports/initial_reports_under_the_kyoto_protocol/items/3765.php).
  - 4 *The Australian Greenhouse Emissions Information System online database*, Commonwealth of Australia, 2008 (accessed 6 November 2008).
  - 5 Figures derived from Australia's national greenhouse gas emissions in 1990 and 2000 (from *The Australian Greenhouse Emissions Information System online database*, Commonwealth of Australia, 2008 (accessed 6 November 2008)) and the Australia Bureau of Statistics' estimate of Australia's population in those two years (from *Australian Historical Population Statistics*, ABS catalogue item 3105.0.65.001).
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