

Carbon pricing that builds consensus and reduces Australia's emissions:

Managing uncertainties using a rising fixed price evolving to emissions trading

FRANK JOTZO

CCEP working paper 1104, 15 March 2011

Abstract

This paper identifies principles for carbon pricing that could attract a broad based and durable societal consensus in Australia. It applies these principles to a phased carbon pricing architecture as put forward by Australia's Multi-Party Committee on Climate Change, namely a government determined (fixed) carbon price transitioning to emissions trading. Linking to international carbon markets decouples Australia's domestic carbon price from its national emissions target, allowing significant net national emissions reductions with manageable transitional impacts. A fixed price in the near term can end costly delays to carbon pricing while dealing with uncertainties about Australia's target and international markets.

A strategy is outlined to manage international uncertainties and to accommodate the multiple goals of domestic constituencies, while achieving efficiency and effectiveness. First, ensure the medium term carbon price is high enough to for emissions to begin to trend down in the next few years, recognising that investment decisions are shaped by current expectations about future prices. Second, set the initial price at a level that gives confidence that short run impacts will be manageable, given other transitional assistance. Third, ensure that wider policy settings do not compromise incentives for reducing emissions, and make the scheme robust in the face of competing claims for carbon revenue and lobbying efforts.

For Australian carbon pricing policy, these principles suggest the carbon price may need to rise rapidly over the course of the decade, to double or more compared to starting prices that are currently in the Australian discussion. Payments of carbon pricing revenue to industry may need to be limited to create more room for income tax cuts, possibly by means of an overall cap and accelerated phase-out of industry assistance. Forestry and agricultural offsets can be supported through the scheme, but at the cost of fiscal revenue.

**Centre for Climate Economics and Policy
Crawford School of Economics and Government
The Australian National University**



The **Centre for Climate Economics and Policy** (ccep.anu.edu.au) is an organized research unit at the Crawford School of Economics and Government, The Australian National University. The working paper series is intended to facilitate academic and policy discussion, and the views expressed in working papers are those of the authors. Contact for the Centre: Dr Frank Jotzo, frank.jotzo@anu.edu.au.

JEL codes:

Q58 Environmental Economics - Government Policy
D72 Analysis of Collective Decision-Making - Political Processes: Rent-Seeking, Lobbying, Elections, Legislatures, and Voting Behavior
Q54 Environmental Economics - Climate; Natural Disasters; Global Warming
A13 General Economics - Relation of Economics to Social Values
Q01 Sustainable Development

Citation for this report:

Frank Jotzo, 2011, *Carbon pricing that builds consensus and reduces Australia's emissions: Managing uncertainties using a rising fixed price evolving to emissions trading*, CCEP working paper 1104, Centre for Climate Economics and Policy, Crawford School of Economics and Government, The Australian National University, Canberra.

Please note: This paper is under review for journal publication. Please contact the author for the latest information before citing: frank.jotzo@anu.edu.au

Contents

1. Introduction	3
2. The role of carbon price and quantity targets in a small open economy	4
3. Mapping multiple climate policy objectives in goals in Australian political economy	6
4. Identifying a consensus compatible policy strategy	10
5. A carbon price policy mechanism for Australia	13
6. Concluding comments	19
7. References	21

1. Introduction

Achieving sustainability requires the development and implementation of policies that both promote human wellbeing and respect natural limits. This paper provides a case study in crafting policy packages that are both politically feasible and worthwhile in some objective sense. We identify the elements for a societal consensus on carbon pricing, draw out principles for a model of carbon pricing that could achieve such a consensus, and analyse design elements of carbon pricing for Australia.

Our logic is that visionary theorising is not, of itself, sufficient for sustainability (and can even be unhelpful in some cases), but that politically pragmatic strategies also frequently fall short. Promoting adaptive governance requires us to seek the intersection of these goals, rather than framing this challenge as a trade-off – fashioning approaches that are both valuable and valued (see Hatfield-Dodds et al 2007a).

Our case study sits at the heart of one of the most highly contested issues in Australian public policy: whether and how to introduce some form of carbon price to drive long run reductions in greenhouse emissions, and the associated transition to a low carbon economy. The political, economic and ecological stakes are high. Politically, this issue has already been a key factor in the fall of one Australian Prime Minister and two leaders of the Opposition party, and been central issue in the last two federal elections (Farr 2009, Climate Institute 2008, 2010), with Carson et al (2010:902) observing that “Australia may be the first country where environmental policy and climate policy (... have) played a dominant role in a national election”. Economically, it is well known that early smooth action to reduce emission is less disruptive and has lower overall costs than more abrupt later reductions to achieve the same total (stock) reduction in emissions (Stern 2008, Australian Government 2008, Hatfield-Dodds et al 2007b). Ecologically, it is clear that decisive commitments to emissions reductions by high income nations are urgently required to give any real hope of an early global peak in emissions, and reduce the risks and extent of dangerous climate change (Stern and Taylor 2010, UNEP/den Elzen et al 2010). A worthwhile outcome in Australia – with its highly energy and emission intensive economic base – would offer insights for other countries, and hopefully contribute to international momentum.

Section 2 starts with an outline of the real world effects of carbon price mechanisms in a small open economy, with particular attention to the roles of a national emissions target and the market price of carbon (regardless of how this is set). Section 3 builds on this with an analysis of the underlying political economy of Australian climate policy: identifying the goals and likely bottom lines of four key constituencies, each of whom could retard, or block, the consensus required for implementation. These two perspectives together provide the assessment matrix for potential policy approaches. Section 4 outlines key features of an illustrative policy strategy we consider would be both worthwhile (meeting the criteria for good policy) and capable of achieving a working societal consensus. It involves a legislated interim carbon price (via a fixed price permit scheme) that transitions to a trading system linked to international carbon markets as specific global uncertainties are resolved. The analysis suggests that such a phased pricing approach, moving from price based to quantity based mechanisms over time, is likely to have advantages in managing real world uncertainties, and can be designed in ways that appear no more difficult to implement than other policy approaches. It may also be the only way of meeting the multiple policy goals of key Australian constituencies and achieving long run policy stability and effectiveness. Section 5 offers analysis of a carbon price policy mechanism for Australia that meet the conditions set out. It involves a carbon price that accelerates rapidly from a relatively low starting level, transition to market prices with a default and minimum price, provisions for offset credits from land-based carbon sequestration, limits phase-out provisions for industry assistance in favour of assistance to households including through cuts in income taxes.

2. The role of carbon price and quantity targets in a small open economy

The literature on market based environmental policy tools includes extensive discussion of price and quantity based approaches. The emissions trading policy proposed by the Australian Government in 2008 allowed unlimited use of approved international emissions permits to acquit domestic emissions liabilities (DCCEE 2008b). Economic modelling indicates that Australia could achieve substantial abatement but would be a net importer of permits across all likely combinations of national Australian emissions targets and global carbon prices (Australian Government 2008).

This means that the price of international permits effectively puts an upper bound on the domestic carbon price, and breaks the normal symmetry between price and quantity in policy design, so that the carbon price and the national emissions reduction target have distinct and separate policy functions.

Under this policy approach, Australia's domestic abatement, emissions trajectory, and the pace of structural adjustment are all primarily determined by the level and coverage of the carbon price.¹ More specifically, the level of the current carbon price will influence current emissions from covered sectors and activities (arising from patterns of use of the existing capital stock), while current expectations about the future level and coverage of carbon prices will influence current investment decisions, influencing future abatement costs and emissions as the capital stock evolves. Some share of the carbon price will be passed through to households and other businesses, particularly through changes in electricity and other energy prices, providing incentives for downstream changes in behaviour and investments. In principle, rapid price shocks could result in increased unemployment, however in practice changes in employment appears likely to be accommodated within normal employment turnover at the sector level (Gillard 2009, Hatfield-Dodds et al 2008), although regional employment impacts may require special policy attention in a small number of cases (Garnaut 2008).

Perhaps counter intuitively, for a relatively small country that trades emissions in international markets or with other governments (Jotzo and Betz 2009), the national emissions target has no direct impact on domestic emissions (defined as actual emissions within Australia before adjusting for international trade in emissions permits).² Rather, the target determines Australia's overall contribution to global abatement, made up of domestic abatement (driven by the carbon price) and offshore abatement resourced through the purchase of international permits (to cover the gap between domestic emissions and the national target).

This means the use of international permits decouples the domestic carbon price from the national target. For a given global carbon price, a more (or less) stringent emissions target simply results in a larger (or smaller) requirement to import international permits – with corresponding wealth effects and impacts on the net capital outflows, but little or no direct effect on domestic resource allocation or economic structure (other than feedbacks on the size of government or other revenue raising due to lower or higher government auction revenues over time).

Effective complementary policies, such as promoting energy efficiency or mandating minimum levels of renewable energy generation, can reduce domestic emissions and in some cases can also assist adjustment or contribute to wider policy goals (PMTGEE 2010). Relying solely on policies that avoid an

¹ Coverage is important because exemptions or shielding may result in a lower effective carbon price for some sectors or activities, and hence smaller emissions reductions from those sectors and in aggregate domestically.

² Consistent with the Kyoto Protocol, 'national emissions' are defined as actual 'domestic emissions' plus or minus trade in international permits (see DCC 2010:89).

explicit carbon price would not avoid increases in energy prices, however – rather they would be expected to result in larger price increases (Sims 2010, DCCEE/Comley 2010). In addition, transitional assistance should be provided in ways that do not detract from the price signal - such as increases in income support payments for pensioners, reductions in existing taxes (with priority to reducing existing tax distortions or high effective income tax rates, see Freebairn 2011, Hatfield-Dodds, Jackson et al 2007), or one-off transitional assistance for severely impacted businesses

With emissions trading, the carbon price is expected to be set by global demand-supply balance over the medium term, but the level of the carbon price is uncertain, as it is sensitive to the level of global ambition and the market rules for creating and using international emissions permits, neither of which are yet settled in the current international negotiations (Garnaut 2011a). Investors in emissions and energy intensive assets bear some input price risks – both upside and downside – as cost pass through is usually determined by market conditions rather than firm-specific cost structure.

By contrast, an administratively set price provides greater confidence over price (if policy settings are considered durable), but shifts financial risks to government if additional international permits must be purchased to meet the national emissions target. Any prolonged gap between the global (market) price and the national (administrative) price would reduce the efficiency of resource allocation. A national carbon price below the global carbon price means that the country is missing out on some domestic mitigation options that could be achieved at lower cost than the price at which permits need to be bought or can be sold internationally, and it provides an implicit subsidy to domestic emission intensive activities. Conversely a domestic price above the global price means that the national quantity target could be achieved at lower cost with less domestic mitigation and more permit imports (or fewer permit sales).

From a public policy perspective this economic analysis highlights five core issues that are likely to be politically salient to various constituencies:

- (1) the change in domestic emissions over time;
- (2) the pace and extent of structural adjustment, including impacts (after accounting for assistance) on household costs of living, business costs and profitability, and regional employment and unemployment;
- (3) the degree of certainty over future carbon prices, and the associated allocation of risk between government (who bears the responsibility to meet an agreed national emission target), emitting businesses (through impacts on the profitability of assets with different carbon price exposures), and households and the general business sector (due to cost pass through);
- (4) the level of Australia's contribution to global abatement; and
- (5) overall fiscal impacts of different policy combinations.

3. Mapping multiple climate policy objectives in goals in Australian political economy

The experience of the Rudd Labour Government (November 2007 to July 2010) testifies to the complexity of Australian climate politics.

Australia was one of a small number of advanced countries that negotiated a 'growth target' under the Kyoto Protocol, setting a target of 108 percent of 1990 levels for the period 2008-12. Policy action over the last 15 years has achieved significant abatement, estimated to yield an 18% reduction from business as usual emissions in 2020, including through promoting energy efficiency (5% of the 18% total), mandatory renewable electricity targets (4%) restrictions on land clearing (2%), improved waste management (2%), and other measures (5%) (DCC 2010 p.89). Notwithstanding this, domestic emissions have continued to rise by 1% per year over the last decade, and are projected to continue rising 1-2% per year driven by strong population growth, increasing per capita GDP and energy demand, and fast expansion of the extractive resources industry (DCC 2010, DCCEE 2011a, Australian Government 2008a). National emissions in 2009 were 6 percent above year 2000 levels, and without further policy action are projected to grow to 24 percent above year 2000 levels by 2020 (DCCEE 2011a). With most low cost options for reducing emissions already implemented. by 2007 there was a broad expert consensus that emissions trading or some form of carbon price was required to achieve further restraint or reductions (PMTGET 2007, ABRCC 2006).

In the November 2007 election campaign both major parties promised to bring in an emissions trading scheme by 2010, representing a dramatic shift from the longstanding position of the Howard-led conservative Coalition Government (see PMTGET 2007). Polling indicated that the Rudd-led Labour opposition was considered to be more committed to action on climate change (Climate Institute 2007, 2008), and their 2007 election win was interpreted as providing a strong mandate for emissions trading. The first official act of the new Government was to ratify the Kyoto Protocol. A detailed emissions trading policy framework was developed through a green paper and white paper process (DCC 2008a, 2008b), informed by extensive economic modelling (Australian Government 2008) and a parallel government-commissioned Climate Change Review (Garnaut 2008), with legislation tabled in May 2009 (Nielson et al 2009).

But things did not follow the Government's plan. The Government's proposed emissions targets were derided by environment groups as "completely unacceptable" (WWF 2009) and likely to "hold back progress towards an effective international agreement" (ACF 2008), despite adjustments in April 2009 to allow a target consistent with a global 450ppm emissions trajectory (Rudd et al 2010). On the other side, it was claimed that "any Australian measures (to reduce emissions) would constitute an empty and economically debilitating gesture" (Moran 2008), with even the most modest emissions target resulting in "job losses in all states" (MCA 2009) and the relocation of investment or even whole industry sectors to other countries (ABC Radio National 2008, APP 2008).

The fragile political consensus collapsed in late 2009. The leader of the Opposition party was removed because of his support for an amended legislative package, and replaced by a steadfast opponent of any form of carbon price (Farr 2009) who promised that "under a Coalition government everyone who uses energy – that's pensioners, retirees, farmers, families and young people – could live without the threat of a carbon tax or an emission trading scheme that would raise prices, damage industries and cost jobs" (Abbott 2010). In May 2010 the Government put plans for emission trading on hold, at an enormous cost to their credibility. The political fallout resulted in a change of Prime Minister from Kevin Rudd to Julia Gillard, and the associated loss of credibility almost caused the Government to lose the August 2010 election (see Climate Institute 2010).

Neither major party achieved a majority in the election, and Prime Minister Gillard established a Multi-Party Climate Change Committee (MPCCC) as part of winning the support of the Greens and several independents to form a Labour Government (Gillard, Brown et al 2010, Gillard, Combet et al 2010). The stated purpose of the MPCCC is to explore options for introducing a carbon price that are able to achieve the political agreement required for it to pass the two houses of the federal parliament, given the stance of the federal opposition (Abbott 2010). This initiative built on an earlier proposal by the Greens to introduce an interim carbon price, as a way of beginning stronger action to reduce emissions despite unreconciled party positions on an appropriate Australian emissions target for 2020 (Kirk 2010).

The Government has publicly committed to establishing a form of carbon price (Gillard 2010), and in February 2011 the Government and the Greens announced a framework with broad (potentially staged) coverage of gasses and sectors involving an administratively set price for three to five years transitioning to a market determined price (MPCCC 2011), with a proposed start date of 1 July 2012 if an agreed approach can be legislated in the second half of 2011. Such a model was proposed as a 'viable second best' by the Garnaut (2008) Review, and during 2010 it became increasingly clear that it would be an appropriate approach given international and domestic circumstances (Jotzo 2010a).

In this paper we examine the underlying political economy and how effective and efficient policy outcomes can be achieved within the context of interest group advocacy and citizen concerns, and illustrate an approach that can be both worthwhile and feasible. We analyse the political economy in terms of the values and interests of four key constituencies in Australia's climate change discourse, each of which has a distinctive stance on the introduction of a carbon price and emissions target. Achieving a workable societal consensus may be possible without the support of all four constituencies, but recent experience suggests that it will be difficult – and perhaps impossible – to establish a stable long term policy approach in the face of strident opposition from any one group.

Environmentally concerned citizens and groups are deeply concerned about climate change, and convinced of the need to reduce domestic emissions, and would like to see Australia making a constructive contribution to global action (see ACF 2010). Peak social justice groups support emission reductions (SCCC 2008, ACOSS 2008, UCA et al 2010), with measures to protect low income and vulnerable groups, and are included in this constituency.

General citizens accept that more needs to be done to address climate change, but are concerned about cost of living impacts (Morrison and Hatfield-Dodds 2011, Climate Institute 2008, 2010), making their support vulnerable to campaigns on this issue (Hatfield-Dodds and Morrison 2010).

General business are only weakly engaged in public debate. Climate change policy is not perceived as impacting on core business concerns, but has icon value as indicator of Government commitment to reform and good governance. While there are some business groups in favour of emission reductions, they do not appear to have engaged or mobilised wider business sentiment.

Emissions intensive industries now appear to consider that some form of emissions reductions policy is inevitable, and is focused on minimising financial impacts on major emitters (BCA 2008, AIG 2010, Kloppers 2010). Advocacy efforts by emissions intensive firms and industry associations during the first (failed) attempt at introducing emissions trading in Australia (Australian Government 2008) resulted in significant shares permits and permit revenue being offered for free to emitters and significant energy users (Pezzey, Mazouz and Jotzo 2010), though the share of free permits would have been less than that in the first two phases of the EU emissions trading system. While delaying policy action would be in the interests of some segments of this constituency (see MCA 2009), the voice of these interests appears to be moderated by the impact of policy uncertainty on investment decisions in electricity generation,

which is causing an investment hiatus that risks disruption in electricity supply over coming years (with attendant risks to both energy businesses and government regulators), as well as biasing investment towards less economically efficient options with lower investment risks such as open cycle gas generation (Macey 2010, Sims 2010).

Table 1 summarises our analysis of the position of each of these four constituencies on the core issues identified in Section Two. Crucially, this analysis suggests that the tensions between constituencies are primarily indirect (as no row in the table has more than one major concern), and thus that tensions arise from 'second order' interactions between policy choices rather than 'first order' direct conflicts of values or interests. This in turn reflects that the political pain of structural adjustment (salient to the business community and general citizens) is largely a function of the carbon price, particularly in the early period, while the political gains relate more to the target and emissions trajectory (which are most salient to environmentally concerned constituency, and also of interest to general business and citizens).

This analysis summarised in Table 1 suggests the potential for consensus, but does not imply that such consensus is likely or inevitable. This is for two main reasons. First, the passions and objectives of each constituency often range wider than their central values and interests. Some elements of the environmentally concerned constituency, for example, are opposed to providing transitional assistance to emissions intensive industries – even if this assistance does not compromise the environmental integrity of the policy package. Second, constituencies may overstate the range of their concerns for strategic reasons (to provide bargaining chips) or because they conflate issues and confuse the effects of different mechanisms. In public debate in 2008 and 2009, for example, business constituencies routinely conflated the effects of a carbon price and the national target in public debate – such as by arguing for a low target to reduce the competitiveness impacts of a carbon price – while environmentally concerned groups presumed that the gross value of industry assistance implied that the overall policy package would provide little incentive for emissions reductions. The resulting confusion over projected impacts (on both emission and the economy) laid the foundation for the defeat of the previous emissions trading legislation. Achieving a working societal consensus is thus likely to require constituencies to focus on their core concerns, supported by economists and policy analysts doing more to 'bring the solvent of knowledge' to public debate (Parkinson 2010, see Robbins 1935).

Table 1. Summary of views and underlying interests of four major constituencies across six key issues

ISSUES	CONSTITUENCIES			
	ENVIRONMENTALLY CONCERNED	GENERAL CITIZENS	GENERAL BUSINESS COMMUNITY	EMISSIONS INTENSIVE INDUSTRIES
Domestic emissions trajectory	Central concern: Domestic emissions must peak and begin to decline.	Domestic emissions should decline, perhaps after stabilising.	Increasing emissions are not sustainable from a geopolitical perspective, and risks a loss of future business opportunities.	(concerns arise indirectly as a result of potential business impacts of a carbon price, but not the target)
Household cost of living impacts and assistance	Low income and vulnerable households must be protected against net cost impacts. Optimistic about the scope for energy efficiency to reduce overall policy impacts. Pessimistic about food and water costs in the absence of policy action.	Central concern: Cautious about increases in energy costs. Willingness to accept costs will depend on 'fair' assistance to households, and confidence that policy is environmentally effective and that Australia is not doing more than its share.	(not a material concern, although concerns would arise if household impacts undermined consensus required for stable policy settings)	(not a material concern)
Business costs and certainty	(impacts on business costs and certainty are not a material concern) Very concerned that any assistance provided does not undermine emissions reductions and associated transition to a low carbon economy.	(impacts on business costs and certainty are not a material concern)	Supports assistance to highly affected industries, with transition to a polluter pays approach (releasing government revenue for other purposes, such as business tax cuts). Desire for policy to be settled as indicator of commitment to reform and good governance.	Central concern: Concerned to minimise financial impacts on emission intensive sector through maximising financial assistance and exemptions, and seeking a low carbon price. Prefer rapid resolution as uncertainty is delaying investment decisions, with risks to businesses.
National and regional employment	(not a material concern, with many in this group considering emissions reductions will promote employment)	Would be concerned if policy resulted in unemployment nationally, or had employment impacts in their own region.	Would be concerned if policy resulted in unemployment nationally, or had employment impacts in their own region.	(does not appear to be a material concern, given historical employment reductions in these sectors)
International contribution	Central concern: Australia must do everything possible to support global action to avoid dangerous climate change.	Supports Australia 'doing its bit' but would be concerned about doing more than its share.	Supports Australia being a good global citizen and 'doing its bit'.	Concerns focus on competitiveness issues rather than target. Appear sceptical on the prospects for comprehensive global action.
Fiscal impacts	(not a material concern)	(not a material concern)	Would be concerned about excessive assistance due to very tight fiscal conditions.	(not a material concern)

4. Identifying a consensus compatible policy strategy

The analysis above suggests the following illustrative strategy has the potential to deliver a worthwhile long run policy outcome, while working within the major concerns and interests of the major constituencies and thus having potential to be a feasible compromise.

The strategy assumes the establishment of an administratively determined carbon price in this term of Government, with provision to shift to a market determined price as international uncertainties are resolved, consistent with the February announcement by the Government and the Greens (MPCCC 2011). We refer to this as a phased price approach. Legislating an administrative carbon price trajectory now would demonstrate the Government's willingness to act, improve business certainty and avoid the risk of unnecessary economic costs from delayed action, without requiring agreement on a national target which is politically difficult in current circumstances.³ The shift to a market determined price over the medium term would promote economic efficiency and appropriate risk allocation (as discussed in Section 5).

The strategy is illustrative in the sense that there may be a number of strategies or combinations of elements that would deliver mitigation policy outcomes that are 'both valuable and valued' – and so this specific strategy may be one of a set of potential approaches. In general, however, our analysis suggests that something along the lines of the first three elements below may be important to reaching agreement – focused on the carbon price trajectory including expectations about future prices, and the incentives it provides. It may also be valuable to consider two further elements dealing with the national target, which may assist in achieving the consensus required.

First, the implementation of the phased price approach should set a medium term minimum carbon price that is high enough to give confidence Australia's domestic emissions will begin to trend downward from current levels in the next few years – regardless of whether the price in any particular year is set administratively or determined through emission trading. Here it is important to note that expected future prices are the major driver of current investments in assets that shape future energy use and emissions (such as power plants, business machinery, transport infrastructure and vehicles, buildings, and household appliances). The most straightforward mechanism for implementing this would be to legislate forward default and minimum price trajectories to at least 2020, drawing on credible economic analysis of the projected effects of different levels of carbon price on domestic emissions and energy use, and with reference to expected prices in other jurisdictions. A shift to a market-based emissions trading scheme would be expected to occur before the end of the predetermined trajectory.

Second, set the initial administrative carbon price and other transitional measures at a level that gives confidence that short run impacts will be manageable, and allows households and businesses time to adjust. This would reassure general citizens and the two business constituencies, and would demonstrate that a carbon price will not cause major economic disruption or stall growth (as sometimes claimed by its most vigorous opponents.)

Third, ensure that wider policy settings do not compromise incentives for reducing emissions and make the scheme sustainable and robust in the face of future lobbying efforts and competing demands for

³ This is consistent with the political agreement between the Greens and the Gillard Labour Government that emissions reductions should begin in this term of government, notwithstanding their political disagreement about an appropriate national target (at least until the current international negotiations are concluded).

carbon revenue. This implies that any assistance to emitters should be tightly limited, determined on the basis of principles and transparent rules, has sunset provisions included, and maintains abatement incentives. Another element could be early forward sales of permits for future years, creating a constituency for the continuation of the scheme and improving the early fiscal impact of the scheme.

Fourth, the overall policy framework should unambiguously position Australia to support and participate in any increase in global ambition from the current post-Copenhagen trajectory to a level more compatible with stabilisation of greenhouse gases at 450ppm CO₂e or lower, consistent with the Australian Government's stated national interest objective (Australian Government 2008b p.4-15). This implies that the initial decision about the carbon price trajectory, as well as a possible near-term decision about the national emissions target should not preclude 'ratcheting up' at a later date to a 2020 target of a 25 percent reduction from 2000 levels (equivalent to 24 percent from 1990 levels or 30 percent from 2005 levels, DCCEE 2011b). A corollary is that assistance arrangements for emissions intensive industries need to avoid locking in free permits or financial assistance that would place excessive burdens on the rest of the economy if global circumstances change.

Fifth, there may be advantages in clarifying (and simplifying) how Australia will determine its emission 2020 target, such as adopting a simple quantitative formula relative to a defined group of nations. Such clarification would reduce the present or any future Government's discretion in favouring one set of interests over another, which may improve the confidence of parties to the agreement.⁴

Consistent with our emphasis on consensus, this strategy takes a middle path, focusing on achieving both long run reductions in emissions and a manageable economic transition. Table 2 summaries the likely views of each of the four major constituencies on each of the elements of the illustrative strategy, suggesting that environmental groups are likely to focus on emissions reductions and the long run restructuring of the economy while other groups likely to focus more on whether short run impacts are manageable. The analysis presented in the table also highlights the importance of crafting assistance arrangements that support the transition (including addressing competitiveness issues) while maintaining incentives for emissions reductions. Potential implementation mechanisms for elements one to three are discussed below.

⁴ This approach might, for example, state that Australia will adopt a 2020 target that is no less stringent than the average for all advanced countries relative to 1990 levels. In this example, if the current negotiations result in commitment by advanced (Annex 1) nations to reduce 2020 emissions by 16% on average relative to 1990 (UNEP's estimate for the most ambitious end Copenhagen Accord range, see UNEP/den Elzen et al 2010 p.41), Australia would adopt a 2020 target of 'at least a 16 percent reduction on 1990 levels' (equivalent to a 17% reduction on 2000 levels), and remain open to a more stringent target as part of future negotiations following the next IPCC assessment report (consistent with the fifth point above). Alternatively, if the negotiations deliver aggregate advanced country commitments in the middle of UNEP's estimated range, Australia would adopt a target of 'at least 10% below 1990 levels' (11% below 2000 levels). Under this illustrative approach, Australia would also automatically increase its ambition in line with other advanced countries, consistent with our national interest in the most ambitious possible global action.

Table 2. Summary of likely views of major constituencies on each element of the illustrative policy strategy

STRATEGY ELEMENTS	CONSTITUENCIES			
	ENVIRONMENTALLY CONCERNED	GENERAL CITIZENS	GENERAL BUSINESS COMMUNITY	EMISSIONS INTENSIVE INDUSTRIES
Establish default administrative carbon price this term of government with provision to shift to a market price in future	Strongly favour action this term of government	Favour action this term of government	Action this term of government has icon value	Detail of arrangements will be very important to stance
Set medium term price (2015-2020) at a level where domestic emissions are expected to trend down	Outcome likely to be crucial minimum condition for support	Likely to increase confidence in policy effectiveness, enhancing support	Likely to increase confidence in policy effectiveness, and reduce investment risks	Provides clarity and reduces investment risks
Set initial carbon price to give confidence that short run impacts are manageable, in the context of other assistance	Would prefer a higher initial price, all else equal	Likely to be crucial condition for support	Likely to be crucial condition for support	Likely to be crucial condition for support
Ensure assistance and wider policy maintains abatement incentives and supports the transition to a low carbon economy	Likely to be crucial condition for support	Important for support	Likely to have a mix of views by sector and type of business	Detail of assistance provided will be crucial to stance and support
Position Australia to support increased global ambition consistent with stabilisation at 450ppm CO ₂ e or lower	Likely to be crucial condition for support	Likely to have a mix of views, generally favourable	Likely to have a mix of views by sector and type of business	May consider global action consistent with 450ppm CO ₂ e or lower is unlikely
Clarify process for setting Australia's 2020 target	Generally favourable, but support would depend on detail	Unlikely to have a significant impact on support, will depend on detail	Unlikely to have a significant impact on support, will depend on detail	Generally favourable, but support would depend on detail

5. A carbon price policy mechanism for Australia

Implementing this strategy requires a phased pricing approach, using elements of both price and quantity based mechanisms in succession. In this section we discuss aspects of design, calibration and implementation of a possible Australian carbon pricing mechanism, referring to the basic design elements proposed by the Australian government and the Greens, and put forward under the Multi-Party Climate Change Committee in February 2011 (MPCCC 2011).

Transition from fixed price to market price

The argument for switching from an administratively determined price (fixed price) to a market determined price turns on the allocation of costs and risks between government and emitting businesses. Linking the Australian carbon price to the world carbon price promotes efficiency through allowing Australian emitters to offset their emissions through the purchase of international permits where this is cost effective. The international climate negotiations are framed around setting targets and emissions baselines (rather than prices), and allowing prices for emissions permits to emerge through various forms of market – implying that future global prices will be uncertain.

Given the expectations that Australia would be a net importer of permits under a future international climate agreement, setting the domestic price below the world price for a sustained period would shift costs from emitting firms to the government budget, risking large fiscal costs and reducing overall economic efficiency. This is because the price of emissions intensive goods would not reflect the full societal costs of their production, and some cost effective domestic abatement would be replaced by more expensive international abatement. Reducing these risks by setting the Australian carbon price comfortably above the expected global price would raise government revenue (perhaps more efficiently than alternative sources (Sandmo 1975), but would impose additional adjustment costs and promote inefficient abatement effort. Together these considerations support Australia moving to a market determined price after a transition period (Garnaut 2008).

The carbon price trajectory could be set administratively as a set of fixed annual prices for emissions permits within the architecture provided by the Government's emission trading legislation. The number of permits available each year would not be constrained. Permits would not be able to be banked for use in future years while the price was set administratively, but banking of permits would be allowed after the transition to a market determined price.

Permits for future years could be sold or auctioned from the start of the scheme. As mentioned above, this would create financial interests in the community for the continuation of the scheme, as permit holders will want to see the value of their investment maintained.⁵ Forward auctioning of permits can assist in price discovery for the period after the transition to emissions trading. They also help achieve greater involvement of the financial services sector, in advance of the shift to emissions trading.

The transition to market based pricing would be achieved by introducing a limit on the number of permits issued each year, starting at some point in time. These permits would be issued by government at market prices. The scheme can then be opened to international permit trading by businesses.

⁵ A similar idea of political sustainability underlies the McKibbin and Wilcoxon (2002) hybrid scheme, but their specific proposal is to freely allocate long-term permits, rather than to auction short-term permits.

At what point the shift to emissions trading would and should occur is an open question. The proposal in the policy process (MPCCC 2011) suggests that a fixed price be in place for between three and five years, with the possibility of deferral of the transition. Important considerations in shifting to internationally open emissions trading would be that a single target for Australia's national emissions is agreed on, and that there are sufficient opportunities for trading in international emissions markets (Jotzo 2010a).

During the fixed price period, international emissions trading could take place by way of the government trading national emissions allocations with other countries, to help fulfil international commitments on Australia's emissions target.

Domestic offset trading

Businesses could trade in domestic offset markets and use offsets, for example from sequestration in forestry and agriculture (such as under Australia's Carbon Farming Initiative scheme), instead of purchasing government-issued permits to cover their emissions. Support for carbon sequestration in forests and agricultural soils is a particular priority in Australia's climate change policy environment, as it may offer substantial opportunities for mitigation (Garnaut 2011b). However, it is highly uncertain what mitigation potential will be technically and institutionally feasible, and at what cost.

Depending on decisions about coverage, purchases of domestic offsets increase the overall amount of domestic abatement. In a fixed price scheme, the extra abatement comes at the cost of fiscal revenue. This is because the amount of offsets entering the system does not change the carbon price, and therefore does not alter the incentive to cut emissions in the sectors covered by the carbon price. Emitters who purchase offsets credits rather than government-issued permits pay money to forestry and agricultural businesses, rather than to the Treasury. Therefore, during the fixed price period, offset credits amount to extra government-financed mitigation action in land-based sectors.

If offset markets were large, this could mean a substantial claim on carbon pricing revenue, which is needed to pay for transitional assistance to households and also industry. Large fiscal claims may not be able to be accommodated under a revenue-neutral scheme, in which case it may be necessary to keep support for some or all land-based sequestration separate from the carbon pricing scheme. This may mean that land-based sequestration would be paid for directly under government-initiated programmes that include a broader range of instruments than offsets. Separation could also be desirable also from the perspective of managing abatement cost uncertainty about sequestration volumes and costs.

Alternatively, quantitative limits could be applied for the amount of offsets that can be supplied into the carbon pricing system. With quantitative restrictions, the marginal cost of offsets will be below the carbon price, creating economic surplus. It is possible for government to capture the economic rents created by the restriction, by issuing special subsidiary permits that allow the holder to use an offset credit instead of a normal government issued emissions permit. These subsidiary permits would be auctioned, with the price equal to the difference between the permit price and the marginal cost of producing offsets.

An analogous system of subsidiary permits could apply to the use of international offset credits, should they be allowed into the Australian system during the fixed price period.

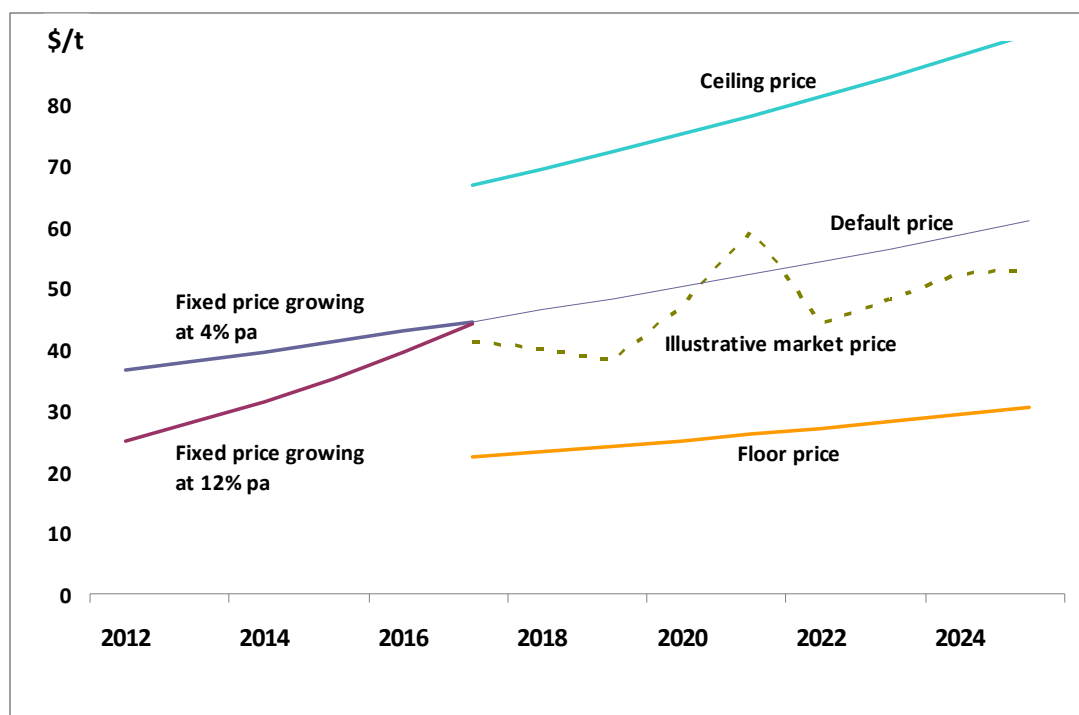
Price trajectories

There are arguments in favour of establishing a minimum price (floor price) that would operate for some period as part of the ETS, including avoiding the risk of price crashes and improving investment confidence (Wood and Jotzo 2010). These arguments are strongest for the establishment phase of emission trading, suggesting that any minimum price arrangements should be transitional and time limited. The economic arguments also imply that the level of the minimum price should be informed primarily by investment thresholds, rather than its effect on aggregate emissions.

A price ceiling as an upper bound could complement the minimum price, together yielding a 'price collar' (McKibbin 2009) around the expected trading price. Such a hybrid mechanism operates as quantity control when market prices are broadly in line with expectations, and as price control if emissions permits are traded at prices that are much higher or lower than expected or desired. We focus here on the default price and a minimum price.

Both the default and minimum carbon prices could be announced as schedule of prices over time, with the default price operating prior to emissions trading, and the minimum price operating after the transition (Figure 1). To provide confidence, we consider it would be valuable for the default price trajectory to 2020 to be legislated from the outset. This could be accompanied by a mechanism to increase the default price trajectory after 2015 if emissions do not begin to trend down.⁶ There are a variety of ways for implementing a minimum price, among them a reserve auction price and additional tax or fee on each unit of emissions (Wood and Jotzo 2010). Consideration could be given to imposing a levy on the use of international permits or to requiring emitters to purchase a 'permit to use international permits'. This would provide a floor under the domestic price regardless of the global price.

Figure 1: Illustration of price trajectories



⁶ If desired, the default price could be increased by an independent body to ensure emissions are declining by a minimum amount in trend terms, or within a specified range (such as between 1% and 3% per year).

Price levels

Under the proposed policy strategy, the precise initial default price is essentially a matter of judgement, taking account of the need for institutional credibility. The initial price could be low relative to the required medium term price level in order to help manage concerns about managing transition in living costs and business input costs in the context of other assistance measures, provided that a credible trajectory to an adequate medium term price is in place. A useful benchmark for an 'adequate' price level would be one that provides confidence that domestic emissions will trend down over time.

What price levels fulfil this condition is a matter for economic analysis, and is subject to a wide range of views (Table 1). Government modelling undertaken by Treasury suggests a real price (in \$2005) rising by 4% per year to \$35/tCO₂e in 2020 would result in emissions stabilising until around 2030, while a real price rising to \$50 would see a trend decline in emissions from around 2015⁷ (Australian Government 2008a: Table 6.1 and Chart 6.4).

Table 1: Illustrative permit prices

	Garnaut (2008) fixed price	EU emissions trading scheme allowances (EUAs) ^c			Treasury (2008) modelling	
		2011 allowances spot price	Projection by Deutsche Bank	Forward price at 2011 for 2020 allowances	CPRS –5 scenario	CPRS –15 scenario
Inflation-adjusted prices ^a	2011	2011 ^c	Average 2013-20	2020	2020	2020
2005A\$	\$20/t				\$35/t	\$50/t
2011A\$ ^c		\$22/t				
2012A\$	\$25/t				\$43/t	\$62/t
2013-20 A\$ avg			\$44/t at present exchange rate, range \$39 to \$57t ^b			
2020A\$				\$33/t at present exchange rate, range \$29 to \$43t ^b	\$51/t	\$73/t
Euro (nominal)		e16/t	e32/t	e24/t		

Notes: ^a Inflation adjustment on the basis of historical and projected Australian consumer price index, and Reserve Bank of Australia inflation target. ^b Assuming A\$/euro exchange rate between 0.56 and 0.86, corresponding to historical high and low respectively. ^c 2011 data is for early March. Data sources: spot price from PointCarbon; EUA futures from http://www.barchart.com/commodityfutures/ICE_ECX_EUA_Futures_Futures/CKH1; projections from Deutsche Bank (2011)

⁷ This analysis assumed livestock emissions would be subject to an emissions price signal from 2015.

Given the well established tendency for ex ante analysis to overstate adjustment costs and understate emission reductions from market based policies (Goodstein 2005, Daley and Edis 2010), this implies a default price path that increases from the administratively determined starting price in 2012 to \$40 to \$50 in 2020 (real 2005\$) plus inflation would be consistent with the published Treasury analysis. This is equivalent to around \$50 to \$60 in 2020 at today's prices, and with inflation this would be expected to give a nominal price of \$60 to \$75/tCO_{2e} in 2020.

For comparison, forward prices for EU emissions allowances in EU emissions trading markets are 24 euro/t for 2020, which – depending on the future exchange rate – may convert to somewhere between \$30 to \$45/t, based on the past band of the exchange rate). Futures contracts currently traded take account of uncertainty about future policy settings and other risks, so a price expectation without risk adjustment would be higher than these futures prices. This is reflected for example in the carbon price projections by Deutsche Bank (2011), which project an average price for EU permits of 32 euro/t on average over the period 2013 to 2020, which may translate to around \$40 to \$55, and higher prices at 2020 given the projection is an average over time for a rising trajectory.

Depending on the initial price, this approach could involve rapid year-to-year increases in price in the early years of the scheme. A higher initial price would involve lower rates of increase to achieve a given medium term price. Fast rates of permit price acceleration in the early years do not present a conflict with normal rates of return on investment, however, as permits cannot be banked in this period.

As an illustration, a starting price of \$36 in 2012 rising at 4% per year real (that is plus indexation for inflation) becomes a default price of \$50 at 2020. Starting values prevalent in the recent Australian debate have, however, been significantly lower, with values between \$20 and \$30 frequently mentioned. This implies that the carbon price would need to approximately double by the end of the decade. If the starting price were \$25 in 2012, equivalent to the \$20 (in \$2005) suggested by Garnaut (2008), then it would have to rise by 12% real per year for five years until catching up with the 4% trajectory in 2017 (Figure 1). Alternatively, the price could be raised in linearly in steps year on year, such as a \$5 increment each year.

After 2020, the default price could increase by 3-5% per year plus indexation for inflation, in line with the Treasury (Australian Government 2008) and Garnaut Review (2008) assumption of a 4% per year real increase in permit prices.⁸

Setting the appropriate level for a minimum price that may operate during the early years of a market price requires a degree of judgement. The impact of different carbon prices on investment decisions have been widely discussed, with estimates of the carbon price required to shift new electricity investment from black coal to gas ranging from around \$25 to \$50/tCO_{2e} (Graham 2010). In practice, however, the iconic value of enacting a minimum price may be more important than the specific value of this price. For simplicity, we thus suggest the minimum price be specified as a percentage of the default price, such as 50-70% of the default price level outlined above. In practice, if the default price path is close to the best estimate of the medium term carbon price that will just cause domestic emissions to trend down, then the gap between the default price and the minimum price trajectories ought to be small, and vice versa. Setting the minimum price below the default price trajectory also

⁸ This reflects that emission permits will be a form of asset and will be expected to pay a comparable return on investment to other assets with similar risk profiles (commonly referred to as the inter-temporal arbitrage condition or the Hotelling price path, see Australian Government 2008:93)

provides an incentive for business to support the transition from an administratively determined price to a market determined price, especially if and when the rising default price exceeds prices in international permit markets.

Assistance to households and industry

How carbon pricing is distributed to different interests in society is a lynchpin of achieving societal consensus. Experience with the CPRS has shown that industry interests are prominent in the Australian debate. However there has been strong and increasing realisation that households, in particular at the lower end of the income scale, need to be assisted with the transition. In addition, there are demands for support for climate change programmes from carbon pricing revenue. Government has committed to revenue-neutral implementation of carbon pricing, so distribution between different groups and purposes is a zero-sum game.

The economic litmus test for providing assistance is that it is provided without compromising incentives to reduce emissions, as laid out above. Cutting income taxes would be the preferred mode of providing assistance to households, and any assistance given to industry needs to be decoupled from their actual emissions levels to preserve their incentives to invest in lower-carbon equipment.

The magnitude of payments to different groups is, however, a pivotal factor in the quest for societal consensus, and for the longer-term sustainability of the policy. Under the CPRS, assistance payments in form of free permits to emissions-intensive trade exposed (EITE) industries were linked to output of these sectors, with the ratio of free permits to output declining by 1.3 percent per year. This could have resulted in EITE industries receiving an increasing share of carbon pricing revenue over time, putting an increasing burden on the rest of the economy (Pezzey, Mazouz and Jotzo 2010).

The risk of strain on the societal consensus from increasing industry assistance through time could be avoided by limiting overall industry assistance to a given percentage of total scheme revenue, for example 20 percent as proposed in the original Green Paper on the CPRS (DCC 2008a). Insofar as this cap was reached, it would also promote scrutiny of claims for assistance among different industries. In addition, setting a higher 'decay rate' for industry assistance may be a useful.

In assessing industries' claims for assistance, it needs to be considered that mitigation policy action in many other countries, including developing countries, has ramped up over the last few years (Jotzo 2010b, Garnaut 2011a), and that starting an Australian scheme with a fixed price eliminates the upside price risk on businesses' carbon liabilities. Together, these factors present a strong argument for a lower amount of industry assistance than was anticipated under the CPRS, and/or for accelerated phase-out of industry assistance.

6. Concluding comments

Achieving significant reductions in greenhouse emissions will require effective policies that are capable of achieving the working societal consensus required for stable long term policy. This is not straightforward. We consider Australia's highly contested policy environment, the very high profile of climate and environmental issues in public debate, and highly emission intensive economic structure provide an interesting context to explore the process of crafting worthwhile and attractive policy strategies. The conclusion however is a positive one: trade-offs between policy goals, such as efficiency and effectiveness, and political imperatives are not always necessary: sometimes we can satisfy both.

The analysis in this paper suggests four central arguments.

First, linking the Australian carbon price to the world carbon price (through uncapped use of international permits to acquit domestic emissions obligations) severs the link between the domestic carbon price and Australia's national emissions target, with the carbon price determining domestic emissions and the associated pace of economic adjustment, and the target determining our overall contribution to the global effort, both through cutting emissions domestically and investing in mitigation overseas. Linking Australia's carbon price to the world price is economically desirable and usually assumed in modelling analyses, yet the resulting separation of roles between the carbon price and the emissions target does not appear widely recognised in Australian public discussion and political debate.

Second, delinking the carbon price and the national emissions target has a significant impact on the political economy of emissions reductions, with the result that there are no direct 'first order' conflicts between the major underlying constituencies across any of the substantive interests and issues identified. Rather the conflicts between constituencies arise through indirect 'second order' interactions across issues – although the potential for consensus may be blocked if key constituencies and opinion leaders are persuaded by partial analysis or pursue second-order passions and grudges.

Third, we identify an efficient and effective policy strategy which appears capable of attracting a working societal consensus. This would involve setting an administratively determined price with a legislated increase over time to a level that influences investment decisions sufficiently for Australia's emissions to begin to fall from current levels, compared to a strong underlying growth trend. The starting price would largely be a matter of judgment, provided the policy credibly commits to an adequate price level in the medium to longer term, influencing near term investment decisions. This achieves both long run reductions in emissions and a manageable economic transition, noting that Australia would still rely on international emissions permits to supplement domestic abatement and meet our future international emissions commitments. Achieving this potential consensus would require key constituencies to focus on their core interests, however, allowing them to find common ground.

Fourth, we find that hybrid policy approaches – in particular starting with price control and later transitioning to quantity control for emissions – appear to have valuable economic advantages for a small open and emissions intensive economy such as Australia, given current significant uncertainties about future world climate policy action and associated world carbon price outcomes. At its simplest level, starting with a fixed price and later moving to cap-and-trade allows an orderly transition from allocating costs and risks to government (at the point when reform is introduced), and reducing short run price risks and volatility, to allocating price and investment risks to major emitting businesses over time, consistent with the broad polluter pays principle.

The analysis also illuminates aspects of policy design and calibration for Australia.

In the recent public debate in Australia, values for the starting price for carbon between \$20 and \$30/t are often mentioned. However in order to be confident that Australia's domestic emissions will start trending downward, the carbon price will probably need to be upwards of \$60/t in nominal terms (around \$50/t in today's prices) by 2020. Doubling of the carbon price from a relatively low base would be feasible, and best achieved by steady ramp-up during the fixed price period.

Our analysis suggests that societal consensus will require a high share of carbon pricing revenue to be returned to households, in particular those in lower income brackets, and predominantly in the form of income tax cuts. As a corollary, assistance to industry would need to be limited. Options are to cap total industry assistance at a fixed share, and to apply provisions for more rapid phase-out of industry assistance. This appears reasonable given increasing mitigation policy action in many countries, and the fact that industry will be relieved of upside price risks during the fixed-price phase of the scheme.

Finally, land-based carbon sequestration activities are of significant policy interest, have large potential but are surrounded by uncertainty. They could be supported through an offset scheme linked to the phased pricing scheme. During the fixed-price period they would not reduce mitigation in the sectors covered by carbon pricing, but would diminish fiscal revenue from the scheme – in other words, government would ultimately pay for any offset credits. Combined with competing demands for carbon pricing revenue, this may warrant a cap on offsets, and there may be arguments for separate arrangements for supporting land-based mitigation.

7. References

- Abbott, T., 2010, Transcript: tony Abbott's campaign launch, *News.com.au*, 8 August 2010
- ABC Radio National, 2008, *Protest against the 2010 emissions trading scheme* (Guest: Ron Knapp, Australian Aluminium Council), ABC News, 24 July 2008 (www.abc.net.au/rn/breakfast/stories/2008/2312886.htm)
- Australian Associated Press (APP), 2008, Woodside warns ETS threatens LNG project, *The Sydney Morning Herald* 27 August 2008
- Australian Business Roundtable on Climate Change (ABRCC), 2006, *The Business Case for Early Action*, ABRCC (April 2006) (www.businessroundtable.com.au)
- Australian Conservation Foundation (ACF), 2008, *Weak target sees Govt fail crucial leadership test*, ACF Media Release, Melbourne (15 December 2008)
- Australian Conservation Foundation (ACF), 2010, *Sound principles for a price on pollution*, ACF Media Release, Melbourne (21 December 2010)
- Australian Council of Social Service (ACOSS), 2008, *Carbon Pollution Reduction Scheme – Green Paper July 2008: Response by the Australian Council of Social Service (ACOSS)*, ACOSS, Sydney (September 2008)
- Australian Government, 2008a, *Australia's Low Pollution Future: The economics of climate change mitigation*, Commonwealth of Australia, Canberra
- Australian Industry Group (AIG) / Ridout, H., 2010, *Competitiveness of Australian industry key to climate debate: Statement by Mrs heather Ridout, Chief Executive, Ai Group, AIG* (October 2010) (www.aigroup.com.au/mediacentre/releases/archive2010)
- Business Council of Australia (BCA) / Gailey, G., 2008, Respond to Carbon with Care, *The Australian* (10 July 2010) (www.bca.com.au/Content/101470.aspx)
- Carson, R.T., Louviere, J.J., and Wei, E., 2010, Alternative Australian climate change plans: The public's views', *Energy Policy* 38 (2010) 902-911
- Climate Institute, The (TCI), 2007, *Climate of the Nation: Australian attitudes to climate change and its solutions, March 2007*, TCI, Sydney
- Climate Institute, The (TCI), 2008, *Climate of the Nation: Australian attitudes to climate change and its solutions, April 2008*, TCI, Sydney
- Climate Institute, The (TCI), 2010, *Climate of the Nation: Australian attitudes to climate change and its solutions, August 2010*, TCI, Sydney
- Department of Climate Change (DCC), 2008a, *Carbon Pollution Reduction Scheme: Green Paper* (July 2008), Commonwealth of Australia, Canberra
- Department of Climate Change (DCC), 2008b, *Carbon Pollution Reduction Scheme: Australia's Low Pollution Future, White Paper Volume 1* (December 2008), Commonwealth of Australia, Canberra
- Department of Climate Change (DCC), 2008, *Carbon Pollution Reduction Scheme: Australia's Low Pollution Future, White Paper Volume 1* (December 2008), Commonwealth of Australia, Canberra
- Department of Climate Change (DCC), 2010, *Australia's Fifth National Communication on Climate Change: A report under the United Nations Framework Convention on Climate Change, 2010* (December 2009, released January 2010), DCC/Commonwealth of Australia, Canberra
- Department of Climate Change and Energy Efficiency (DCCEE), 2011a, *Australia's emissions projections 2010* (December 2010, released February 2011), DCCEE/Commonwealth of Australia, Canberra.
- Department of Climate Change and Energy Efficiency (DCCEE), 2011b, *Australia's emissions projections 2010: Spreadsheet data* (released February 2011), DCCEE/Commonwealth of Australia, Canberra.

- Department of Climate Change and Energy Efficiency (DCCEE) / Comley, B., 2010, *Incoming Government Brief – Strategic Brief: The Climate Change and Energy Efficiency Portfolio*, DCCEE (September 2010)
- Deutsche Bank (2011), *Commission's Roadmap to 2050 keeps open the idea of a set-aside*, DB Global Markets Research (Isabelle Curien and Marc-C Lewis), 8 March.
- Farr, M., 2009, *Tony Abbott new Liberal Leader*, The Daily Telegraph, 1 December 2009
- Freebairn, J., 2011, *A Tax Mix Change to Reduce Greenhouse Gas Emissions*, 55th AARES National Conference, Melbourne.
- Graham, P., 2010, *Energy Futures for Australia*, Invited presentation to the First Australian Earth System Outlook Conference, Australian Academy of Science, 10 December 2010, Shine Dome, Canberra
- Garnaut, R., 2008, *The Garnaut Climate Change Review*, Cambridge University Press, also available at www.garnautreview.org.au.
- Garnaut, R., 2011a, *Progress Towards Effective Global Action on Climate Change*, Garnaut Climate Change Review Update 2011.
- Garnaut, R., 2011b, *Transforming Rural Land Use*, Garnaut Climate Change Review Update 2011.
- Gillard, J., 2009, *Address to the Green Skills Forum - New Convention Centre – Melbourne*, Speech: Minister for Education, Employment and Workforce Relations, DEEWR, 23 October 2009 (www.deewr.gov.au/Ministers/Gillard/Media/Speeches/Pages/Article_091023_...)
- Gillard, J., 2010, *2011 will be a year of delivery – and decision: Speech to the Council for the Economic development of Australia, Sydney*, Transcript, Department of Prime Minister and Cabinet, Canberra (29 November 2010)
- Gillard, J., Swan, W., Brown, B., Bandt, A., Milne, C., 2010, *The Australian Greens and the Australian Labour Party – Agreement*, Canberra (1 September 2010)
- Gillard, J., Swan, W., Combet, G., 2010, *Prime Minister Establishes Climate Change Committee*, Joint Press Release: Prime Minister, Deputy Prime Minister and treasurer, and Minister for Climate Change and Energy Efficiency, Canberra (27 September 2010)
- Goodstein, E., 2005, *Economics and the Environment*, Fourth Edition, Wiley, USA
- Hatfield-Dodds, S., 2006, 'The Catchment Care Principle: A new equity principle for environmental policy, with advantages for efficiency and adaptive governance', *Ecological Economics* 56(3): 373-385
- Hatfield-Dodds, S. and Morrison, M., 2010, *Confusing opportunity costs, losses and forgone gains: Assessing the effect of communication bias on support for climate change policy in the United States and Australia*, Centre for Climate Economics and Policy (CCEP) working paper 9.10, Crawford School, ANU, Canberra (December 2010)
- Hatfield-Dodds, S., Nelson, R., Cook, D., 2007a, *Adaptive governance: An introduction, and implications for public policy*, ANZSEE Conference paper, Noosa Australia, July 2007
- Hatfield-Dodds, S., Jackson, E.K., Adams, P.D., and Gerardi, W., 2007b, *Leader, follower or free rider? The economic impacts of different Australian emission targets*, The Climate Institute, Sydney, Australia.
- Hatfield-Dodds, S., Turner, G., Schandl, H., Doss, T., 2008, *Growing the Green Collar Economy: Skills and labour challenges in reducing our greenhouse emissions and national environmental footprint*, Report to the Dusseldorp Skills Forum, CSIRO Sustainable Ecosystems, Canberra (June 2008)
- Jotzo, F. (2010a), 'Copenhagen targets and Australia's climate commitment', Centre for Climate Economics and Policy (CCEP) policy brief, Crawford School, ANU, Canberra (October 2010)
- Jotzo, F. (2010b), 'Comparing the Copenhagen emissions targets', Centre for Climate Economics and Policy (CCEP) working paper 1.10, Crawford School, ANU, Canberra (October 2010)
- Jotzo, F. and Betz, R., 2009, 'Australia's emissions trading scheme: opportunities and obstacles for linking', *Climate Policy*, vol. 9, pp. 402-414.

Kirk, A., 2010, Green propose interim carbon tax, *ABC News*, 21 January 2010 (www.abc.net.au/news/stories/2010/01/21/2797559.htm)

Kloppers, M., 2010, Speech to the Australian British Chamber of Commerce, September 15, available at <http://www.climatespectator.com.au/commentary/marius-kloppers>.

Macey, J., Business urges certainty of climate policy, *ABC News*, 13 July 2010 (www.abc.net.au/am/content/2010/s2951826.htm)

McKibbin, W. J., and Wilcoxon, P. J., 2002. The Role of Economics in Climate Change Policy. *The Journal of Economic Perspectives* 16 (2), 107-129.

McKibbin, W. J., Morris, A., and Wilcoxon, P. J., 2009. *A Copenhagen Collar: Achieving Comparable Effort Through Carbon Price Agreements*, in: *Climate Change Policy: Recommendations to Reach Consensus*, The Brookings Institution, Washington, D.C., 26-34

Minerals Council of Australia (MCA), 2009, *Backgrounder on the Carbon Pollution Reduction Scheme: Parliamentary Brief*, MCA (June 2009)

Moran, A., 2008, Wong right to put off our targets, *The Australian* (2 December 2008)

Morrison, M., and Hatfield-Dodds, S., 2011, 'The Success and Failure of An Inconvenient Truth and the Stern Report in Influencing Australian Public Support for Greenhouse Policy', *The Economic Record* (published on line 12 January 2011)

MPCCC, 2011, *Proposed architecture of a carbon price mechanism*, Multi-Party Climate Change Committee, Canberra, 24 February 2011.

Nielson, L., Styles, J., Talberg, A. And Tomaras, J., 2009, *Bills Digest: Carbon Pollution Reduction Scheme Bill 2009 [No.2]*, No. 59 2009-10, Parliament of Australia, Canberra (29 October 2009)

Parkinson, M., 2010, *Climate Change and the Australian Reform Agenda*. Sir Leslie Melville Lecture 2010, Australian National University, Canberra (28 June 2010)

Pezzey, J.C.V., Mazouz, S. and Jotzo, F., 2010, 'The logic of collective action and Australia's climate policy', *Australian Journal of Agricultural and Resource Economics*, 54: 185-202.

Prime Minister's Task Group on Emissions Trading (PMTGET), 2007, *Report of the Task Group on Emissions Trading*, Department of Prime Minister and Cabinet, Canberra

Prime Minister's Task Group on Energy Efficiency (PMTGEE), 2010, *Report of the Prime Minister's Task Group on Energy Efficiency*, Department of Climate Change and Energy Efficiency, Canberra

Robbins, L., 1935, *An Essay on the Nature and Significance of Economic Science*, 2nd edition, Macmillan, London

Rudd, K., Swan, W., Wong, P., 2009, A New target for Reducing Australia's Carbon Pollution, Joint Press Release: Prime Minister, Treasurer and Minister for Climate Change and Water, Canberra (4 May 2009)

Sandmo, A., 1975, Optimal taxation in the presence of externalities, *Swedish Journal of Economics* 77: 86-98

Stern, N., 2008, The economics of climate change. *American Economic Review* 98(2): 1-37

Sims, R., 2010, *Energy Market Outlook – Overview of presentation to Multi-Party Climate Change Committee*, DCCEE, Canberra (10 November 2010)

Southern Cross Climate Coalition (SCCC), 2008, *Towards an Effective and Fair response to Climate Change: A joint statement by the Australian Conservation Foundation, Australian Council of Social Service, Australian Council of Trade Unions and The Climate Institute*, SCCC (6 July 2008)

Stern, N., and Taylor, C., 2010, *What do the Appendices to the Copenhagen Accord tell us about global greenhouse gas emissions and the prospects for avoiding a rise in global average temperature of more than 2°C?*, Centre for Climate Change Economics and Policy / Grantham Research Institute on Climate Change and the Environment, March 2010 (www.lse.ac.uk/grantham)

UNEP / den Elzen, M., Hare, W., Höhne, N., Levin, K., Lowe, J., Riahi, K., Rogelj, J., Sawin, E., Taylor, C., van Vuuren, D., Ward, M., and others, 2010, *The Emissions Gap Report Are the Copenhagen Accord pledges sufficient to limit global warming to 2° C or 1.5° C? A preliminary assessment*, United Nations Environment Programme (UNEP), November 2010 (www.unep.org/publications/ebooks/emissionsgapreport)

Uniting Church in Australia (UCA), World Vision Australia et al, 2010, *Civil society statement on a credible plan on pollution and climate change*, 1 September 2010 (www.unitingjustice.org.au/component/content/article/9-living-sustainably/235-civilsocietystatementclimatechange010910.html)

WWF-Australia, 2008, *Australia's carbon emissions target of 5-15% 'pitiful': WWF*, WWF-Australia, Sydney (15 December 2008)

Wood, P.J. and Jotzo, F., 2011, 'Price floors for emissions trading', *Energy Policy* 39(3): 1746-1753.