Assessment of Australia's policies impacting its greenhouse gas emissions profile

CLIMATE ACTION TRACKER

AUSTRALIA

Conducted by Ecofys and Climate Analytics
29 November 2011

The authors

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Other colleagues from Ecofys and Climate Analytics contributed to multiple aspects of the analysis and were instrumental in delivering the study. **Jan Grözinger** (buildings), **Vivian Schüler** and **Gesine Hänsel** (AFOLU), **Michiel Schaeffer** (modeling and AFOLU and review), **Hanna Fekete** and **Marcia Rocha** (data analysis).

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EXECUTIVE SUMMARY

What we evaluate

The Climate Action Tracker (CAT) provides information to help answer the question:

"Will current – and pledged – international climate action be enough to limit the negative effects of climate change by holding long term global temperature increase below 2°C"?

The CAT compares and assesses national and global action against a range of different climate targets across all relevant time frames, starting with an ongoing analysis of countries' current emission reduction pledges[1].

This report assesses Australia's climate policies and is the first of a series of country analyses addressing the following questions:

- Are policies implemented to meet the country's own targets and which approach the targets required for a global 2°C or lower (1.5°C) pathway in 2020?
- Do implemented policies lead towards a low carbon future in 2050?

While our focus is on domestic action, we acknowledge that international targets and pledges are often contingent on international mechanisms - international trading of carbon units for developed countries and international financial support for developing countries.

As with the broader Climate Action Tracker project, the CAT Country Assessments track progress in elements that contribute to the global efforts to hold warming below 2°C above pre-industrial temperatures.

Australia's Clean Energy Future Package makes break with the past

Australia has long been regarded as lagging behind the rest of the world in terms of implementing climate policies. Although it does have in place a number of policies established over the last decade, these have not had a significant effect on the trajectory of greenhouse gas emissions growth.

Due to the special provisions of the Kyoto Protocol's Article 3.7, Australia was able to account for the reduction in its deforestation emissions that occurred in the early 1990s without significantly slowing the growth of greenhouse gas emissions from the energy and other industrial sectors. Australia is therefore well within reach of meeting its Kyoto target for the period 2008 to 2012, taking into account energy and industrial greenhouse gas emissions[2], afforestation, reforestation and deforestation emissions and removals.

The passage of the 18 Acts that form the Clean Energy Future Legislative Package through the House of Representatives on October 18, 2011 and the Senate on November 8 is a ground breaking development that we estimate is likely to change the trend of emissions in a positive direction. This legislation establishes a framework for significant and long-lasting emission reductions.

The Clean Energy Future Plan has the potential to become the cornerstone instrument for low carbon development in Australia - but requires substantial enhancement. The policies differ significantly in stringency and do not completely cover some areas that could potentially have a large impact on emissions.

With very high per capita emissions and a rising population, Australia's starting point is difficult – and shows that the longer a country delays strong policies, the more difficult it will be.

[1] Results are published and constantly updated under www.climateactiontracker.org.

[2] This refers to sources of greenhouse emissions listed in Annex A to the Kyoto Protocol (http://unfccc.int/resource/docs/convkp/kpeng.html), principally carbon dioxide from fossil fuel combustion and other greenhouse gases from this source, industrial and agricultural activities. This does not include greenhouse gas emissions and or removal from land use, land use change and forestry (LULUCF) activities.

We recognise that the threat by Australia's Leader of the Opposition to withdraw the current efforts does create uncertainty for investment and decreases effectiveness of the instrument. However, we have evaluated the impact of policies under the assumption that the currently implemented measures and efforts continue at the present level, independent of possible changes in the administration.

Given the dynamic nature of policy development and implementation, the analysis in this report must be seen only as a snapshot.

How does current policy compare to a long-term low-carbon future?

Prior to the adoption of the Clean Energy Future plan, there was insufficient policy effort to significantly change the upward trajectory of emissions (Figure A). Australia was lagging behind the European Union, Japan, Norway and other industrialised countries, and behind the policy frameworks that China has put in place.

The comprehensive Clean Energy Future Plan defines a legislated strategy that, if fully implemented, would almost reach the 5% reduction from 2000 levels by 2020 'unconditional' target through domestic action. The Clean Energy Future Plan involves deep and far-reaching policy changes:

Carbon price - The centrepiece of the strategy is the introduction of a carbon price for the biggest polluters. It is scheduled to start on 1 July 2012 with a fixed price, moving to an emissions trading system (ETS) in 2015.

Renewable energy - The Renewable Energy Target of 20% share of renewable electricity production was reaffirmed.

The new Australian Renewable Energy Agency will support activities and administer a A$ 3.2 billion budget to promote renewable energy.

A new 'Clean Energy Finance Corporation' will be set up to enhance private investment in efficiency and renewable energy technology.

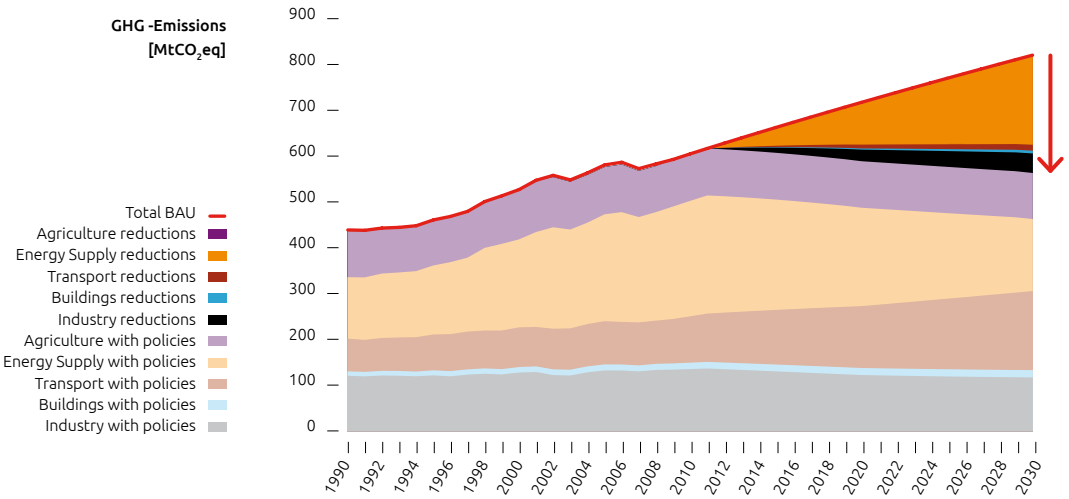
Energy efficiency - Energy efficiency efforts by households, industry and the electricity sector will be affected by the carbon price. Additional support will be provided through the 'Low Carbon Communities' program and an energy savings initiative.

Closure of 2000 MW of highly polluting coal-fired electricity production plants will improve efficiency of the energy sector.

Land use - Agriculture and forestry are not subject to the carbon price. The 'Carbon Farming Initiative' will instead allow farmers and land managers to create Kyoto-compliant credits from activities to reduce emissions or to increase carbon storage.

Figure A

Emissions and emission reductions (excl. LULUCF) for 'Policies including Clean Energy Future' up to 2030



We have scored how well Australia is doing in the various sectors and policy areas, as seen in the Table A below. We rate policies in each area against a predefined low carbon policy package that would be needed to be on a pathway towards 2°C.

As can be seen from Table A, highlights in Australia's current policy compared to the low carbon policy package are its general climate strategy (rated B) and it support for renewables in electricity generation (rated A).

Table A
Rating against the low carbon policy package[3]

	Changing activity	Energy efficiency	Renewables	Low carbon	Other
General	–	–	–	–	**B**
Energy supply	–	**E**	**A**	LC **F** REN **G**	–
Industry	**G**	D	F	LC **F** REN **G**	**F**
Buildings	**F**	**D**	E	No score	–
Transport	**F**	**F**	E	**G**	–
Agri-culture/ Forestry	E	–	–	–	**D**

Scoring matrix

>=	Rating	Interpretation
0	**G**	No or very limited policies
0.57	**F**	Few policies, ambition level low
1.14	**E**	Some policies with medium ambition level
1.71	**D**	Comprehensive package or good ambition level for a wide range of policies
2.29	**C**	Comprehensive policy package, ambition level good
2.86	**B**	Pathway is set, minor improvements required
3.43	**A**	Consistent with low carbon development

[3] Size of the symbols indicate importance (mitigation potential), letter indicates stringency compared to low carbon policy package (A= emission development consistent with a global path towards 2°C with or without external support, G=no or very limited policies). The low carbon policy package has two alternatives. One version suggests using carbon capture and storage (CCS) as well a nuclear energy (left score under "low carbon"), the other sees CCS and nuclear energy as a barrier to renewable energy (right score under "low carbon").

Australia's binding target of 80% reduction by 2050 provides guidance on the intended long-term trajectory, which is in line with our low carbon vision. The Renewable Energy scheme with a target of 20% in 2020 is likely to be achieved due to high penalties for participating parties if they don't comply. Further highlights are presented in Table B.

There are policy areas that the Government has covered inadequately, e.g. energy efficiency in transport or non-energy emissions in industry, both with significant emission reduction potential but both rated F.

Australia has not yet implemented emissions standards for light vehicles - and the levels it is proposing are too low and would be introduced too late. There are very limited incentives for efficiency improvements for heavy vehicles apart from some information programmes.

Efforts to reduce methane from mining would only stabilise those emissions, not reduce them. Further gaps between the low carbon policy package and the policies of Australia are provided in Table C.

We identified further policies and actions that could contribute substantially to increasing greenhouse gas emission (GHG) reductions. They include:

Climate strategy

- Australia could agree on the more ambitious end of its short-term targets for 2020 (e.g. 25 % below 2000) to be better prepared to reach its 2050 target of -80%. While the legislation puts the appropriate instruments in place to achieve the necessary change, it is only a first step to meet the 5 % target. Its long-term effectiveness will depend on the ability of successive Governments to increase stringency and coverage of the instruments over time.
- Australia could decide not to include deforestation emissions in their base year for their international pledge (2000) whilst maintaining the same target. This would increase the level of effort required to meet their target and reduce the allowed energy and industrial greenhouse gas emissions in 2020.

Electricity supply

- Given the vast renewable resources available in Australia, the government could give significantly more support to renewable energy, in particular in industry, buildings and transport with deeper targets for 2020 and 2030. Additional incentives to those already introduced could help development in such direction. The Clean Future Energy Plan only provides limited additional incentives for renewable energy.
- Changing a centralised distribution structure to a decentralised and smart grid oriented system is necessary to ensure a fast deployment of renewable energy. When considering large-scale geothermal and solar thermal generation in remote areas, high voltage direct current (HVDC) transmission line technology would be particularly necessary.

Industry

- Energy efficiency in industry and electricity generation could be further stimulated by a national white certificate scheme, which is already in planning but it's unclear if it will be implemented. Some states have introduced similar schemes, so there is already significant experience to draw on.
- Additional financial support for research in methane-capturing technologies in the mining sector would lead to more emission reductions. Waste emissions could also be targeted with policies that increase recycling rates to avoid landfilling and methane capturing at landfill sites.

Buildings

- More attention needs to be given to activities in non-residential buildings. This includes incentive schemes that could also cover commercial buildings, as well as the inclusion of commercial equipment in performance standards. Overall performance standards for appliances could be increased and a system for regular revision and update (e.g. Top-runner approach) implemented.
- Incentives for energy- related retrofit could be improved and implemented at national level.

Transport

- The inclusion of heavy transport in the carbon price mechanism is already envisioned by the Government, but still requires a final decision and implementation.
- The Government is considering the implementation of light vehicle GHG emission standards in 2015. The envisaged standard could already start as early as 2012, which would allow a swifter uptake of more efficient vehicles. The system could be further improved with an inbuilt system of review and improvement over time.
- Massive infrastructure investment in urban public transport, bike and pedestrian infrastructure and rail infrastructure would be required to ensure a long term transition to low carbon transport modes.

Agriculture and forestry

- Australia could take further action to ensure that deforestation emissions are reduced by addressing land clearing emissions in urban areas, addressing illegal deforestation by providing incentives to land holders and stop old growth forest clearing.
- Australia could move to stop old growth forest logging (e.g. in Tasmania) as these forest systems are significant carbon stores.
- Australia could further enhance agriculture policies to promote sustainable land management through good farm and rangeland management.

Table B
Highlights of Australian policy

	Changing activity	Energy efficiency	Renewables	Low carbon	Other
General	▸ The binding target of 80% by 2050 is in line with low carbon vision. ▸ Clean Energy Finance Cooperation with a budget of A$ 10 billion will invest in businesses seeking for funding of innovative clean energy and technologies.				
Electricity supply	–	▸ Generator Efficiency Standards which set efficiency standards for new entrants ▸ The Clean Energy Investment plan for generators receiving free permit in the ETS	▸ The Renewable Energy scheme with a target of 20% in 2020, including a strict implementation with high penalties for participating parties	▸ Carbon price mechanism will stop the new construction of coal power plants. Gas will be used in future ▸ Closure of 2000 MW brown coal power plants and replacement by highly efficient gas power plants	–
Industry		▸ Energy Efficiency Opportunity Program (EEOP) - an energy efficiency audit scheme ▸ The carbon price mechanism	▸ The A$ 200 million Clean Technology Innovation Program, which is foreseen to support R&D for renewable energy, low pollution technology and energy efficiency in industry ▸ The carbon price mechanism	▸ Clean Energy Initiative: A$ 1.7 billion for CCS in Industry, funding to support construction and demonstration of large-scale integrated carbon capture and storage projects in Australia	▸ the Carbon Price mechanism will fully cover CH_4, N_2O and PCF as well as emissions from landfill ▸ HFCs and SF_6 will be covered by a tax ▸ carbon farming initiative covering landfill before 2012
Buildings	▸ The *National Urban Policy* analyses major cities and the population strategy. Strategic plans are to be in place from 1 January 2012	▸ Several programmes for energy efficiency improvements as Equipment Energy Efficiency Programme, Phase-out inefficient lighting, High Efficiency Strategy for Heating, ventilation and air condition, the National energy savings initiative, with a focus on households ▸ Phase-out of GHG-intensive water heaters, Rebates for residential buildings in many states to support the exchange of water heating systems ▸ Building Code of Australia (BCA), the Low Carbon Communities programme and Tax Breaks for Green Buildings programme.	▸ Phase-out of GHG-intensive water heaters also supports renewable water heaters. ▸ Renewable Energy Bonus Scheme - Solar Hot Water Rebate (REBS) ▸ National Solar Schools Programme	No relevance for Australia.	–
Transport	▸ TravelSmart initiative in WA provides a good concept in directly working with communities to address travel behaviour (both activity and efficiency)		▸ Mandatory bioethanol (10%) and biodiesel (2%) quotas in NSW		–
Agriculture / Forestry	▸ Insufficient measures to promote sustainable consumption ▸ Implement consistent land use strategy on a national level	–	–	–	▸ Increase non-offsetting activities in the sector ▸ Provide intensive complementary activities to ensure uptake of farmers and landowners, e.g. information dissemination, training, research and development

Table C
Gaps in policies compared to the low carbon vision

	Changing activity	Energy efficiency	Renewables	Low carbon	Other
General	▸ Ambitious binding greenhouse gas reduction target, consistent with major effort-sharing approaches (-80% to -95% by 2050 for developed countries) ▸ Comprehensive and consistent long term strategy beyond 2020				
Electricity supply	–	▸ Active support for CHP ▸ Enhancement of grid development and further efforts to reduce distribution losses ▸ Removing subsidies	▸ While the rating is high, there is a risk of failure of the target in case of no or low incentives to improve grid access for Renewable Energies ▸ The deployment of REN should be more differentiated	▸ Policies, financing mechanisms and strategies that support the increasing use of CCS for coal and biomass	–
Industry	▸ No policies in place to support increasing material efficiency, long product lifetime	▸ No mandatory implementation of identified measures in EEOP ▸ Tax too low for stimulating energy efficiency	▸ No direct support for renewable energy ▸ No framework for sustainable biomass import	▸ Low support for coal, gas, biomass and process emissions CCS	▸ No absolute reduction in CH_4 from mining. These emissions are covered by policy but due to rapid expansion will only be stabilised
Buildings	▸ Implementation of strategic plans and embedding of climate as a core element in urban planning	▸ No or very low support for energy efficient retrofitting. ▸ Buildings must fulfil the energy performance requirements according to 6 stars, but the path to 10 star buildings (nearly zero energy) is not defined. ▸ The non-residential sector is not covered by all measures.	▸ Incentives for renewables are mainly for hot water. No coverage of all technologies (e.g. heating systems) and no national coverage.		–
Transport	▸ Insufficient infrastructure investment and incentives to promote non-motorised transport. ▸ Insufficient investment in public transport infrastructure and services ▸ Low fuel prices provide little incentive for behavioural change	▸ Carbon emission standards for light vehicles under discussion are not yet implemented, below required levels and too late ▸ Very limited incentives for efficiency improvements for heavy vehicles apart from some information programs	▸ Strengthen incentives at national scale, especially for transport sectors that are not covered by the carbon price ▸ Implement a framework that ensures sustainability and effective carbon reductions from biofuels	▸ Incentives for low carbon technologies are very limited and need to be strengthened to facilitate the required increase ▸ There are currently no measures in place to promote electric mobility	–
Agriculture / Foresty	▸ Insufficient measures to promote sustainable consumption ▸ Implement consistent land use strategy on a national level	–	–	–	▸ Increase non-offsetting activities in the sector ▸ Provide intensive complementary activities to ensure uptake of farmers and landowners, e.g. information dissemination, training, research and development

Analysing energy intensity and carbon intensity

Development of the energy intensity (energy use per GDP) - and carbon intensity (emissions per unit of energy) are important factors in evaluating a country's progress towards a low carbon economy.

Australian energy intensity has been steadily decreasing over the past 20 years. However, BAU projections indicate a slowing down of this trend. Policies implemented, specifically the renewables target, are projected to improve intensity beyond the long-term trend, approaching a 39% reduction from 2005 levels by 2035. While positive, this falls short of the (non-binding) target of APEC countries[4] of achieving a 45 % reduction in energy intensity compared to 2005 levels by 2035.

Carbon intensity has declined historically, yet overall it remains at a high level. In the BAU this is projected to continue, but slower than the historical trend. Policies put in place with the Clean Energy Future package have the potential to accelerate decarbonisation and could reach around 3 kt CO_2/ktoe by 2030, a 16 % reduction below BAU and 6% below the policies in place before the package was introduced.

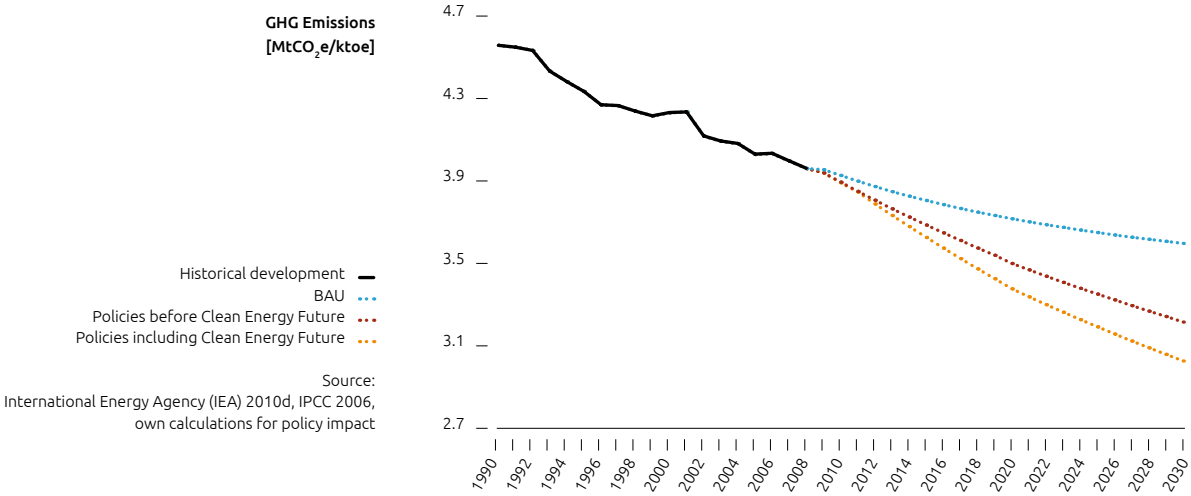
Impact of policies on emissions and pledges

Australia's GHG emissions excluding LULUCF (Land Use, Land Use Change and Forestry) have increased by 75 % since 1990 (2008 levels) and, under BAU, are projected to grow further to around 731 Mt CO_2e until 2030. This would represent an increase of 187 % compared to 1990 levels.

With the new Clean Energy Future Plan, this emissions growth could be dramatically reduced, leading to 74% above 1990 levels in 2030 - a reduction of almost 200 Mt CO_2e or 27 % below BAU in 2030. Reductions in 2020 are expected to be 16 % below BAU, but total emissions would still be 38 % above 1990 levels.

Article 3.7 of the Kyoto Protocol allows Australia to calculate its base year emissions as the sum of energy and industrial GHG emissions in 1990 and its deforestation emissions in 1990[5]. The emission target for the first commitment period of an 8 % increase relative to 1990 is applied to emissions in this base year. Effectively, Australia is allowed a 42 % increase in energy and industrial GHG emissions in the period 2008-2012 compared to 1990.

Figure B
Carbon intensity projections to 2030



[4] http://www.apec.org/Meeting-Papers/Leaders-Declarations/2011/2011_aelm.aspx
[5] For 1990 emissions from afforestation / reforestation activities were zero, so total ARD emissions for this year are equal to pure deforestation emissions

One of the key issues is evaluating how the Clean Energy Future package places Australia in relation to its international emission reduction pledges. Due to the accounting rules of the Kyoto Protocol, this requires putting together the actions on greenhouse gases covered by the Kyoto Protocol's energy and industrial GHG emissions (all sectors but excluding LULUCF) along with the projections for Kyoto Protocol afforestation, reforestation and deforestation (ARD) activities (i.e. only part of the full LULUCF sector) for 2020.

First, we evaluate Australia's 5 % reduction from 2000 levels by 2020 pledge using a 2000 base year that includes energy and industrial GHG emissions and emissions from afforestation, reforestation and deforestation (ARD). This is the way Australia has defined its pledge.

Figure C shows the projected effects of the Clean Energy Future policies, including Australian Government projections of ARD, on energy and industrial GHG plus ARD greenhouse gas emissions to 2020 compared to the range of Australia's international pledges. This indicates that the effect of the Clean Energy Future policies is not yet sufficient to meet Australia's unilateral pledge of a 5% reduction from 2000 levels by 2020 domestically.

Figure C compares energy and industrial GHG emissions plus afforestation, reforestation and deforestation (ARD) BAU trends to both the effects of policies - and the range of international pledges Australia has made (5 %, 15 %, 25 %). It shows, for comparison, the historical data for energy and industrial GHG emissions only.

Figure C
Clean Energy Future policies and Australia's international pledges including afforestation, reforestation and deforestation (ARD), CRF = the UNFCCC's Common Reporting Format

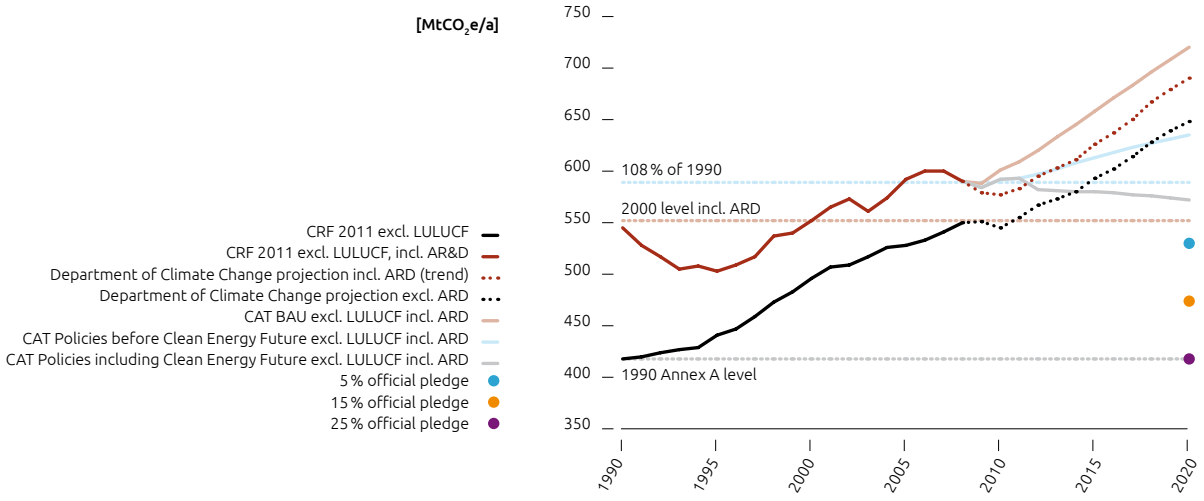


Figure D shows the estimated emissions of energy and industrial GHG emissions resulting from the Clean Energy Future package in 2020, taking into account two different estimates of ARD emissions in 2020.

We calculated the "allowed" energy and industrial GHG emissions under the -5 % by 2020 pledge.

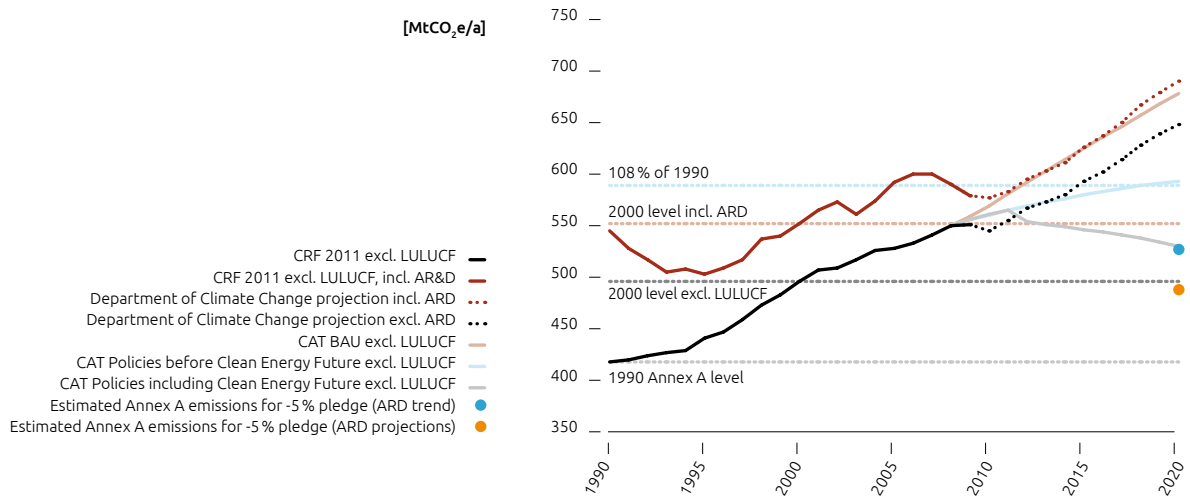
In the first estimate, we used the ARD recent historical trend that continues to 2020 with decreasing deforestation emissions and increasing storage of carbon. The allowed energy and industrial GHG emissions would be 26 % above 1990 levels. In this case, the Clean Energy Future package would be close to sufficient to meet this pledge.

In the second estimate, we used the Australian Government's projections for ARD. The results here show that the "allowed" 2020 energy and industrial GHG emissions would be 17 % above 1990, in which case the Clean Energy Future package would be insufficient to meet the -5 % by 2020 pledge.

For the more ambitious international pledges of 15 % and 25 % below 2000 levels by 2020, the ARD government projections and extended trend cases translate into allowed energy and industrial GHG emissions in the range of 3-13 % above 1990 and -1 to -10% below 1990 respectively. Only in the latter case would emissions of energy and industrial GHG gases drop below 1990 levels.

In all cases these reductions are less ambitious than what Australia needs to do to be on a path towards keeping global warming below 2°C, the temperature limit that it signed up to in both Copenhagen and Cancun.

Figure D
Clean Energy Future policies and energy and industrial GHG emissions



Content

1 | INTRODUCTION

Introduction

The Climate Action Tracker (CAT) provides information to help answer the question:

"Will current – and pledged – international climate action be enough to limit the negative effects of climate change by holding long term global temperature increase below 2°C"?

The CAT compares and assesses national and global action against a range of different climate targets across all relevant time frames, beginning with an ongoing analysis of countries' current emission reduction pledges[1].

This report is the first of a series of country analyses where the Climate Action Tracker addresses the following questions:

- **Are governments implementing policies to meet their own targets and to approach the targets required for a global 2°C or lower pathway in 2020?** This will include quantitative analysis of the effectiveness of policies. It will be driven by "deviation from reference" with all its complications: what is BAU before policies? What is the effect of action against this BAU? How are previous efforts factored in?
- **Are governments implementing policies for a low carbon future (in e.g. 2050)?** This turns the focus towards a "common endpoint" away from a "deviation from reference". We focus on whether countries have policies in place to meet a common endpoint: a low carbon economy. The core approach is to analyse "facilitating policies": policies that provide a coherent and consistent strategy to achieve a long-term low-carbon future, eliminate barriers to implementation and enhance incentives for stakeholders and sectors to ultimately make an economy-wide transition. Such method is independent of a BAU, or even immediate emission reductions, and can focus on the positive messages that some countries are progressing well in this direction (because of current *and/or* past actions).

We assess a country's domestic action and aim to provide a profound basis for national and international policy discussion. Our analysis provides policy makers and stakeholders with an independent assessment of the country's current policy environment and what this means towards an ambitious, long term goal - and more immediate targets.

While our focus is on domestic action, we acknowledge that this does not always directly relate to international targets and pledges. These are often contingent on international mechanisms - international trading of carbon units for developed countries and international financial support for developing countries.

Our analysis can help clarify the gap between current domestic action and the pledges, thus stimulating discussion on how best to close the gap, taking into consideration the international regime.

In this report we present the results for Australia. The following chapters include a brief description of our methodology (chapter 2), a short introduction of the economic, environmental and political context of Australia (chapter 3), results of the evaluation of existing policies in Australia (chapter 4) and a summary of our findings as well as a description of the way forward (chapter 5).

[1] Results are published and constantly updated under www.climateactiontracker.org.

2 | METHODOLOGY

This chapter provides a brief overview of the methods used for this assessment. A detailed description of the method is provided in a separate technical paper.

2.1 General approach

The basis of the analysis is the collection of data and information on policy and its effectiveness. Information and data gathering is organised along the segments shown in Figure 1 below. The evaluation produces a qualitative assessment for the long and medium term, but also supports the quantification of policy impact, which then results in emissions pathways for implemented and planned policies.

For the calculation of emission pathways we use a simple and transparent Excel based bookkeeping tool. On the basis of a business as usual scenario we calculate the impact of already implemented policies as well as of planned policies to 2030. These scenarios provide the basis for assessing progress towards 2020 pledges and the overall trend towards 2030.

Figure 2 illustrates the different elements of the analysis and the different outcomes related to the time frames analysed.

Figure 1
Dimension of the analysis - definition of segments

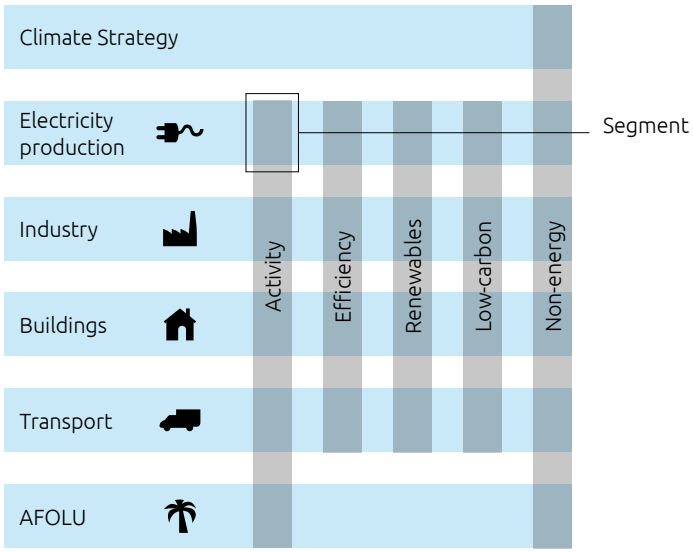
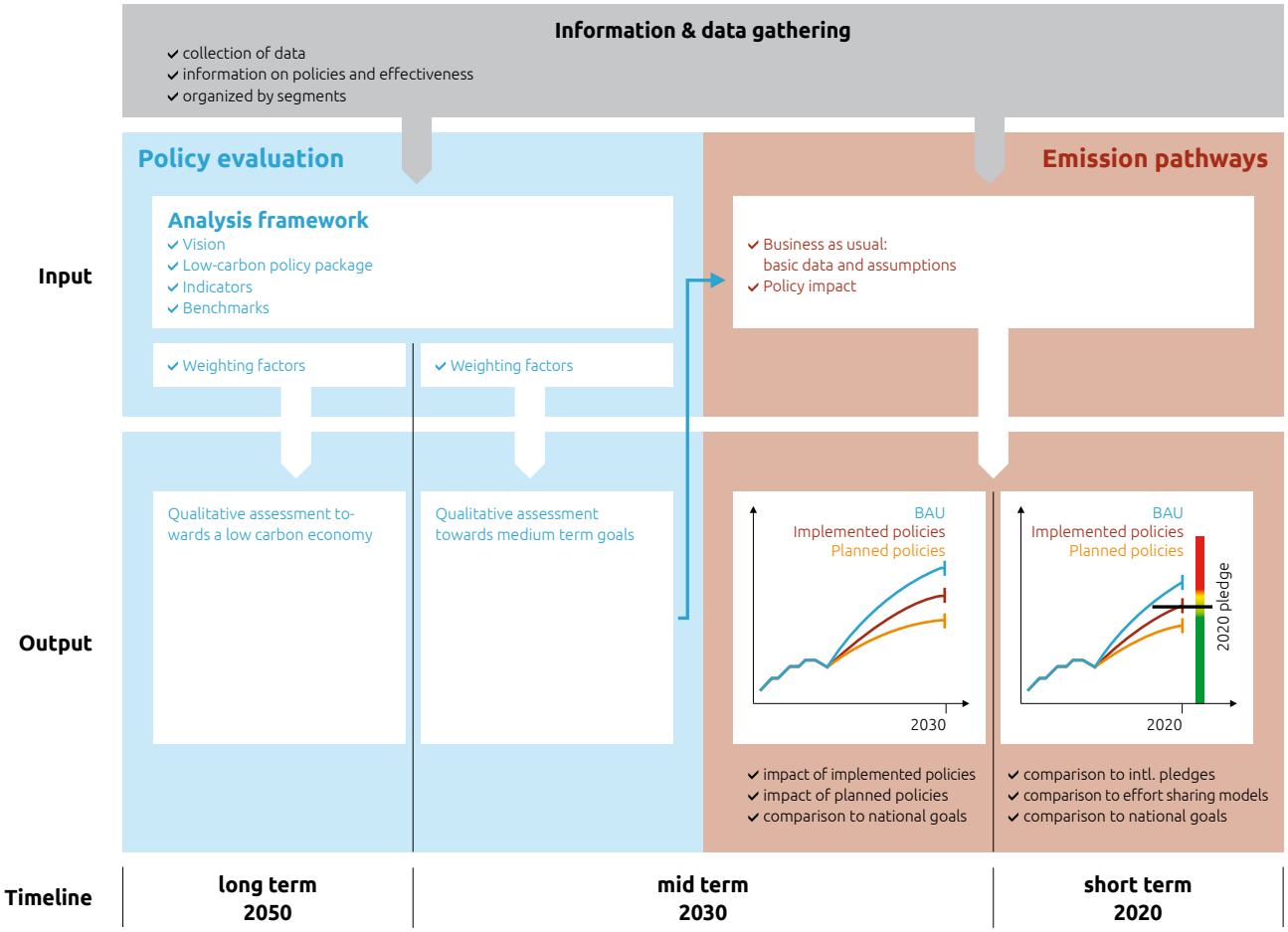


Figure 2
General approach for country analysis



2.2 The low carbon vision

Based on the review of various low-carbon scenarios[2], we developed a framework vision of a low carbon future. This constitutes the benchmark for the Climate Action Tracker. The common major features of the scenarios are as follows:

- **Ambitious energy efficiency improvements:** A fully sustainable low-carbon future is only possible if all energy efficiency potentials are fully implemented in a very ambitious way.
- **100 % carbon free energy supply by 2050:** The scenarios show that 100 % carbon free energy supply is technically possible and economically feasible. We use two alternatives to reach this. The first is that a 100 % renewable energy supply is technically possible and economically feasible: significant adjustments to the electricity grid are necessary. The alternative is that carbon capture and storage as well as nuclear energy can be used. Sensitivity to these assumptions is provided in the report.

[2] e.g. "The Energy report: 100 % renewable Energy in 2050" (WWF 2011); "World Energy Outlook 2010" [International Energy Agency (IEA) 2010e] and "Energy technology perspectives 2010" [International Energy Agency (IEA)]; The Economics of Low Stabilization: Model Comparison of Mitigation Strategies and Costs" (Edenhofer 2011); "Energy [r]evolution: a Sustainable Global Energy Outlook" (Greenpeace International and European Renewable Energy Council 2008)

- **Wide application of zero emission buildings:** Buildings need to be retrofitted to very high energy efficiency standards at least twice as fast as current practice. These renovated buildings and all new buildings need to be zero-emission buildings.
- **Paradigm shift in industrial production:** Not only is energy efficiency necessary, but material efficiency must be significantly improved. Industrial production must be redefined to move away from material-intensive products to long lasting, almost 100 % recyclable products.
- **Almost fully decarbonised mobility:** Provided there is a massive shift away from individual energy-based mobility, the remaining passenger car fleet must meet ambitious requirements both regarding efficiency and fuels used. Sustainably-produced biomass will be used in areas where there are no technological alternatives, e.g. trucks, aviation and shipping. Hence, passenger cars have to use alternative technologies, e.g. run on electricity with suitable batteries or other storage options.
- **New options to reduce emissions in agriculture:** Major reductions in non-energy emissions in agriculture are necessary. Where there are currently no mitigation options, research must be intensified.
- **Comprehensive land use strategies:** Comprehensive land use strategies need to be developed to solve the potential conflict in use of land. Land use can be optimised to reduce transport emissions. Agricultural products, forests and wood production compete for food production, as a source of biofuels and for carbon storage, biodiversity and other ecosystem services. We do not determine whether carbon sequestration in biomass or bio-energy should be favoured. Additionally, a framework for sustainable biomass production must be in place to ensure biomass used for energy purposes is produced in a sustainable way that actually decreases emissions. Where biomass imports occur, a framework to ensure the sustainability of these imports is required to ensure that leakage is minimised.
- **Halting deforestation:** global deforestation needs to be halted in the early half of this century.
- **Prompt action:** While global emissions need to peak no later than around 2020 to set the world on a pathway consistent with 2 and 1.5°C warming limits, power plants, industrial investments, infrastructure and transport fleets have life cycles of multiple decades. Hence, action has to start immediately to initiate a fast transformation. Participation and the phase-in of all major emitting countries is required within the coming decade.

To make this happen, fundamental changes in all sectors are needed. Policies need to be evaluated against how far they are able to trigger these fundamental changes. No single instrument can achieve this. It is essential to combine single policy measures into a coherent package both within each policy area, as well as between the different areas.

Our approach does not require an explicit representation of these elements of the low-carbon vision in policies and measures. The method is to assess if, ideally, Australia is implementing a comprehensive and economy-wide integrated set of instruments that facilitate this development.

In other words, the policy packages need to form a coherent and consistent strategy to achieve a long-term low-carbon future, eliminate barriers to implementation and enhance incentives for stakeholders and sectors to ultimately make an economy-wide transition.

2.3 From vision to policies

At the heart of the analysis is the definition of a **'low carbon policy package'** that contains the policies necessary to reach a low carbon economy.

We look at both positive and negative aspects of policy, i.e. those that support the low carbon goal and those that are barriers and need to be removed.

Table 1
Low carbon policy package

	Changing activity	Energy efficiency	Low carbon			Other
			Renewables	With nuclear/CCS (low carbon vision)	Without nuclear/ CCS (100 % renewable vision)	
Climate Strategy	▸ Ambitious binding greenhouse gas reduction target, consistent with major effort sharing approaches ▸ Comprehensive and consistent long term strategy beyond 2020					
Electricity (heat) supply	(Electricity production is driven by the demand of the other sectors)	**Efficiency of fossil fuel power plants:** leading to average efficiency of 45 % (coal) and 60 % (natural gas) in 2030 or inventive is > 100 US$/tCO$_2$) **Combined heat and power production (CHP):** leading to 10 % additional share of electricity production in 10 years **Reduction of distribution losses:** leading to 4 % distribution losses in 2030	**General incentives for the production of electricity from renewable energy sources:** supporting at least 10 % points increase in share in 10 years **Support different technologies:** including sufficient support for 1-2 high price technologies (PV, geothermal power, biogas…) **Support for adapted electricity grids** **Sustainability standards for biomass use** **Removal of administrative and grid barriers**	**Policies that influence fuel choice:** taxes, emissions trading, emission performance standards in the order of 100US$/tCO$_2$e **Support for biomass CCS:** demonstration scale plants are supported **Support for coal CCS:** support for substantial increase in capacity **Support for substantial increase of nuclear capacity**	**Policies that influence fuel choice:** taxes, emissions trading, emission performance standards in the order of 100US$/tCO$_2$e **Support for biomass CCS:** demonstration scale plants are supported **Support for coal CCS is a *barrier* to renewable energy** **Support for substantial increase of nuclear capacity is a *barrier* to renewable energy**	Not applicaable
Industry	**Restructuring industry towards high material efficiency:** leading to 0.5 % additional material efficiency improvement per year	**General incentives such as taxes, subsidies, ETS:** tax >100 % of energy price or leading to 0.5 % additional annual increase in energy efficiency	**General incentives:** energy taxes (> 100 % of energy price) and subsidies, ETS, overall leading to additional 5 % in 10 years **Sustainability standards for biomass use**	**Support for coal and gas CCS:** 10 % in 2030 **Support for CCS on biomass and process emissions:** 10 % in 2030	**Support for CCS on biomass and process emissions:** 10 % in 2030 **Support for coal and gas CCS is a *barrier* to renewable energy**	**Reduce N_2O process emissions:** to 10 % of historical maximum by 2030 **Reduce fugitive CH_4 from oil and gas production:** to 10 % of historical maximum by 2030 **Reduce CH_4 from waste:** by 20 % below BAU by 2030 **Reduce emissions of F-gases**
Buildings	**Urbanisation policy that leads to energy efficient development**	**Efficiency standards for new buildings:** zero energy by 2020 **Support to increase energy efficient retrofit rate:** 3 % per year **Incentives for efficient electrical appliances:** leading to 1-2 % less electricity use per year **General incentives:** taxes in the order of 100 % of the energy price **Removal of barriers, e.g. subsidies**	**Support for renewables in new and existing buildings:** increase in share of 10 % in 10 years **General incentives:** taxes in the order of 100 % of the energy price **Sustainability standards for biomass use:** national and imported	**Support for fossil fuel switching (to gas)**		Not applicable
Transport	**Strategies to avoid transport or to move to non-motorised transport:** 4 % avoided by 2020 **Strategies for modal shift:** 8 % increase of capacity by 2020 **General incentives:** e.g. tax of the order of 100 % of energy price	**Incentives for efficiency in light vehicles:** trajectory to reach 95g/km in 2020 for new cars **Incentives for efficiency in freight transport:** reduce specific emissions by 20 % by 2020 **General incentives:** e.g. tax of the order of 100 % of energy price	**Incentives for renewables in transport:** additional share of 10 % by 2020 **Sustainability standards for biomass use:** national and imported	**Support for fossil fuel switching (to gas) an other low carbon technologies** **Support for electro mobility (cars and infrastructure):** 5 % electric cars by 2020		Not applicable
Agriculture, Forests and other land use	**Incentives for sustainable consumption practices** **Consistent land use strategy exists and is implemented** **Land use register exists**	Not applicable				**Decrease livestock CH_4 and N_2O emissions:** by 3 % below BAU in 2030 **Decrease cropland and organic/peaty soils, all non-CO_2 emissions (including rice production):** 5 % below BAU in 2030 **Implement measures CO_2 on cropland**

We measure how effective a policy package is by looking at whether we can prove the direct relationship between the political influence on the actors (e.g. taxes, regulations, incentives) and the policy's intended effect (reaching of target e.g. through sectoral change).

We only evaluate **policy packages**, i.e. all policies relevant within a segment, and not individual policies or measures. Often only the combination of a range of measures creates the desired impact.

The packages are designed to reflect the desired effect of policy instruments. We do not prescribe the use of specific policy tools and some will have effect on a range of segments, like tax incentives or carbon trading mechanisms.

The scoring system

If a policy does not deliver the expected results, it is not always easy to assess whether this is because the policy has not been driven properly, or because of existing barriers. We have developed an indicator for both incentives and barriers to allow for this.

For each indicator we defined a benchmark - on the basis of the defined vision. The benchmark is descriptive, but aims to include quantified expected results where possible.

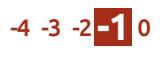
Incentive scores: 0 to 4

Scale for scoring incentives

We evaluate incentives on a scale against the defined benchmarks, from 0-4, where 4 is excellent.

Barrier scores: -4 to 0

Scale for scoring barriers



We evaluate barriers on a similar scale, from -4 to 0, where 0 means that barriers have been addressed. This negative score counts against its related incentive.

We evaluate the impact of policies that have been adopted, i.e. the proven and future expected effects of measures that are **fully implemented**.

Where policies have already been in place for some time we evaluate both the past effectiveness and the expected effects of the policy.

Policies that have just recently been implemented are evaluated on the basis of their design and potential effectiveness.

We aggregate the individual scores per segment to an overall rating between 0 and 4. This segment rating is translated into a scale from A to G according to the matrix in table 2.

Table 2
Scoring matrix

Assessment value	Rating	Interpretation
>=		
0	G	No or very limited policies
0.57	F	Few policies, ambition level low
1.14	E	Some policies with medium ambition level
1.71	D	Comprehensive package or good ambition level for a wide range of policies
2.29	C	Comprehensive policy package, ambition level good
2.86	B	Pathway is set, minor improvements required
3.43	A	Consistent with low carbon development

2.4 From policies to emissions

The development of emission pathways is based on a highly simplified, excel-based model: the "book-keeping model". This is to provide transparency, allowing discussions about the model, its assumptions and results to be accessible to people with limited modeling or technical background.

The "book-keeping model" works at the level of energy and emission data and does not include activity data (e.g. kilometers driven per car and year). The output from the policy analysis directly affects either energy consumption or greenhouse gas emissions.

The basis for the calculation of the policy scenario is the business as usual (BAU) scenario. It consists of two parts:
1. Historic energy use and emissions
2. Projected energy use and emissions

Before being able to quantify the emission pathways that result from the policy analysis, we translated the results from the policy evaluation into a format that can be used as an input in the 'book-keeping model'.

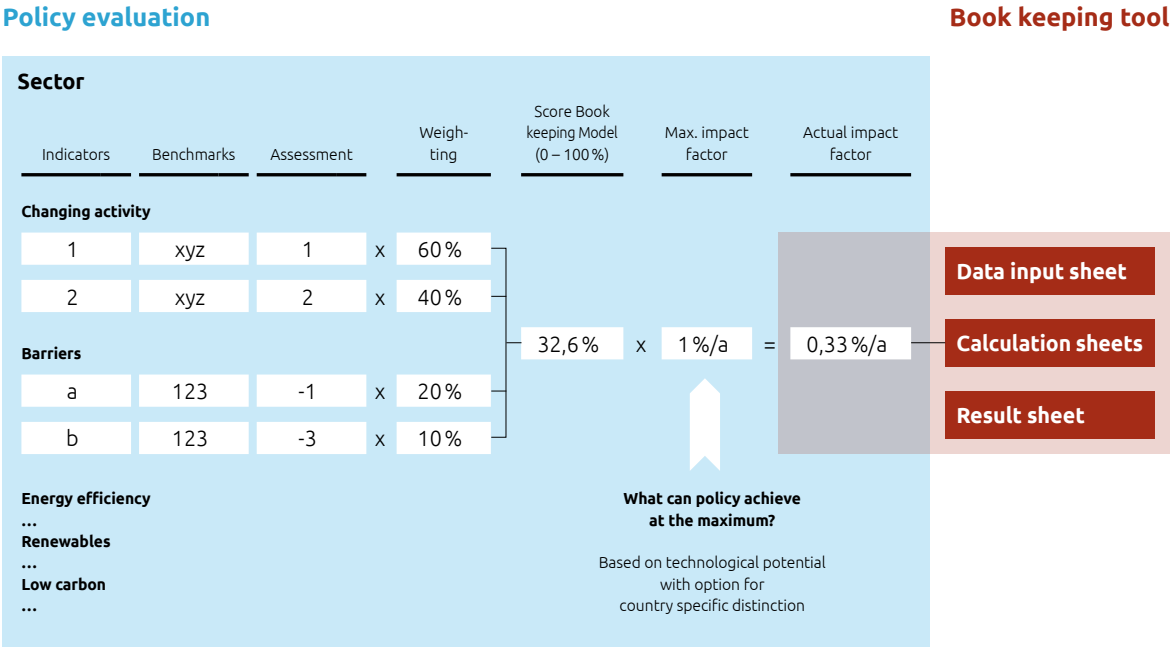
We had to aggregate the indicator scores, including both incentives and barriers. For example, all scores that drive the share of renewables in a sector have to be aggregated.

For each of the aggregated scores we defined a 'maximum impact factor' and multiplied it with its associated **'book-keeping model score'** to derive the **'actual impact factors'**. We then used the actual impact factor in the calculations for that segment.

For the resulting policy projections and scoring we differ between two scenarios:
1. Policies before Clean Energy Future: which includes all policies in place except the Clean Energy Future Package
2. Policies including Clean Energy Future scenario: which includes the new legislation

The final evaluation in this report is based on the "Policies including Clean Energy Future" scenario. We introduced the two scenarios to show the additional effect by the new policy package.

Figure 3
From policy evaluation to emissions pathways



2.5 Data sources

We use a variety of data sources for the determination of historic emissions and projections of future emissions. An important factor for the choice of data sources is to ensure consistency within the dataset for historic and projected data and to enable comparability with other countries.

Table 1 shows the different data sources used for all sectors except AFOLU, which follows a different approach as outlined further below.

For the projections of energy use and non-energy emissions we generally use pre-defined energy and/or emissions scenarios from trusted sources, preferable an in-country institution.

For energy projections in this report we used the "Australian energy projections to 2029-30" published by the government of Australia in 2007 (Australian Bureau of Agricultural and Resource Economics (ABARE) 2007). ABARE published more recent projections that include the Carbon Pollution Reduction Scheme (CPRS) that was planned to be introduced by the Rudd Government, but never implemented. The latest projections could therefore not be used. The 2007 projections only includes four policies, which were subsequently excluded for our further policy evaluation:

- The Mandatory Renewable Energy Target (MRET) that was already achieved within the historic data set used in our analysis.
- The New South Wales Government's greenhouse gas abatement scheme.
- The Queensland Government's gas scheme.
- The Victorian Government's renewable energy target scheme.

For emissions projections we use data from the fifth national communication (Department of Climate Change 2010).

Emissions for AFOLU are determined by a combination of two approaches: for CH_4 and N_2O emissions we use UNFCCC inventory data; CO_2 emissions from land us change and forestry are calculated using the historic data for de- and afforested area, grassland and cropland from the "National Inventory Report 2009, Volume 2" (UNFCCC 2011). The appropriate values for the carbon content for the areas are taken from the IPCC Guidelines.

For all details on the methodology please consult the separate technical paper available on the Climate Action Tracker website (www.climateactiontracker.org).

Table 3
Sources for emissions data for the electricity supply, industry, buildings and transport sectors

	Historic data	Projections
Energy CO_2	▸ IEA energy balance 2010, final energy demand ▸ IPCC 2006 emission factors	▸ Australian energy projections ▸ (ABARE 2007) ▸ IPCC 2006 emission factors
Non-energy CO_2	▸ UNFCCC emission inventory - Common Reporting Format 2011 (Process emissions)	▸ 5th National Communication Australia
Other gases	▸ UNFCCC emission inventory - Common Reporting Format 2011	▸ 5th National Communication Australia

Table 4
Sources for emissions data for the AFOLU sector

	Historic data	Projections
CH_4 and N_2O (Agriculture)	▸ UNFCCC emission inventory - Common Reporting Format 2011 (non-energy)	▸ 5th National Communication Australia
CO_2 (ARD)	▸ UNFCCC emission inventory - Common Reporting Format 2011 (non-energy)	▸ Australia's emissions projections

3 | AUSTRALIA IN BRIEF

This chapter gives a brief introduction on Australia's economic, administrative and environmental context as well as on the major pillars of its climate policy.

3.1 Context

Geographic location, climate and administration

Australia covers an area of about 7.74 million km², and counts as an own continent located between the Indian Ocean and the South Pacific Ocean.

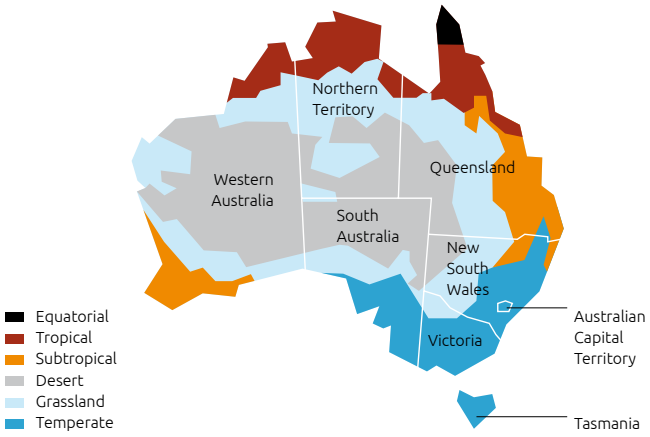
Australia's climate is dominated by dry, sinking air of the subtropical high-pressure belt, which moves north and south with the seasons. The continent is differentiated in climate zones from arid to semi-arid climate, temperate in the south and east and tropical climate zones in the north (see Figure 4).

Basic data

Area:	7.74 million km²
Population (2011):	21.5 million
Population density:	3cap/km²
GDP per capita (2010):	~ US$ 54,868
Human Development Index:	2

Sources: CIA 2011; UNFCCC 2009b; UNdata 2011; United Nations Department of Economic and Social Affairs (UN DESA) 2011; International Monetary Fund 2010

Figure 4
Different climate zones of Australia (Bureau of Meteorology 2011a)



Aridity is a significant issue, as 80% of Australia has less than 600 millimetres of rainfall per year and 50% has less than 600 millimetres per year and 50% having even less than 300 millimetres (Bureau of Meteorology 2011). Only Antarctica receives less rainfall per year. Otherwise heavy rainfalls and floods can occur depending on the variations of the El Nino phenomenon (Bureau of Meteorology 2011a).

The resulting weather extremes lead to a share of around 87% of the total economic damage due to natural disasters (storms, floods, cyclones, earthquakes, fires and landslides) from 1967 to 1999 (IPCC 2007).

The Commonwealth of Australia is a parliamentary democracy constituting a federation of six States (New South Wales, Victoria, Western Australia, South Australia and Tasmania) and two national territories (the Australian Capital Territory and the Northern Territory) (see Figure 4) and a Federal Government based in Canberra. The Federal Parliament is a bicameral system consisting of the House of Representative and the Senate. The responsibility for governing Australia is shared between three levels of government — the Australian Government, the governments of the six states and two territories and about 700 local government authorities (Department of Climate Change 2010).

Australia has a written Constitution which defines the responsibilities of the federal government, including foreign relations, corporations, trade, defence and immigration, but not explicitly energy or environmental power (Department for Foreign Affairs and Trade 2011). Thus, energy and climate change policy is shared between Federal, State and local level. Governments of states and territories are responsible for all matters not assigned to the federal government (MacGill 2007).

The head of the Commonwealth Government is the Prime Minister, who is elected by the House of Representatives and formally appointed by the Governor-General. The Governor-General has wide powers, but by convention acts only on the advice of Ministers on virtually all matters (Australian Government 2011a). The Governor-General is nominated by the Government and represents the British Monarch, Queen Elizabeth II, who is the constitutional monarch of Australia and of the Commonwealth realm.

The Council of Australian Governments (COAG) forms an intergovernmental forum consisting of the Prime Minister, the State Premiers, Territory Chief Ministers and the President of the Australian Local Government Association. The role of COAG is to develop and discuss policies which have national relevance, which also covers climate policy (Department of Climate Change 2010).

Social and economic situation

Australia's population was around 21.5 million in 2010. Average population density is extremely low, and mainly located along the coast of south-east, east and south-west Australia, an increasing share (64% in 2006 and 69% in 2007) live in urban areas (United Nations Department of Economic and Social Affairs (UN DESA) 2011.) In contrast to many other developed countries, population is rising. Between 1990 and 2010, population grew annually by 1.0% on average (see Figure 5). The growth rate is projected to increase in future and an increase in population of 20% is estimated by 2020 relative to 2008 (UNdata 2011; Department of Climate Change 2010).

About 57% of the population is based in south-eastern Australia: New South Wales and Victoria. The Northern Territory is the most sparsely populated territory with a share of around 1% of the total population (Australian Bureau of Statistics 2011b).

Per capita gross domestic product (GDP/cap) was US$ 54,868 in 2010, which ranks Australia in the world's top ten countries in the world in this regard. The average growth rate of the total GDP from 1990 to 2009 was 3.3% well above the OECD average of 2.2% and is expected to continue this trend (UNdata 2011; Department of Climate Change 2010, see Figure 5). GDP is mainly generated in the service sector (71.2%), followed by industry (24.8%). At 4%, the agricultural sector makes a minor contribution. (UNdata 2011; CIA 2011). Internationally, Australia is an important source for mining products, mainly coal, iron ore, and gold, as well as transportation equipment, agricultural products (wool, wheat), machinery and aluminium (CIA 2011).

Figure 5
Time series of historical (dark line) and projected data (light line) for population[3] (blue) and GDP[4] (brown)

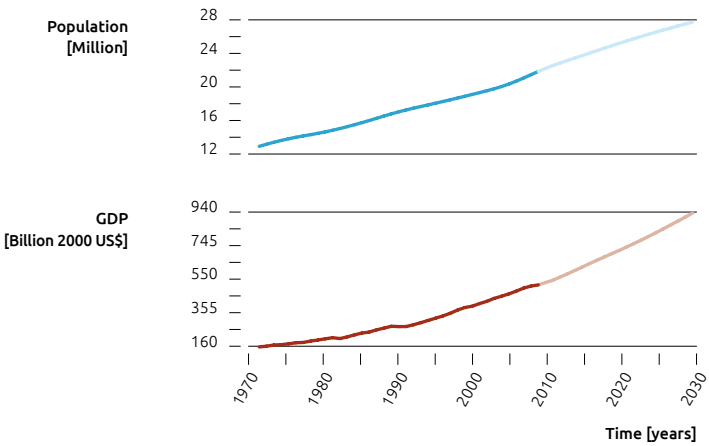
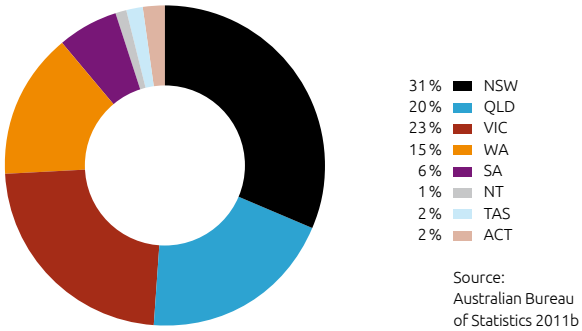


Figure 6
Contribution to the total GDP by state in 2010



Source: Australian Bureau of Statistics 2011b

The most important contributors to the gross value vary strongly between states. In 2009-10, the largest contributors to growth in each state were: New South Wales (NSW) - Financial and insurance services; in Queensland, Western Australia and Northern Territory – mining; Victoria - Professional, scientific and technical services & Financial and insurance services; Southern Australia - Manufacturing & Health care and social assistance; Tasmania - Financial and insurance services & Health care and social assistance; and Australia Capital Territory (ACT) – Construction (Australian Bureau of Statistics 2011b).

The three south-eastern states and Western Australia are economically the most important, together generating 89% of total GDP.

[3] Historical data and projections were obtained from the World Population Prospects: The 2010 Revision (Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat). We chose the medium growth case scenario for projections.

[4] The source for historical data was the IEA 2011. GDP values between 2008-2030 were estimated using annual growth rates delivered by World Bank World Development Indicators, International Financial Statistics of the IMF, HIS Global Insight, and Oxford Economic Forecasting. Unit: 2000 US$

Environmental issues

Australia has a wide range of climates ranging from alpine regions to desert and tropical rainforests that contain unique habitats. The resulting high level of biodiversity with unique animals and plants and the continent's old age is internationally recognised and is a treasure for biologists and earth historians, putting Australia in the category of a 'megadiverse' country (Department of Sustainability 2011).

Climate change poses acute risks for this unique continent. Projections show that without any action to tackle climate change, average temperatures across Australia will increase between 2.2 to 5°C by 2070 (compared to 1990) (Garnaut 2008). Studies indicate that warming of 2°C will overwhelm the capacity of many of natural ecosystems to adapt. For example, the survival of the Great Barrier Reef will be in danger as higher ocean temperatures and acidity levels cause major changes to coral reefs (Australian Government 2011j).

Other anthropogenic activities such as deforestation, bushfires, heavy exploitation of natural resources and resulting contamination of soils and water additionally threaten the mostly already fragile ecosystems.

Energy and CO_2 emission trends and projections to 2030

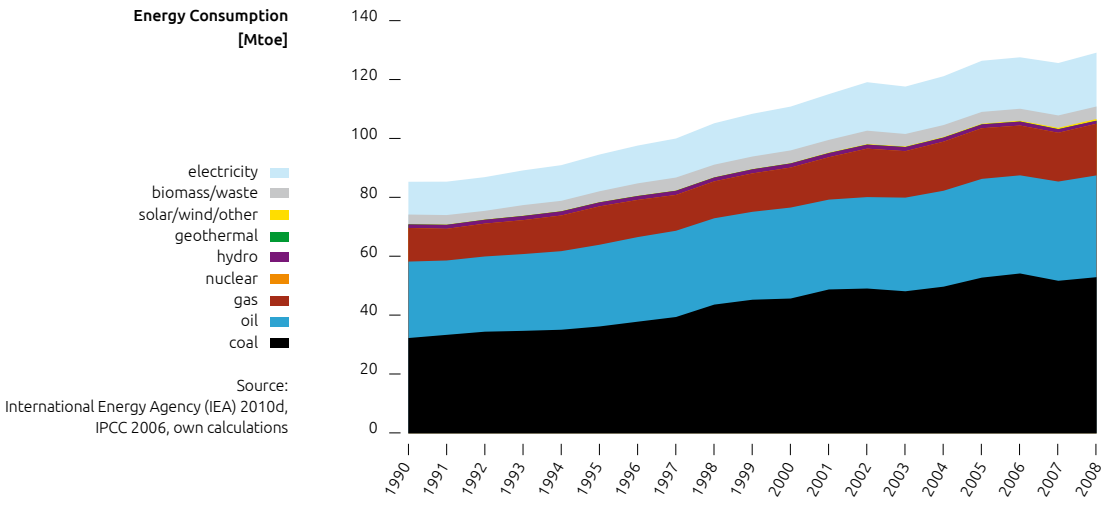
Energy consumption increased between 1990 and 2008 to about 130 000 ktoe (see Figure 7), growing by 60% in this time frame. Historically, energy supply has been dominated by fossil fuels, especially coal, oil and gas, which are mainly extracted domestically. Australia's fossil resources are still abundant, with the reserves to production ratio estimated at 180 years for coal, 20 years for oil and 58 years for natural gas (BP 2011). In 2008, the renewable energy share of the primary energy demand was 5% with biomass and waste-gas capture as the biggest contributors (3.7%).

Basic data

Total emissions (2008):	638 Mt CO_2e
Per capita emissions (2008):	29.7 t CO_2e
Rank of per capita emissions:	6
Emissions per GDP (2008):	0.77 kg CO_2e / US $

Sources: Garnaut 2008; International Energy Agency (IEA) 2009

Figure 7
Primary energy consumption in Australia 1990 – 2008



Source: International Energy Agency (IEA) 2010d, IPCC 2006, own calculations

The energy supply sector was responsible for 44% of the primary energy demand in 2008, followed by the transport sector, which consumed 23%. The industrial sector used 21% and the residential and commercial sector 12%. Energy intensity (energy use per $GDP) has seen a peak in the late 1970s and early '80s, with a continuous downward trend since then. Carbon intensity (CO_2 per energy unit) has fluctuated in the extreme, with a decreasing trend from around 2000. Together both elements have actually worked towards a decarbonisation of the Australian economy. However, this has been over compensated through increases in GDP per capita and population growth (see Figure 8 and Figure 9).

Figure 8

Time series of main drivers

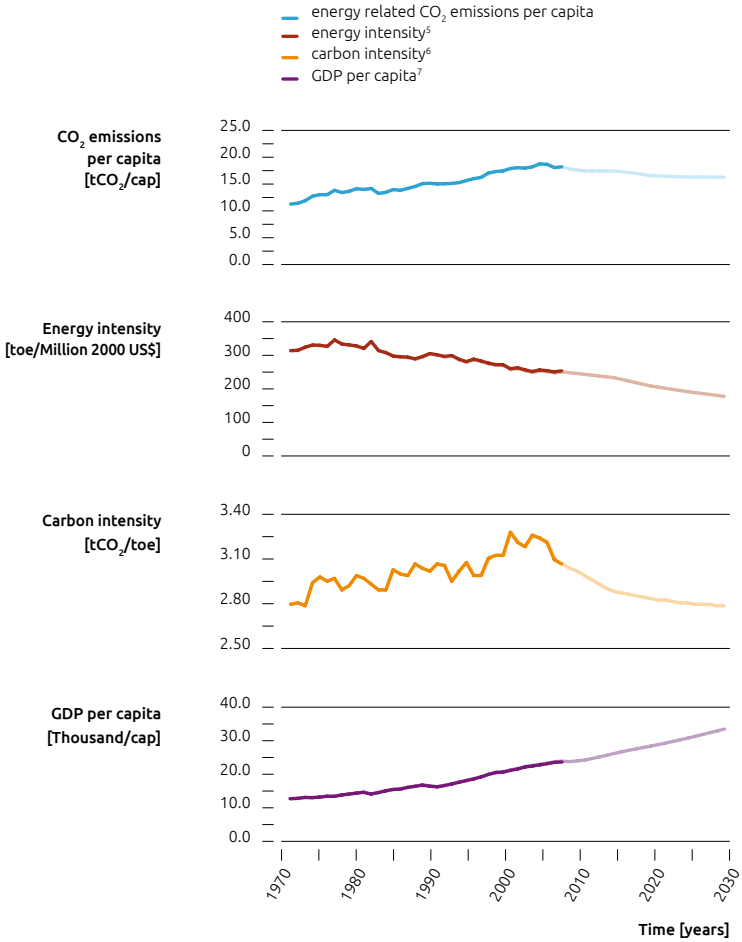
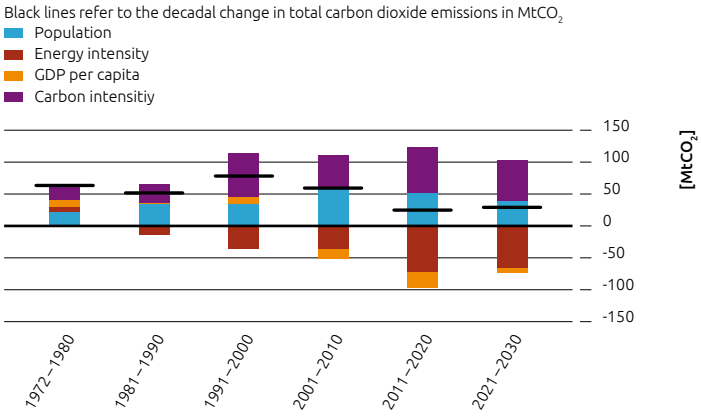


Figure 9

LMDI decomposition analysis[8] per decade.



[5] Historical data (1971-2007) from IEA 2010 edition (total primary energy supply). Values between 2008 and 2030 were estimated using annual projected growth rates for TPES/GDP from the International Energy Outlook (EIA)

[6] Historical data from IEA 2010 edition. Values between 2008 and 2030 were estimated using annual projected growth rates from International Energy Outlook 2010 (EIA)

[7] We break up changes in energy related CO_2 emissions along the factors of the Kaya identity (Kaya, 1990) and express CO_2 emissions as a product of the driving forces population density (P), energy intensity (E/GDP), GDP per capita (GDP/P) and carbon intensity (CO_2/E) on total carbon emissions. Non-energy emissions and other gases are not included. Sources for GDP and population see Figure 5;

[8] We employed the LMDI (Logarithmic mean Divisia index) method (Ang, 2005) to determine the individual effect of the driving forces on changes in CO_2 emissions.

Sources of greenhouse gas emissions

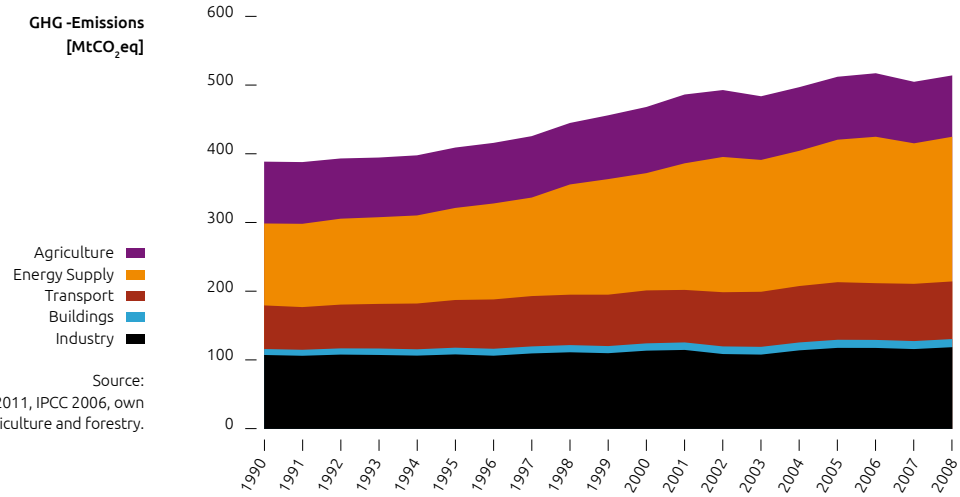
Australia's greenhouse gas emissions (excluding LULUCF) have constantly increased to about 524 Mt CO_2e in 2008, with an average growth rate of 1.1% since 1990 representing a total increase of 34% in this time frame. In 2008, the biggest emitters were the energy supply sector (40%) and the industry sector (24%), followed by agriculture (17%), transport (16%) and the building sector (2%). Emissions have increased in all sectors constantly, except emissions in the AFOLU sector, which has seen temporary fluctuations.

Emissions in the LULUCF sector are highly variable due to the fact that the land is either a net source or sink of emissions, changing annually depending on the occurrence of fires and droughts. Extreme drought and fire events lead to large losses in above ground biomass and affect related emissions. However in the period after such an event carbon uptake increases due to revegetation. They have therefore been excluded from the graph below.

The breakdown of contributions to total emissions by state shows a strong relationship between size, population and GDP of a state. A breakdown into sectors also shows that the largest contributions per state are strongly related to the most important economic sectors (see Figure 11).

New South Wales and Queensland together generate 50% of the GDP and 50% of annual total emissions. Together with Victoria and Western Australia they account for almost 90% of total annual emissions. The most CO_2-intensive sector in all states except Tasmania and the Northern territory is energy supply. The variations are mostly distributed to the remaining sectors.

Figure 10
GHG emissions excluding LULUCF in Australia 1990 – 2008

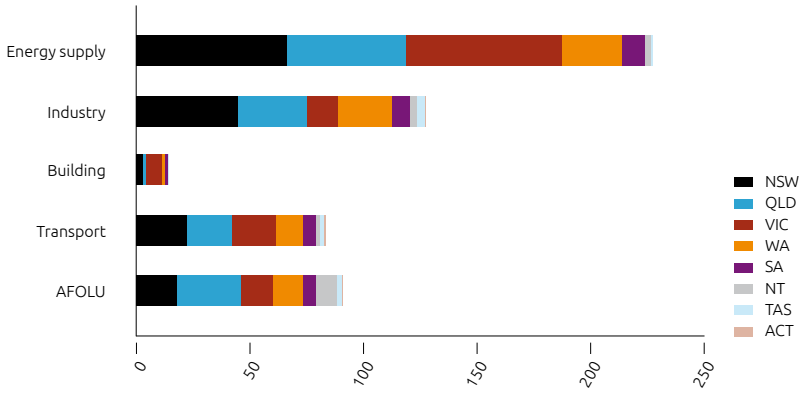


Source:
International Energy Agency (IEA) 2010d, UNFCCC 2011, IPCC 2006, own calculations for emission from land-use change, agriculture and forestry.

After energy supply, industry was the second largest contributor in New South Wales in 2008, while in Queensland it was the Agriculture, Forest and Land use-change (AFOLU) sector, mostly due to continued land use change (deforestation). In Victoria a large share of emissions can be attributed to the transport sector, likely connected to the economic focus on the service sector. Western Australia, most emissions are from the industry sector (including mining), noting that 30% of the state GDP is generated by the mining sector. The shares of the total emissions of Tasmania (TAS) and Australian Capital Territory (ACT) to national emissions are minimal in comparison.

Analysing per capita emissions provides additional insights. The Australian average per capita carbon emissions in 2008 was 29.7 t CO_2e/capita. Only countries such as Bahrain, Brunei, Kuwait and Qatar have higher per capita emissions. Australia's per capita emissions are nearly twice the OECD average and more than four times the world average (Garnaut 2008). Per capita emissions in the least inhabited state, the Northern Territory, reaches 80 t CO_2e/capita, mainly from the agriculture sector (Australian Government 2002).

Figure 11
Total GHG emission (Mt CO_2e) in Australia 2008 by sector and state



Source:
Department of Climate Change and Energy Efficiency 2011e, own calculation

3.2 Climate policy in Australia

Institutional framework

The Prime Minister of Australia, Julia Gillard (the Australian Labour Party), has been in her position since June 2010. The Department for Resources, Energy and Tourism (RET) and the Department for Climate Change and Energy Efficiency are responsible for energy and climate-related issues respectively. The latter was established in 2007 by the Rudd Government to address both mitigation and adaptation. However, the Prime Minister deals with issues of national importance.

In September 2010 the 'Multi-Party Climate Change Committee' was established by the Prime Minister to explore options for action on climate change. The committee includes representatives of the Government, the Australian Greens, and independent parliamentarians and is supported by independent experts.

In 2010 'Low Carbon Australia[9]' was established by the Australian Government as an independent company with an initial funding of over A$ 100 million. It provides financial solutions and advice to Australian business, government and the wider community to encourage action on energy efficiency, cost-effective carbon reductions, and accreditation for carbon neutral products and organisations.

Main instruments

Climate policy in Australia has undergone intense discussions and various concepts during the last ten years, depending on political constellations. Activities have been largely scattered in the past. The main instrument on national level used to be the Renewable Energy Target, supported by a range of state level initiatives. In 2011 the new climate change strategy presented by the Gillard Government finally presents an integrated strategy.

The Renewable Energy Target

In 2001 the Howard Government established the Mandatory Renewable Energy Target. The target was set to achieve 2% renewable electricity generation by 2010, which was then amended to an absolute target of 9,500 GWh. The scheme introduced a tradable certificate scheme that achieved its target by 2006 (Schiavi 2010).

After a change in government in 2007, when Australia ratified the Kyoto protocol and the 2008 Garnaut Climate Change Review[10] was published, a range of climate policy instruments were under discussion. The Renewable Energy Target was finally increased to achieve a share of renewable energy generation of 20% by 2020 or 45,000 GWh in 2020 annually.

In 2011 the program was divided into a large-scale and a small-scale Renewable Energy Target to increase the number of large-scale projects. (Department of Climate Change and Energy Efficiency 2011g; Schiavi 2010).

[9] http://www.lowcarbonaustralia.com.au/

[10] Professor Ross Garnaut conducted a study, commissioned by Kevin Rudd (former Premier) to examine the impact of climate change on the Australian economy and recommended long-term policies.

A 'Clean Energy Future' for Australia

At the start of 2011 Julia Gillard launched the climate change plan "Securing a clean energy future". It includes strategies for all sectors along four focus areas (Australian Government 2011k):

- **Carbon price** - The centrepiece of the strategy is the introduction of a carbon price for the biggest polluters. It is scheduled to start on 1 July 2012 with a fixed price, moving to an emissions trading system (ETS) in 2015. Details of the scheme are outlined in box 1.

- **Renewable energy** - The Renewable Energy Target of 20 % share of renewable electricity production was reaffirmed.

  The new Australian Renewable Energy Agency will support activities and administer a A$ 3.2 billion budget for research and development, demonstration and commercialisation of renewable energy.

  A new 'Clean Energy Finance Corporation' will be set up to enhance private investment in efficiency and renewable energy technology. The A$10 billion corporation is scheduled to start operations in 2013-2014.

- **Energy efficiency** - Energy efficiency efforts by households, industry and the electricity sector will be affected by the carbon price. Additional support will be provided through the 'Low Carbon Communities' program and an energy savings initiative.

  Plans to close down around 2000 MW of highly polluting coal-fired electricity production plants will improve efficiency of the energy sector.

- **Land use** - Agriculture and forestry are not subject to the carbon price. The 'Carbon Farming Initiative' will instead allow farmers and land managers to create Kyoto-compliant credits from activities to reduce emissions or to increase carbon storage.

  This will be further supported by a number of funds, dedicated to research and development as well as for the implementation of projects.

To compensate households for the cost related to the carbon price, while maintaining the incentive to reduce emissions, a tax reform will provide tax cuts, increases in pensions, allowances and benefits. Assistance is mainly targeted at low and middle-income households and pensioners. The reform will also raise the tax-free threshold from 2012 with a further increase in 2015.

Additional to funds targeted at helping businesses to improve efficiency, the 'Jobs and Competitiveness Program' will support industry through provision of free carbon units under the Clean Energy Legislative Package 2011.

The strategy set out in the plan was translated into 18 legislative Acts. They implement the core elements of the climate strategy as summarized above. On October 12 the Clean Energy Legislative Package passed the House of Representatives. The Acts passed Senate unamended on 8 November 2011.

The introduction of this comprehensive set of actions provides a major breakthrough in Australian climate policy. It moves action from scattered initiatives (with often limited impact) towards a more encompassing scheme with high potential. More detailed information on the individual impact of the new measures is outlined in the respective sectors in chapter 4 below.

Box 1

Carbon Price – Design features

Starting date carbon price: 1 July 2012
Carbon price in 2012: A$23
Annual increase: 2.5%

The key feature of the new climate strategy is the introduction of a fixed price on carbon in 2012, followed by an emissions trading scheme (ETS) in 2015. The carbon pricing mechanism will cover around 500 of the largest polluters in Australia (including the 50 polluters who are responsible for 75% of Australia's carbon emissions). Not all sectors are directly involved, as agriculture, landfill and emission from light-road vehicles are excluded from carbon pricing mechanism. Heavy transport could be included from 2014, but this has not yet been decided. Emissions from light road vehicles are set to be covered by tax adjustments and different measures address emissions from land use as described above.

The Australian Government decided on a two stage-approach: a fixed price stage from 2012-2015 and a flexible price ETS stage, to allow sectors to get used to the new system which allows higher predictability than a capped ETS.
The initial price for the fixed price period will be at A$ 23 per tonne, and will increase by 2.5% annually. Businesses that are covered by the carbon mechanism will have to buy and surrender a permit for each tonne of carbon pollution they emit. The permits cannot be banked or traded for future use.

Starting date ETS: 1 July 2015
Cap period: continuous 5 year period
3-year price floor and ceiling
Partly auctioning
Access to international carbon markets regulated

In 2015 the carbon pricing mechanism will transition to a flexible cap-and-trade emissions trading scheme with the first five-year cap to be announced in 2014. After this, the system is designed to set the cap each year for the subsequent, undecided year. While the system is set up, the overall cap for future periods is as yet unclear. For the first three years a price ceiling will apply in the flexible period and be set by regulations in 2014 at A$ 20 above the expected international price for 2015-16 and will rise by 5% each year. Additionally there will be a three-year price floor starting at A$ 15 and rising by 4% each year.

To foster the development of a carbon market, some permits will be allocated by auctioning and can be banked and under specific conditions also borrowed. In the flexible price period, international units can be used to meet carbon pricing mechanism liabilities but are subject to certain qualitative and quantitative restrictions.

Governance

The Climate Change Authority will advise on pollution caps and review progress. The Clean Energy Regulator will actually administer the mechanism, while the Productivity Commission will review industry assistance programs, fuel tax arrangements and international mitigation activities. (Australian Government 2011j).

Expected Carbon Price

The modelling by the Australian treasury assumes two price scenarios for the future carbon price. There is a core policy scenario including a starting price by A$ 23, and depending on international actions a A$ 60 starting price scenario considered. While the core policy scenario predict a price to be at A$ 30-40 in 2020 and around A$ 50 in 2030 (considering the 5% target below 2000 in 2020), the prediction of the high price scenario considers a target of 25% below 2000 in 2020 will end by A$ 60 – 80 in 2020 and A$ 140 in 2030.

International arena

Australia was one of the last industrialised countries to join the Kyoto Protocol, only ratifying in 2007, with the Protocol itself coming into effect on 11 March 2008. (Department of Climate Change and Energy Efficiency 2011c).

Under the Kyoto protocol, Australia had a binding target requiring it to limit emissions of greenhouse gases to 8% above 1990 levels of greenhouse gas emissions from industrial sources plus deforestation emissions. Under a special provision of the Protocol, article 3.7, Australia was able to account for the reduction in its deforestation emissions since 1990 (and mostly before the Kyoto protocol was agreed) resulting in an ability to meet this target without significantly slowing the growth of greenhouse gas emissions from the energy and other industrial sectors. This can be seen in the figure 12 below.

Australia is therefore well within reach of meeting its Kyoto target for the period 2008 to 2012, taking into account industrial greenhouse gas emissions, and afforestation, reforestation and deforestation emissions of removals.

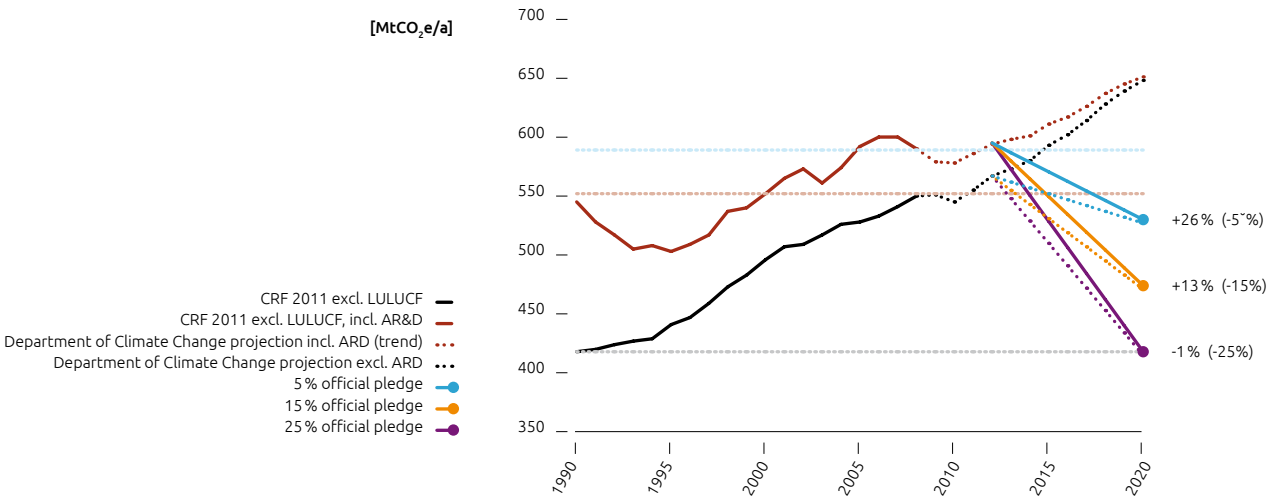
Internationally, for the period post-2012, Australia has pledged a range of targets depending upon the strength and comprehensiveness of agreed international action. In the case of weak international agreement, it has pledged an unconditional target of 5% below 2000 in 2020 with extra, conditional, targets of 15% or 25% by 2020 that depend on the degree of action by other large emitters within an international agreement.

The unconditional pledge, which translates to an increase of about 28% for industrial greenhouse gas emissions relative to 1990 after taking into account Australia's approach to the accounting of land-use, land-use change and forestry activities[11], is far less ambitious than what would be required to be on a path towards 2°C. The 25% goal is contingent on the adoption of an ambitious global deal capable of stabilising levels of greenhouse gases in the atmosphere at 450 ppm CO_2eq or lower. Note that stabilisation of GHG concentrations at 450 ppm of CO_2eq, would result in about a 60% chance of exceeding 2°C, so would likely not hold warming below this levels as specified in the Cancun Agreements.

[11] http://unfccc.int/files/meetings/ad_hoc_working_groups/lca/application/pdf/3-5-110331_australia_developed_mitigation_workshop.pdf

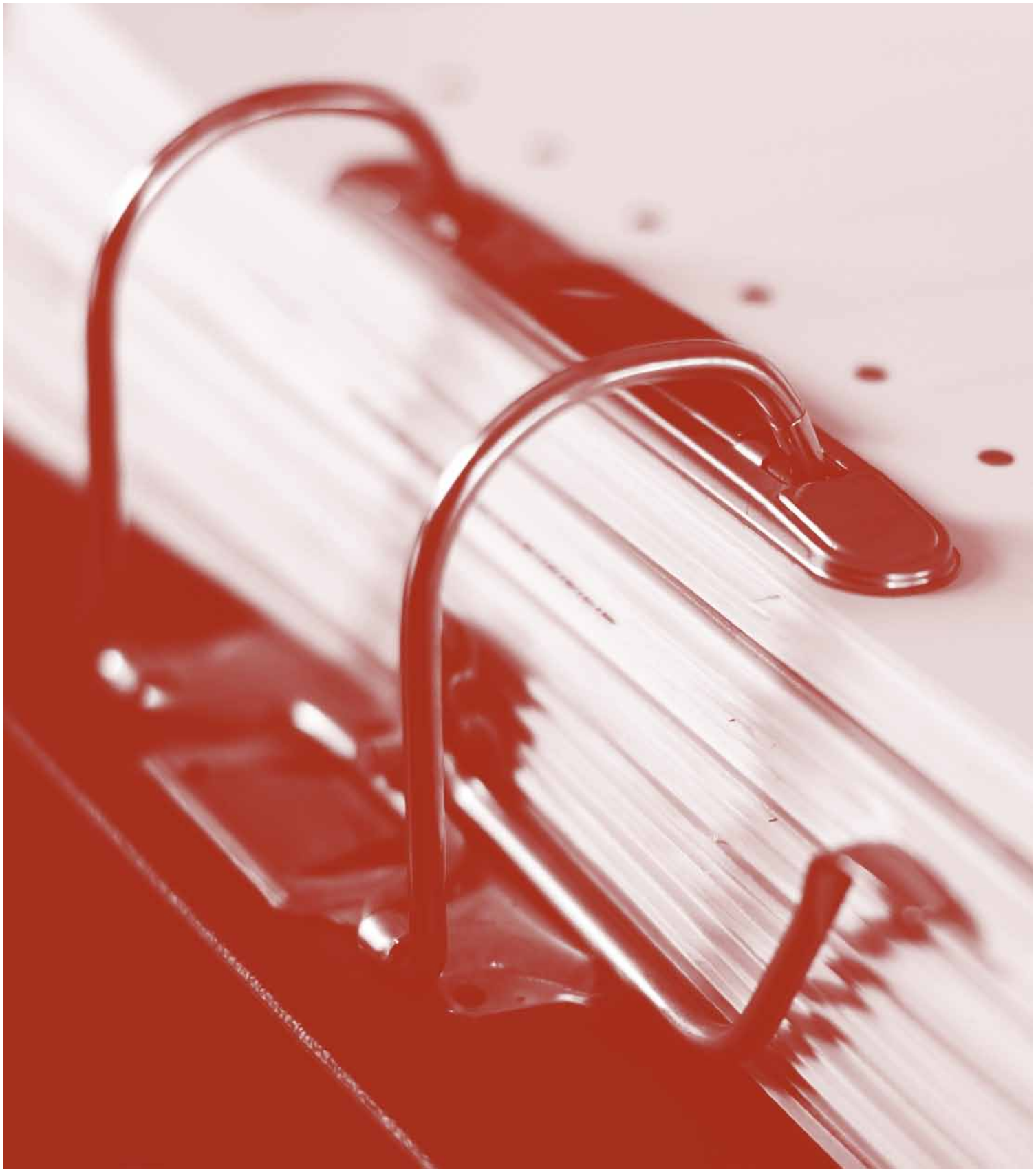
GHG emissions excluding LULUCF (blue) derived from Australia's CRF2010 inventory for the historical period 1990-2008 and projections based on growth rates from the IEA's World Energy Outlook 2009 thereafter (reference scenario PRIMAP4 –see www.primap.org). The green line indicates emissions excluding LULUCF, but including ARD (linear projections from Figures 1 & 2) and the -5, -15 and -25% targets for 2020 are applied to the 2000 emission level of the latter. The linear reduction pathways from 2012 to 2020 are for illustrative purposes only. The dashed lines 2012-2020 shows implied Annex A emissions (excluding LULUCF) derived by subtracting linear projections of ARD emissions shown in Figures 1 & 2 from the target pathways for Annex A emissions plus ARD (full lines 2012-2020).

Figure 12
GHG emissions excluding LULUCF based on linear projections for ARD



4 | POLICY EVALUATION

This chapter provides an overview of the policies in place in Australia in the different sectors and evaluates their effectiveness towards a low carbon development.



4.1 General climate strategy

Australia pledged under the Copenhagen Accord and the Cancun Agreements to reduce its GHG emissions by 2020.

Key indicators

Emission reduction target 2020:	5-15-25% below 2000
Emission reduction target 2050:	80% below 2050

Sources: (Australian Government 2011j)

For 2020, Australia proposed to decrease its emissions to 5-15-25% below 2000. Adoption of the most ambitious target of 25% is conditional on an ambitious global deal capable of stabilising levels of greenhouse gases in the atmosphere at 450 ppm CO_2e or lower. The 15% target is also conditional on a global agreement that falls short of securing atmospheric stabilisation at 450 ppm CO_2e and under which major developing economies commit to substantially restrain emissions and advanced economies take on commitments comparable to Australia's. The Clean Energy Future strategy (2011) has strengthened Australia's 2050 target to 80% below 2000 levels by 2050 (from earlier 60%).

A strategy towards the 5% target is described in the Clean Energy Future Plan. It includes details on actions until 2020 to reduce emissions by 159 Mt CO_2e in 2020 (Australian Bureau of Statistics 2011b), financed from domestic resources. It does not include concrete actions beyond 2020 (Australian Government 2011k). The conditional targets (15 and 25%) are not addressed in the new strategy.

Three states recently legislated binding targets:

South Australia was the first state to introduce a target to reduce greenhouse gases in 2007. The target has three components; an overall emissions target to reduce the State's greenhouse emissions at least 60% compared to 1990 levels by 2050; a renewable electricity target of 20% of electricity generated in the State by 2014, i.e. in line with the national target; and a renewable electricity consumption target of also 20% of electricity consumed in the State by 2014 (Government of South Australia 2007).

Victoria passed a Climate Change Act in September 2010 that came into effect on July 1, 2011. The target of an emissions reduction of 20% by 2020 (based on 2000 levels) comes along with new arrangements for ownership, registration and transfer of forestry and carbon sequestration rights as well as improvements in adaptation and reporting of emission data (Department of Sustainability and Environment 2011).

Table 5
Qualitative summary of the climate strategy

	General climate strategy
Highlights	▸ The binding target of 80% by 2050 is in line with low carbon vision. ▸ Clean Energy Finance Cooperation with a budget of A$ 10 billion will invest in businesses seeking for funding of innovative clean energy and technologies.
Requirements of the low carbon policy package	▸ Ambitious binding greenhouse gas reduction target, consistent with major effort sharing approaches (-80% to -95% by 2050 for developed countries) ▸ Comprehensive and consistent long term strategy beyond 2020
Gap of national policies to low carbon policy package	▸ Ambitious binding greenhouse gas reduction target, consistent with major effort sharing approaches (-80% to -95% by 2050 for developed countries) ▸ Comprehensive and consistent long term strategy beyond 2020
Rating for 2050	B
Relevance for emissions in 2020	Low relevance for immediate emission reductions, very high relevance for long-term development towards a low-carbon economy

Note on rating: Rating represents the aggregated score per segment translated into G (poor) to A (excellent). Size of the letters resembles the importance of the segment towards developing a low carbon economy

In October 2010, ACT passed legislation for the introduction of the most ambitions greenhouse gas reductions targets in the country. The Climate Change and Greenhouse Gas Reduction Act 2010 will see emissions reduced by 40% by 2020 and 80% by 2050, based on 1990 levels (ACT Government 2011b).

Potential options for future actions

Australia could agree on the more ambitious range of the short term targets for 2020 to be better prepared to reach its 2050 target of -80% (according to (Climate Works Australia 2011) Australia could reduce emissions by 25% below 2000 levels for a lower than expected cost). In addition, Australia could develop a comprehensive strategy to reach its 2050 target.

4.2 Electricity and heat

General situation

Regulation - Energy policy on federal level in generally is overseen by the Department of Resources, Energy and Tourism, the key federal department responsible for developing energy legislation. Once this legislation passes, it is the responsibility of the energy regulator to enforce. Each state and territory has own departments and regulators operating in close connection to the federal government bodies.

Supply - The energy supply relies heavily on coal-fired power plants, producing 80% (55% black coal and 25% brown coal) of the electricity in 2008-2009, followed by gas with 12%. Electricity from renewable energy accounts for only 7.4% of the final electricity generation where 4.7% is generated by hydropower, 2% by wind and 1% biomass. Electricity generation from solar is still very low (less 0.5%) and especially in the residential sector relevant (Australian Bureau of Agricultural and Resource Economics (ABARE) 2010 and Productivity Commission 2011).

Key Indicators (2008-09)

Installed capacity:	51 GW
Total electricity production:	261000 GWh
Share of renewables:	7.4%
Share of non-hydro REN:	2.7%

Sources: Department of Resources 2011i

A major problem in the electricity market is the high peak load. Extra production capacity is built to support peak demand, which is under-utilised most of the time. Demand side management would therefore improve overall efficiency of the system.

Energy market - The Australian energy market can be broken down into three systems: the National Electricity Market (NEM) which operates in the eastern states, the Wholesale Electricity Market, which operates in Western Australia and an own system in the Northern Territory, which is serviced by an integrated electricity utility. As the Australian energy market has been liberalised since the early nineties (International Energy Agency (IEA) 2001) the value chain, generation, transmission, distribution and retail follows different market rules set up by appropriate entities. The framework differs based on the system of the three schemes.

Generation is open to competition in the NEM and, as in all states, is predominantly sourced from fossil fuels. The main difference between the NEM and WA market is the additional government payment that generators receive in WA to provide capacity. In NT there is no competition at all: the system is operated by a government utility responsible for generation, transmission and retail (Department of Infrastructure 2008).

Grid structure - Transmission and distribution companies are regulated monopolies. On federal level it is governed by three entities which are predominantly owned by the government:

- The Australian Market Commission - a independent authority of the government and mainly responsible for legislation and developing of the national energy markets (Australian Energy Market Commission 2011),
- the Australian Energy Market Operator (AEMO) - a partly government-owned entity and responsible for the operation of electricity and gas markets; and
- the Australian Energy Regulator (AER) - the government regulator for electricity and gas distribution, which includes rule enforcement for the National Electricity Market (NEM) as well as economic regulation of transmission networks.

The Wholesale Electricity market is overseen by an own entity the “economic regulation authority”. Regulation of retail electricity prices is a state government responsibility, whereas most states have implemented a mix of regulations (Productivity Commission 2011).

The NEM has interconnectors of 5,000 km from North Queensland to central South Australia. There is also an undersea interconnector between Victoria and Tasmania. The electricity transmission networks in Queensland, NSW, ACT and Tasmania are state owned, while the transmission networks in Victoria and South Australia are privatised and the interconnectors are privately owned (Australian Energy Market Operator 2011). The networks in WA are not connected to other states or the NT. Distribution losses are in the range of the world average (9%), with 7% in 2011 (TradingEconomics 2011).

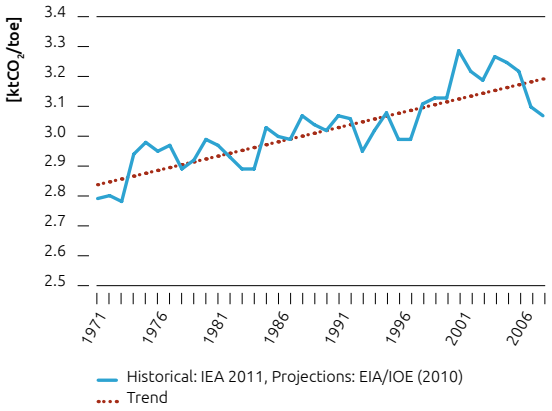
The NEM is an interconnected power system and operates as a mandatory wholesale pool in which generators sell their electricity and retailers (and some large users) buy electricity from the pool (spot-market or OTC) to sell on to residential and business consumers. Two-thirds of the electricity generation capacity in the NEM is government owned. States with the highest retail competition are Victoria, South Australia and Queensland. The single retailer in Tasmania is state owned.

The Western Australia market can be broken down into three transmission systems – South West Interconnected, North West Interconnected and the Esperance System. All three networks are owned by two, state government-owned, trading companies: Western Power and Horizon Power. Most electricity is traded through bilateral contracts between retailers and generators, a small amount is also traded on short-term energy markets mainly to adjust demand and supply at short intervals. The main difference between NEM and WA market is the additional government payment generators receive in WA to provide capacity. The networks in WA are not connected to other states or the NT.

Electricity prices - The prices for electricity are low compared to other industrialised countries. Residential prices are 40% of those in Japan and a little over half of those in most of Europe. Industrial prices are 30% of Japan's and 60% of most European prices. This is mainly due to cheap fossil fuels produced domestically and the tax exceptions from the government (Department of Resources 2011d).

Carbon content of energy supply - The energy sector has seen a constant increase of carbon intensity between 1971 and 2003 with annual fluctuations. After 2003 the trend seems to be reversed, mainly due to the shift towards gas for new capacity.

Figure 13
Carbon intensity of energy supply
1971 to 2008



Source: CAT calculations based on IEA (2010) data

Overview of policies and their effectiveness

The current energy mix at both national and state level mirrors the dominant use of fossil fuels in Australia – both past and present. Due to the fact that coal and gas are still available in large amounts, efforts in recent years to introduce large scale renewable have been low compared to the country's potential. The renewable energy scheme, enhanced by strict legislation, represents an ambitious step. New coal power stations are unlikely to be built in Australia due to a combination of the clean energy package, high coal prices, and concerns within the investment community.

Renewable Energy Target

In 2009, the Rudd government brought in the so-called Renewable Energy Target Scheme (RET). The system set out annual targets to achieve the goal of 45,000 GWh (or 20% of electricity production) in 2020. A change was made in 2011, when the programme was divided into a large-scale Renewable Energy Target and a small-scale Renewable Energy Scheme in order to foster the development of large scale renewable energy (Schiavi 2010).

The basis to achieve this target is a certificate scheme, which requires electricity retailers and other large electricity buyers to source an additional share of their electricity from renewable or specified waste products[12]. Certificates can be generated by a renewable energy power station, or small-scale solar panel, wind or hydro system; or by displacement of a solar water heater or heat pump.

For both types there is an effective penalty that, where there is failure at the end of the year to surrender[13] adequate LGC (=Large-scale generation certificate) or STC (=Small technology certificate), the retailer is required to charge A$ 65 per MWh (Office of the Renewable Energy Regulator (ORER) 2011b).

Given that this charge is not tax deductible, the real value could theoretically be as high as A$ 94 that, compared to the average price of RECs (A$ 15 to 40) is quite high. Compared to other industrialised countries this can be considered as a very strict measure as it puts considerable pressure on retailers to reach their quotas (Local Power 2011). Current barriers, such as the grid access for REN or the spatial planning burden (see also Annex I.2), must be overcome by additional investments or measures.

In addition to the RECs, there are feed-in tariffs in almost all states that are generally available to residential customers, or to those customers below a given consumption threshold (small-scale REN), and are not likely to be available to commercial scale electricity generation.

Box 2 summarises the current status of different feed-in tariffs.

Box 2

Feed-In tariffs at state level in Australia[14]

State	Status	Max Size	Rate	Duration	Metering
VIC	Commenced 2009	5 kW	60c/25 c (credit/cash)	15 y	Net
SA	Commenced 2008	30 kW (10kW per phase)	44 c / 22 c	20 y	Net
ACT	Closed	200 kW	30.16 c	20 y	Gross
TAS	Commenced 2011	n.a.	20 c	n.a.	Net
NT	Commenced 2011	n.a.	Same as consumption rate	n.a.	Gross
QLD	Commenced 2008	5 kW	44 c+	20 y	Net
WA	Finished 2011	5 or 30 kW	20 c	10 y	Net
NSW	Closed	10 kW	60c / 20 c	7 y	Gross

[12] Energy companies must surrender RECs into their holding account at the end of every calendar year at an amount representative to 20% of their market share.
[13] For STC this is valid for the 2011 and future compliance years and LGC for 2010 and future compliance years
[14] The table is generated by using data from appropriate state government websites.

The duration of the proposed Feed-In tariffs varies between 7 to 20 years, depending on state and type. The type of metering is an important issue for transparency, since net and gross differs significantly. While "gross" metering fully rewards the system owner for the benefit of their system to the electricity grid, "net" metering rewards homeowners for the electricity exported to the grid minus what is consumed in the home at the time of production.

Currently, most of the states offer net metering only, which provides an incentive for new homeowners to take up the feed-in tariff, while providing a disincentive for system owners (Alternative Technology Association (ATA) 2010).

Neither the national renewable energy scheme, nor the feed-in schemes on state level differentiate between different REN technologies, therefore only the low cost options as solar and wind are supported by both measure types.

Additionally, the current capacity and design of the distribution network does not ensure country-wide access for renewable energy and needs additional investment to do so.

Clean Energy Future Package

The Senate's passing of the Clean Energy Future Package in November 2011 is one step forward in changing this ongoing situation. Closing down 2000 MW of inefficient fossil fuel power plants and replacing those by gas will increase the overall efficiency in electricity generation in the short-term. The effect by the carbon price on an additional REN generation will be low compared to the reductions achieved by the market-based mechanism in place (the RET scheme as described below).

Hence, the price of A$ 23 per t CO_2e compared to the costs of REN technologies (A$ 80-100 per t CO_2e[15]) will not motivate companies to invest in REN in near future (The Parliament Of The Commonwealth Of Australia 2011a). However, in the long term, there may be potential, depending on the interaction of carbon price development and RECs on the Australian market (Diesendorf 2011).

In terms of diversification of REN deployment in Australia, the Clean Finance Cooperation (CEFC) will strengthen the current efforts by establishing a renewable energy investment stream facilitating research in REN such as geothermal and wave as well as large scale power generation (Australian Government 2011j). According to ClimateWorks 2010, the abatement potential of the CEFC is assumed to be 12.1 Mt CO_2e.

Energy Efficiency

Two types of policy address energy efficiency in the electricity sector:

- A performance standards programme at the national level that covers all new thermal power plants with a capacity above 30 MW or an annual output of 50 GWh. To improve the efficiency of existing plants, a best-practice benchmark was introduced which allows a plant to plant determination.
- NSW introduced an Energy Saving Obligation for electricity retailers and other parties who buy or sell electricity, similar to a white certificate scheme. While the performance standard only covers new facilities, the NSW savings obligation requires all retailers to participate in - and meet - certain targets.

The effect of the carbon price on energy efficiency will be low in the short-term as fossil fuelled power plants will receive free certificates in the fixed price period until 2016-17.

Carbon capture and storage (CCS)

Even though there have been a lot of funds in place, most of them were not completely spent. There are two projects under development (Sequestration hub project) with likelihood to deliver reductions in the near /middle future. It is still unclear what came out of government spending on CCS demonstration. But so far little interest by companies (electricity and industry) to engage, as long as other lower cost options are easily available. Furthermore problems with acceptance in the public and low efficiency are reasons that it is not likely to see substantial deployment of CCS within the next 20 years in Australia.

[15] Low Carbon Growth Plan for Australia

Table 6
Qualitative summary of policies for the electricity and heat sector

	Energy efficiency	Low carbon		
		Renewables	With Nuclear/CCS (low carbon vision)	Without Nuclear/CCS (100% renewable vision)
Highlights	▸ Generator Efficiency Standards which set efficiency standards for new entrants ▸ the Clean Energy Investment plan for generators receiving free permit in the emission trading system	▸ the Renewable Energy scheme with a target of 20% in 2020, including a strict implementation with high penalties for participating parties	▸ The Carbon price mechanism will stop the construction of new coal power plants. Gas will be used in future ▸ The closure of 2000 MW brown coal power plants and replacement by highly efficient gas power plants ▸ Financial support for CCS	▸ The Carbon price mechanism will stop the new construction of coal power plants. Gas will be used in future ▸ The closure of 2000 MW brown coal power plants and replacement by highly efficient gas power plants
Requirements of the low carbon policy package	**Efficiency of fossil fuel power plants:** leading to average efficiency of 45% (coal) and 60% (natural gas) in 2030 or inventive is > 100 US$/$tCO_2$) **Combined heat and power production: (CHP)** leading to 10% additional share of electricity production in 10 years **Reduction of distribution losses:** leading to 4% distribution losses in 2030	**General incentives for the production of electricity from renewable energy sources:** supporting at least 10%points increase in share in 10 years **Support different technologies:** including sufficient support for 1-2 high price technologies (PV, geothermal power, biogas …) **Support for adapted electricity grids** **Sustainability standards for biomass use** **Removal of administrative and grid barriers**	**Policies that influence fuel choice:** taxes, emissions trading, emission performance standards in the order of 100US$/$tCO_2$e **Support for biomass CCS:** demonstration scale plants are supported **Support for coal CCS:** support for substantial increase in capacity **Support for substantial increase of nuclear capacity**	**Policies that influence fuel choice:** taxes, emissions trading, emission performance standards in the order of 100US$/$tCO_2$e **Support for biomass CCS:** demonstration scale plants are supported **Support for coal CCS is a *barrier* to renewable energy** **Support for substantial increase of nuclear capacity is a *barrier* to renewable energy**
Gap of national policies to low carbon policy package	▸ Active support for CHP ▸ Enhancement of grid development and further efforts to reduce distribution losses ▸ Removing subsidies	▸ While the rating is high, there is a risk of failure of the target in case of no or low incentives to improve grid access for Renewable Energies ▸ the deployment of REN should be more differentiated	▸ Policies, financing mechanisms and strategies that support the increasing use of CCS for coal and biomass	
Rating	E	A	F	G
Relevance for emissions in 2020	High relevance: The increase of efficiency has direct short and long-term effects on emissions	Medium relevance: Renewable electricity has a high impact on emissions in 2020. Several technologies already exist and can, with appropriate support, directly add to Australia's energy supply and support emission reduction	High relevance: the increasing use of nuclear energy and CCS would have mid- to long-term effects. Especially the CCS can be assumed to become relevant only after 2020.	

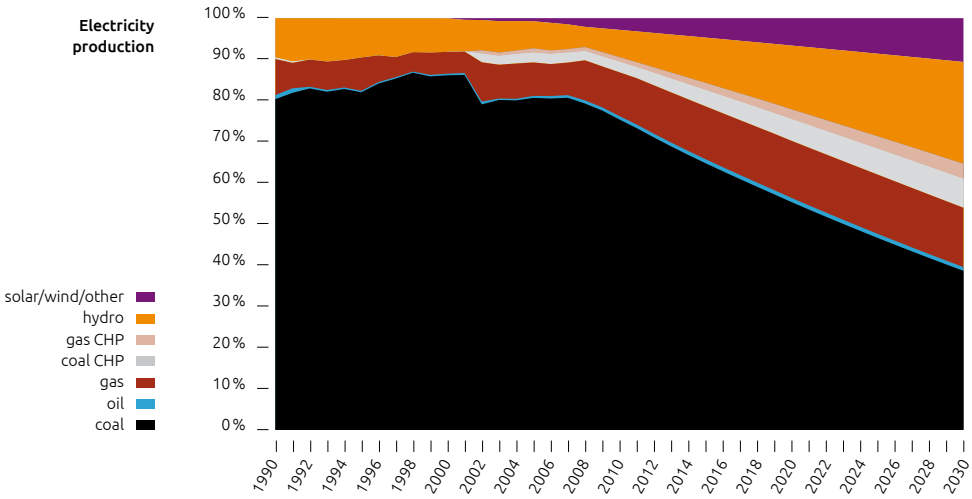
Note on rating: Rating represents the aggregated score per segment translated into G (poor) to A (excellent). Size of the letters resembles the importance of the segment towards developing a low carbon economy

Potential options for future actions

Australia faces new challenges with the ongoing growth in the electricity demand sector and the need for energy security. The ambitious target for the renewable energy generation of 20% by 2020 and the very strict implementation can be considered a role model, but compared to the country's potential there is still a gap.

Current incentives only focus on the low cost options such as wind and small-scale solar, rather then supporting research in tidal, wave or geothermal, as well as large scale solar. Solar thermal, for example, could cover Australia's demand with only 0.3% of the land surface being devoted to solar power generation (Australian Academy of Science 2009).

Figure 14
Energy mix in the electricity generation according to the Policies including Clean Energy Future scenario till 2030



Furthermore, by removing barriers such as the spatial land planning rules or the introduction of national "gross" instead of "net" feed-in tariffs will accelerate the implementation.

Energy efficiency can be further stimulated by a national white certificate scheme, which is already in planning but it's unclear if it will be implemented. Some states have introduced similar schemes, so there is already plenty of experience to draw on.

Increasing generation by CHP and improving the average efficiency of power plants requires more incentives for the industrial scale CHP to construct plants for base-load management. Another option to increase the use of CHP for domestic generation is the introduction of feed-in tariff rates for combined heat and power.

Changing a centralised distribution structure to a decentralised and smart grid oriented system is necessary to ensure a fast deployment of REN. When considering large scale geothermal and solar thermal generation in remote areas, high voltage direct current (HVDC) transmission line technology would be particularly necessary.

Facing the high fossil fuel share in electricity generation and the urgent need of actions, CCS deployment by providing additional funds for research should be considered in future policies.

Impact on emissions in 2020 and 2030

Emissions from the electricity and heat sector have increased substantially in the 1990s and are still increasing. Under the business as usual scenario (BAU), with no policies in the demand sector, emissions increase by another 48% to 2030 (from 2008 levels). If we consider the reduction effect of policies by additional savings in the demand sectors we assume the BAU to increase by 29% between 2008 and 2030. In 2030 emissions from the BAU without demand are reduced by 13% compared to the BAU with demand policies (see Figure 15).

In our calculation, reductions are largely based on renewable energy measures. This is mainly due to the expected 20% share of renewable energies in 2020 (see also Figure 14). Electricity generation from coal will be reduced to less than 30% in 2030 as a result of energy efficiency improvements, considering the use of carbon capture technologies and fuel switch to gas as well as the dominant deployment of renewable energy technologies which we assume will lead to decreased use of capacity and that replacement of generation capacity will be through other than coal technologies.

Emissions will continue to be dominated by coal.

Figure 15
Electricity and heat emissions projections for the policy scenario including the Clean Energy Future till 2030

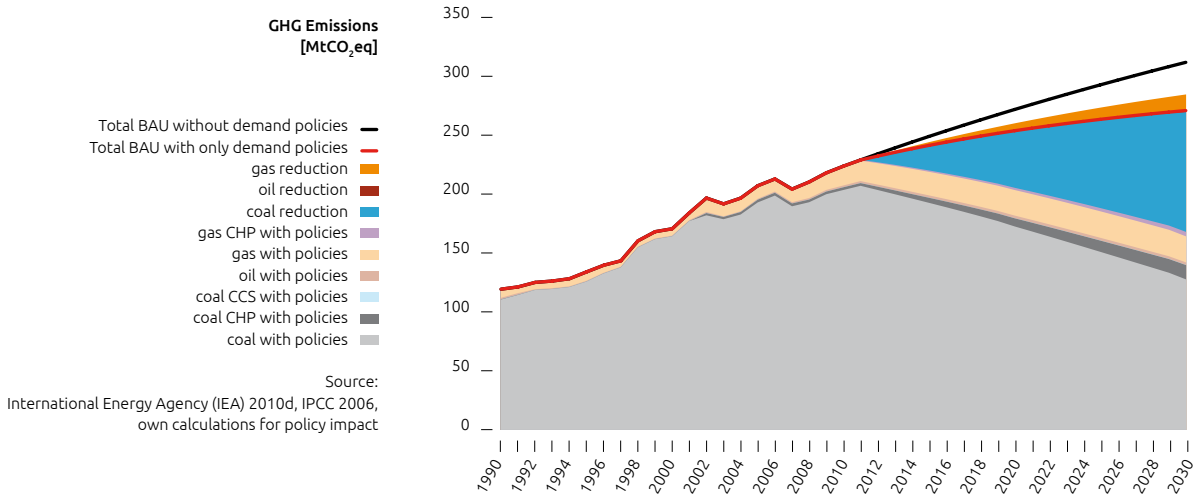
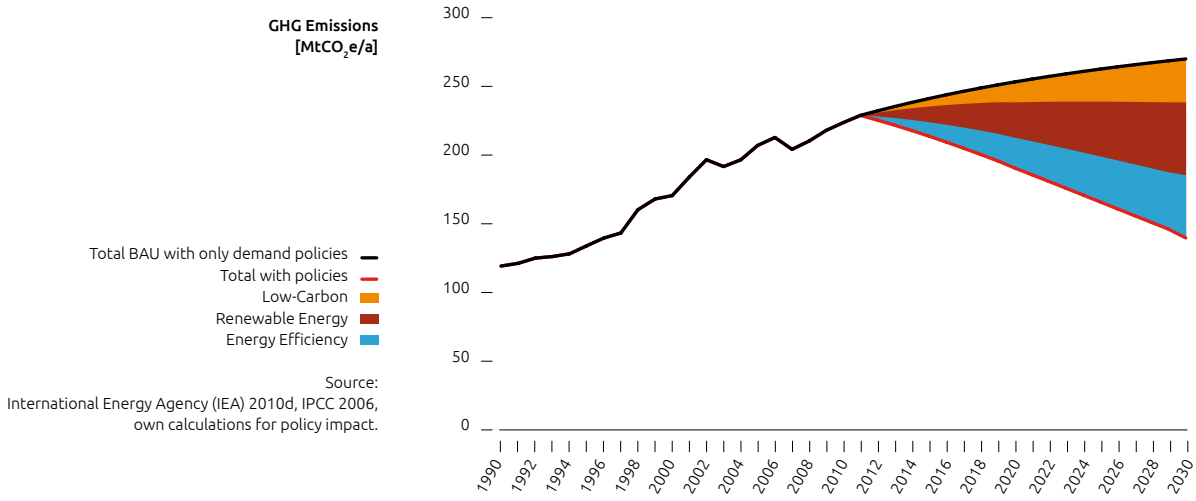
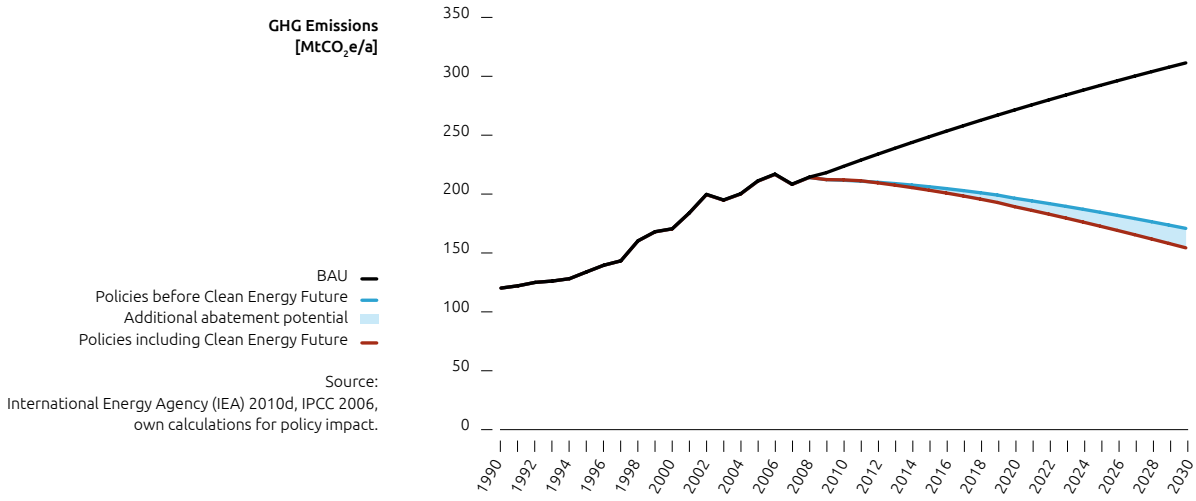


Figure 16
Electricity and heat emissions projections policy scenario including Clean Energy Future measure to 2030, by policy area



The carbon price, together with the other measures of the new package, will reduce projected emissions by an additional 16.6 Mt CO_2e compared to the policy package implemented before. The additional abatements are mainly due to improved energy efficiency measures and a tendency to fuel switch (coal to gas).

Figure 17
Impact from policies without the clean energy future measures and including clean Energy Future policies on future emissions of the electricity and heat sector to 2030

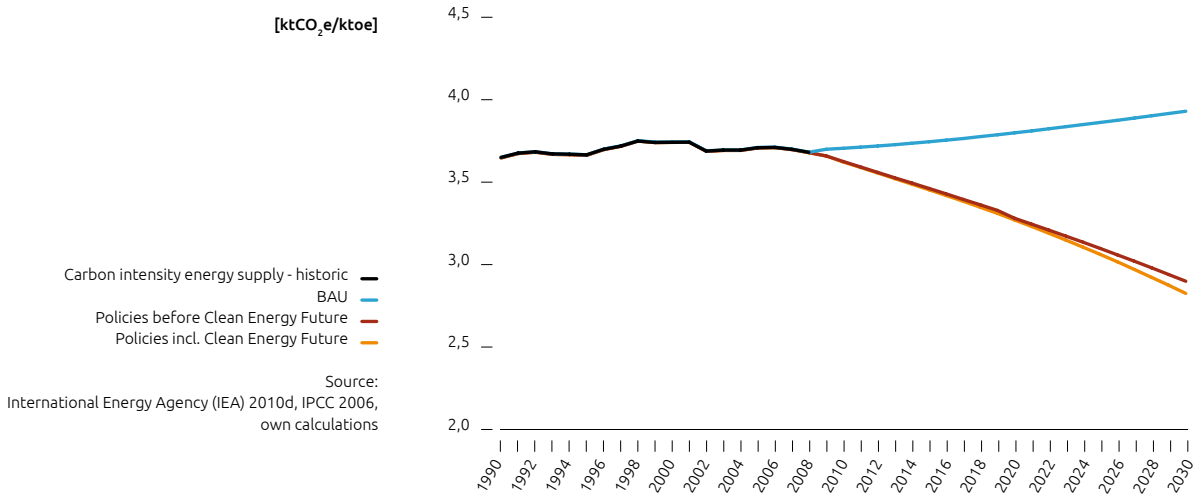


Decarbonising the energy sector?

The past trend in carbon intensity has clearly been pointing upward, leaving Australia with one of the most carbon intensive energy sectors in the world.

Policies implemented by the Australian Government in the past years are projected to be able to turn this trend and lead the country towards decarbonisation. This is mainly due to the renewable energy target, which is further improved by the carbon price.

Figure 18
Projections for carbon intensity in the energy sector



4.3 Industry

General Situation

Australian industry, including the manufacturing, mining, construction and energy supply sectors, contribute 25% to the GDP of the country (International Monetary Fund 2011)[16]. The mining industry contributes about 10% to the national GDP, the construction industry is the second largest industry (7%) and food, metal products and agriculture each contribute 2% to the national GDP (Australian Bureau of Statistics 2011c).

Australian industry consumed about 27,000 ktoe in 2008, of which 30% was electricity, 30% gas, 15% oil 13% coal and 10% biomass and waste. The main energy consuming sub-sectors were the non-ferrous metals (36%), food and tobacco (14%), the mining and quarrying (14%) as well as the chemical and petrochemical (9%) and Non-metallic minerals (10%). The key CO_2e emitters, including emissions from both energy consumption and process emissions, are the mining industry (46%), to basic non-metallic industries (e.g. aluminium) (15%), and the chemical and petrochemical industry (13%) (International Energy Agency (IEA) 2010c; Department of Climate Change and Energy Efficiency 2011e). Australia exports the coal to a large extent, which leads to emissions in the order of 117 MtCO_2e[17] outside of the national boundary of Australia.

Mining in general is spread across all of the states and territories while coal mines are mainly located in the eastern part of Australia. Coal mining was responsible for around 6% of Australia's total domestic emissions in 2009 at 31 Mt CO_2e with emissions expected to grow (Department of Climate Change and Energy Efficiency 2010).

Fugitive emissions are crucial for Australia as they amount for 7% of total emissions in 2009 with a rising tendency. Fugitive emissions to 2020 are expected to rise by 97% (from 2000 levels). Coal mining accounts for the largest share of fugitive emissions, with an average of 31 Mt CO_2e per year (2008-2012), oil and gas extraction is estimated to produce 11 Mt CO_2e per year on average (2008-2012). Current incentives are estimated to reach a yearly abatement of 5 Mt CO_2e on average (2008-2012) and remain the same to 2020 (UNFCCC 2010a). Given that a number of reporting categories (especially in the industrial sector) in the annually inventory reporting for the UNFCCC, which Australia believes to be minor or confidential are reported as not estimated there is a high uncertainty about the real emissions (UNFCCC 2010b).

The group of F-Gases (consisting of HFCs (hydrofluorocarbons), SF_6 (sulphur hexafluoride) and PFCs (perfluorocarbons)) account for 1.2% (2009) of total emissions. The largest share of total f-gas emissions in Australia can be allocated to HFCs due to increased use of refrigeration and air conditioning, foam blowing, fire extinguishers, aerosols/metered dose inhalers as well as solvents. In 2009 6,250 kt CO_2e were emitted by the use of HFCs. SF_6, a by-product of electrical equipment production, accounts for 60 kt CO_2e. PFCs which are mainly generated in the aluminium production decreased since the 90th to 308 kt CO_2e in 2009 (Department of Climate Change 2011).

[16] We discuss the energy supply separately in this analysis, but in national statistics, it is normally part of the industry sector
[17] Assuming an export by 298 Mt or 29750 ktoe in 2010 (ACA 2011) and an emission factor of 3.96 kt CO_2/ktoe.

Overview of policies and their effectiveness

Emissions from industry are almost a quarter of total emissions. Although they are less than emissions from electricity and heat, actions are necessary especially since non-energy emissions include gases with high global warming potential.

Before the Clean Energy Future package was decided, only a few policies for emission reductions in the industrial sector in Australia were available. The Energy Efficiency Strategy includes some features relating to reductions in industrial processes, for example the Energy Efficiency Opportunity Program (EEOP). The EEOP is a national program which requires corporations that have an energy consumption above 139 GWh per year to conduct an energy efficiency audit. Findings on cost-effective energy efficiency measures have to be reported to the government and the public. As there is no obligation to implement theses measures, the policy is considered weak and the effect on real savings is difficult to quantify.

The new package includes the Clean Technology Investment programme that should support business in their energy efficiency investments. As this is a voluntary program, this policy is considered weak. Depending on the influence of the carbon tax on the electricity price, energy efficiency in industry will accelerate in the future.

One of the first measures of the Clean Energy Plan, the "Carbon Farming Initiative" was passed by Parliament on 23 August 2011. The measure is designed as a carbon offset scheme that will cover emissions from the agriculture and landfill sectors (for waste before the introduction of the Carbon Price Scheme). The scheme will be operational from December 2011.

The planned carbon price, another measure of the Clean Energy Plan, will cover non-energy emissions from industry. While fugitive emissions from mining and N20 will be completely covered by the carbon price mechanism, it only covers PFCs and no other f-gas emissions from industry.

While the steel industry will be covered by the system, it will receive government assistance of about A$ 300 million over a five year period.

Table 7
Qualitative summary of policies for the industry sector

	Changing activity	Energy efficiency	Low carbon			Other
			Renewables	With nuclear/CCS (low carbon vision)	Without nuclear/ CCS (100% renewable vision)	
Highlights		▸ Energy Efficiency Opportunity Program (EEOP) - an energy efficiency audit scheme ▸ the carbon price mechanism	▸ the A$ 200 million Clean Technology Innovation Program, which is foreseen to support R&D for renewable energy, low pollution technology and energy efficiency in industry ▸ the carbon price mechanism	▸ Clean Energy Initiative: A$ 1.7 billion for CCS in Industry, funding to support construction and demonstration of large-scale integrated carbon capture and storage projects in Australia, which may include gasification, post-combustion capture, oxy-firing, transport and storage technologies	▸ Clean Energy Initiative: A$ 1.7 billion for CCS in Industry, funding to support construction and demonstration of large-scale integrated carbon capture and storage projects in Australia, which may include gasification, post-combustion capture, oxy-firing, transport and storage technologies	▸ the Carbon Price mechanism will fully cover CH_4, N_2O and PCF as well as emissions from landfill ▸ HFCs and SF_6 will be covered by a tax ▸ carbon farming initiative covering landfill before 2012
Requirements of the low carbon policy package	**Restructuring industry towards high material efficiency:** leading to 0.5% additional material efficiency improvement per year	**General incentives such as taxes, subsidies, ETS:** tax >100% of energy price or leading to 0.5% additional annual increase in energy efficiency	**General incentives:** energy taxes (> 100% of energy price) and subsidies, ETS, overall leading to additional 5% in 10 years **Sustainability standards for biomass use**	**Support for coal and gas CCS:** 10% in 2030 **Support for CCS on biomass and process emissions:** 10% in 2030	**Support for CCS on biomass and process emissions:** 10% in 2030 **Support for coal and gas CCS is a *barrier* to renewable energy**	**Reduce N_2O process emissions:** to 10% of historical maximum by 2030 **Reduce fugitive CH_4 from oil and gas production:** to 10% of historical maximum by 2030 **Reduce CH_4 from waste:** by 20% below BAU by 2030 **Reduce emissions of F-gases**
Gap of national policies to low carbon policy package	No policies in place to support increasing material efficiency, long product lifetime	▸ no mandatory implementation of identified measures in EEOP ▸ tax too low for stimulating energy efficiency	▸ No direct support for renewable energy ▸ No framework for sustainable biomass import	▸ low support for coal, gas, biomass and process emissions CCS	▸ no support for biomass and process emissions CCS	Goals but no incentives to reduce N_2O, CH_4 from oil and gas and waste, F-gas emissions,.
Rating for 2050	**G**	**D**	**F**	**F**	**G**	**F**
Relevance for emissions in 2020	Low relevance: the impact is important only for the long term	Low relevance: Efficiency measures already have short term effects, but share is low	Low relevance: Increasing the share of renewable fuels used will have direct impact, but share is low	Low relevance: Fuel switch and CCS measures have a low impact. Possibilities of fuel switch are limited. CCS options will not be medium term options but rather play a role after 2020		Medium relevance: The share of these emissions for Australia is large and a large amount can be avoided effectively and within a comparatively short time frame.

Note on rating: Rating represents the aggregated score per segment translated into G (poor) to A (excellent). Size of the letters resembles the importance of the segment towards developing a low carbon economy

Potential options for future actions

Energy related emissions are already covered by policies that increase energy efficiency and those that support the production of renewable energy. However, the EEOP and the Clean Technology Innovation Programme can be improved by connecting them to a white certificate scheme or introducing clear rules for the implementation of findings.

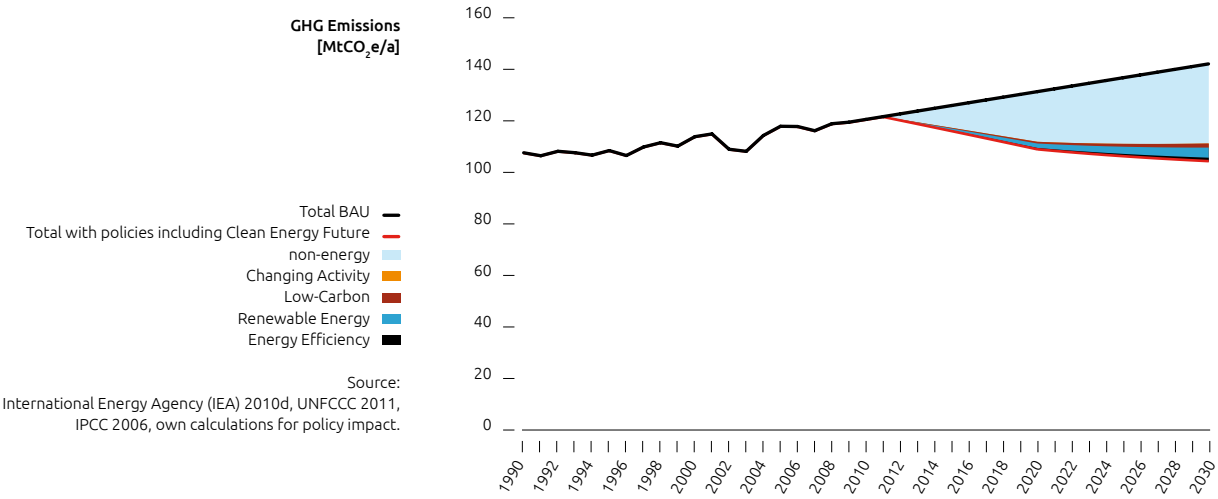
Non-energy related emissions are mainly covered by the carbon price mechanism. Depending on certificate price developments, this incentive could be effective. Additional financial support for research in methane-capturing technologies in the mining sector will lead to a higher mitigation potential. Waste emissions can be additionally targeted with policies that increase recycling rates to avoid landfilling and methane capturing at landfill sites.

A third area is the products themselves. The longer the product lifetime, the higher the recycling rate and the higher the material efficiency, the lower the resulting energy demand and resulting emissions in the medium term. This could be supported through efficiency standards and measures for higher recycling rates and material efficiency.

Impact on emissions in 2020 and 2030

Emissions from the industry sector increase in the business as usual scenario (BAU) by 28% on 2008 levels and by 107% on 1990 levels (see Figure 16) till 2030. Policies implemented at the moment have the potential to decrease emissions by 39 Mt CO_2e/a by 2030 compared to BAU. Existing policies show a large impact in the area of non-energy emissions (f-gases, CH_4 and N20) by 31 Mt CO_2e/a.

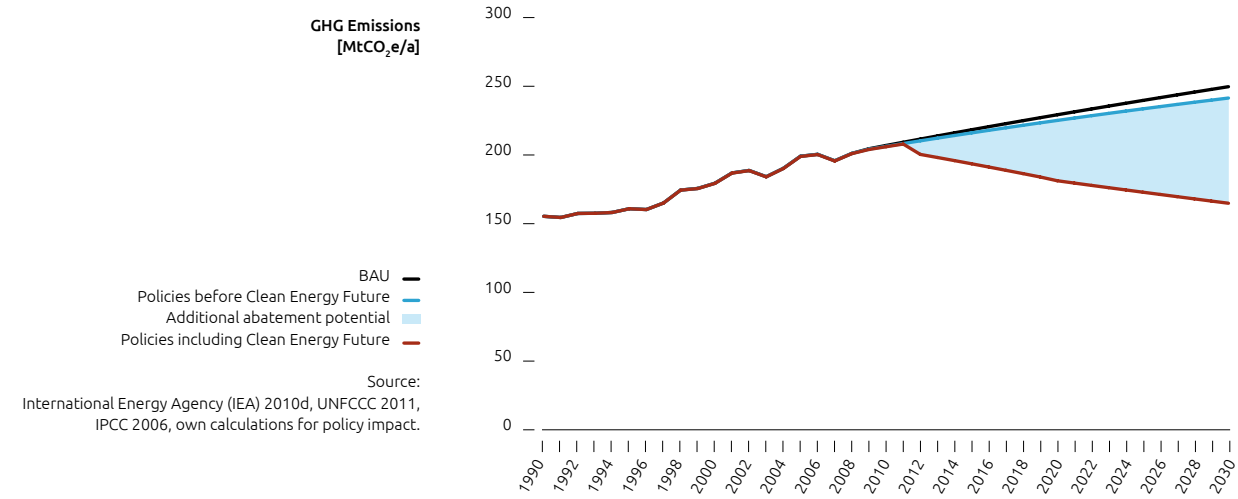
Figure 19
Industry sector emissions projections for policies including measures from the Clean Energy Future package to 2030, by policy area



Source:
International Energy Agency (IEA) 2010d, UNFCCC 2011, IPCC 2006, own calculations for policy impact.

Projected impacts of the policies of the Clean Energy Future lead to the main reductions (see Figure 20). This is due to the fact that there were very few policies for the non-energy sector in place before, while the new Clean Energy Legislative Package addresses especially non-energy by introducing the carbon price, fully covering the appropriate gases in industry (N20, CH_4 and PFCs).

Figure 20
Impact from policies without the clean energy future measures and including clean Energy Future policies on future emissions of the industry sector to 2030



Source:
International Energy Agency (IEA) 2010d, UNFCCC 2011, IPCC 2006, own calculations for policy impact.

4.4 Buildings

General situation

A main driver of the Australian building sector is the availability of space. This is reflected in the high available floor area per household of almost 150 m^2. Australia's overall building stock was 1,365 million m² in 2007. Thereof 177 million m² represent the commercial building stock, which is characterised by education, assembly and warehouse space and to a lesser extend retail and office buildings.

Due to the different climate zones the requirements on the built environment vary. While some areas require mainly cooling, others have a larger focus on heating.

Commercial space is forecasted to grow to just under 200 million m² until 2020. The number of residential households in Australia is forecasted to rise from six million in 1990 to ten million in 2020. The respective floor area is set to increase from 685 million m² to 1 682 million m². Currently (2007) around 8 million households represent 1,188 million m² floor space. The average number of occupants per household was around 2.9 in 1990 and declined slightly until 2.65 in 2007 (Department of the Environment 2008; Australian Bureau of Statistics 2011e).

The building sector accounts for about 12.4% of the total energy end-use of around 5,889 PJ. The total electricity consumption in the residential sector increased its share from 46% in 1990 to 51.6% in 2010 and is estimated to account for 53% of the total buildings sector by 2020. Australian Government projections show the share of energy use of electrical appliances in the residential sector will rise to 36% in 2020 (starting from 24% in 1990), driven by an estimated increase in the use of electrical space cooling of 3% in the same period. Due to this development, electrical appliance energy use is forecasted to almost match space heating as the largest single energy use in the average Australian household.

Heating is dominated by the use of electricity, followed by gas and, to a small extent, wood. While the share of energy use for gas space heating will grow up to 25% (from 16% in 1990), wood space heating will decrease to 8% (from 21% in 1990). The overall energy demand for space heating is forecast to rise with an annual growth rate of 1.3%, comparable little considering the rapid average annual growth of 16% for space cooling (from 0.8 TWh (68,788 ktoe) in 1990 to 4.9 TWh (421,324 ktoe) in 2020).

Key Indicators for the Australian Residential Building sector 2010

No of households (million):	8.551
Av. household growth rate:	1.5 %
No of occupants (million):	22.73
Av. occupants per household:	2.66
Share of residential sector in total energy use:	7.5%
Share in total electricity use:	11.9%
Share in national emissions (2008):	2.2 %

Sources: Department of Resources 2011d Department of the Environment 2008; Australian Bureau of Statistics 2011e

Minimum building shell performance standards were introduced in all jurisdictions. The driving force for the growing heating and cooling demand is the increase in floor area through new buildings and extension of existing stock. Required building shell performance standards are a long-range instrument and effects will only show over time.

Water heating, another major energy use is expected to decline slowly to 2020. This is due to different governmental programmes encouraging the use of solar water heating or efficient gas appliances (Department of the Environment 2008; Bloom and Wheelock 2011).

The building sector consumed 192 TWh (16,509 ktoe) energy in 2007, which constituted 19% of total energy consumption in Australia. While the commercial sector uses 72 TWh, the residential sector consumed 120 TWh of which 50% was electricity, 35% gas products, 13% biomass and 2% natural gas (Australian Building Commission 2008; Bloom and Wheelock 2011).

Overview of policies and their effectiveness

Australia has a wide range of policy measures in pursuit of increased energy efficiency and, to a lesser extent, to support renewable energy in the built environment.

The Building Code of Australia (BCA) has energy efficiency provisions for all building classifications. Several states have adopted their own regulations to strengthen efficiency standards for new and retrofitted buildings. However, most of the policy measures target raising the efficiency of new buildings and assets (such as appliances) but not retrofitting existing buildings.

Changing standards for new buildings is a rather long-term means of bringing about change. On average, new buildings represent around 1.7% of the building stock in the next ten years (Bloom and Wheelock 2011). With this rate of change it would take 50 years or longer to alter the entire building stock. To reach a meaningful amount of energy efficiency in the building sector in a shorter timeframe requires changes in the existing stock of buildings - key drivers being the quality and the speed of renovation.

Australian state governments have agreed to implement a consistent Nation-wide House Energy Rating Scheme (NatHERS) to enable householders to assess the energy efficiency of houses and make more informed choices about housing purchases and renovation (International Energy Agency (IEA) 2010a).

Most of the measures in the current mix of policies that address increasing energy efficiency and reducing greenhouse gas emissions in the building sector are prescriptive in nature. One example is the assistance to households to purchase insulation wherethe only flexibility lies in the choice between taking assistance and buying a prescribed product - or not. This approach focuses on managing inputs rather than outcomes. There may be many circumstances where a household could obtain better results with an investment in measures other rather than (the prescribed) roof insulation. Moreover, households that already insulated their roof on their own expense are penalised, since they do not receive assistance. This 'one size fits all' approach is not necessarily the best way for the different cases. It provides little incentive to innovate under such approaches (Australian Sustainable Built Environment Council 2010).

Complementary measures address energy use in residential buildings where measures typically subsidise insulation or the use of solar technologies in homes; however they have been closed recently. Some states in Australia offer rebates for installing a solar hot water system or a heat pump, but the use of renewable energy for heating and / or cooling is not obligatory.

Regarding the energy efficiency of appliances, Australia implemented the Equipment Energy Efficiency Program (E3), a collection of coordinated programmes that deliver economic and environmental benefits to the community. The programme covers the technical, legal, and administrative aspects of national appliance and equipment energy efficiency initiatives, in particular mandatory minimum energy performance standards (MEPS) and energy efficiency labelling. It is currently estimated that the E3 Programme will yield a cumulative economic benefit to Australia of A$ 22.4 billion by 2024.

It is estimated that the Equipment Energy Efficiency Program saves about 22 TWh in the residential sector and 10 TWh in the non-residential sector per annum in 2020 (Wilkenfeld 2009). The MEPS are well targeted energy efficiency regulations that have a proven track in unlocking emissions reductions and energy saving potential already; however there is still room to enhance.
In Australia, where commercial buildings are concerned it is not clear how many greenhouse gas emissions will actually be reduced as a result of current measures because the impact cannot be estimated easily. One recently implemented measure is the requirement to disclose the energy/ emissions performance of a building when renting a commercial building (Australian Sustainable Built Environment Council 2010).

Table 8
Qualitative summary of policies for the building sector

	Changing activity	Energy efficiency	Low carbon	
			Renewables	Fuel switch
Highlights	The National Urban Policy analyses major cities and the population strategy. Strategic plans are to be in place from 1 January 2012	Several programmes for energy efficiency improvements as Equipment Energy Efficiency Programme, Phase-out inefficient lighting, High Efficiency Strategy for Heating, ventilation and air condition, the National energy savings initiative, with a focus on households, Phase-out of GHG-intensive water heaters, Rebates for residential buildings in many states to support the exchange of water heating systems as well as Building Code of Australia (BCA) , the Low Carbon Communities programme and Tax Breaks for Green Buildings programme.	Phase-out of GHG-intensive water heaters also supports renewable water heaters. Renewable Energy Bonus Scheme - Solar Hot Water Rebate (REBS) National Solar Schools Programme	Switching from use of biomass (not sustainable) to LPG. Increase in use of natural gas, as this is a more cost effective fuel option.
Requirements of the low carbon policy package	**Urbanisation policy that leads to energy efficient development**	**Efficiency standards for new buildings:** zero energy by 2020 **Support to increase energy efficient retrofit rate:** 3% per year **Incentives for efficient electrical appliances:** leading to 1-2% less electricity use per year **General incentives:** taxes in the order of 100% of the energy price **Removal of barriers, e.g. subsidies**	**Support for renewables in new and existing buildings:** increase in share of 10% in 10 years **General incentives:** taxes in the order of 100% of the energy price **Sustainability standards for biomass use:** national and imported	**Support for fossil fuel switching (to gas)**
Gap of national policies to low carbon policy package	Implementation of strategic plans and embedding of climate as a core element in urban planning	No or very low support for energy efficient retrofitting. Buildings have to fulfil the energy performance requirements according to 6 stars, but the path to 10 stars buildings (nearly zero energy) is not defined. The non-residential sector is not covered by all measures.	Incentives for renewables are mainly for hot water. No coverage of all technologies (e.g. heating systems) and no national coverage.	
Rating for 2050	F	D	E	Not rated
Relevance for emissions in 2020	Low impact: Measures on sustainable urbanisation measures have important long-term effects and medium effect on emissions in 2020	Medium impact for measures on appliance efficiency: Life times for most appliances are short to medium term and due to population and GDP growth there is a large demand for new appliances Medium impact for measures on building efficiency: due to the long life time of buildings and the low renovation rates	Low impact: Direct replacement of emissions through the uptake of renewables. Technologies are readily available. Lifetime of equipment is medium term (e.g. water heating systems) and replacement of a large share could happen until 2020	Not rated

Note on rating: Rating represents the aggregated score per segment translated into G (poor) to A (excellent). Size of the letters resembles the importance of the segment towards developing a low carbon economy

Potential options for future actions

The building sector has been the sector with most activity related to GHG mitigation in the past. Measures cover a wide range of issues, although most of it is happening on a state level and it would be necessary to scale activities to a national level, like for example the Energy Saver Incentive to further reduce emissions.

More attention needs to be given to activities in the non-residential sector. Incentive schemes could also cover commercial buildings, as well as including commercial equipment in performance standards. Overall performance standards for appliances could be increased and a system for regular revision and update (e.g. Top-runner approach) implemented.

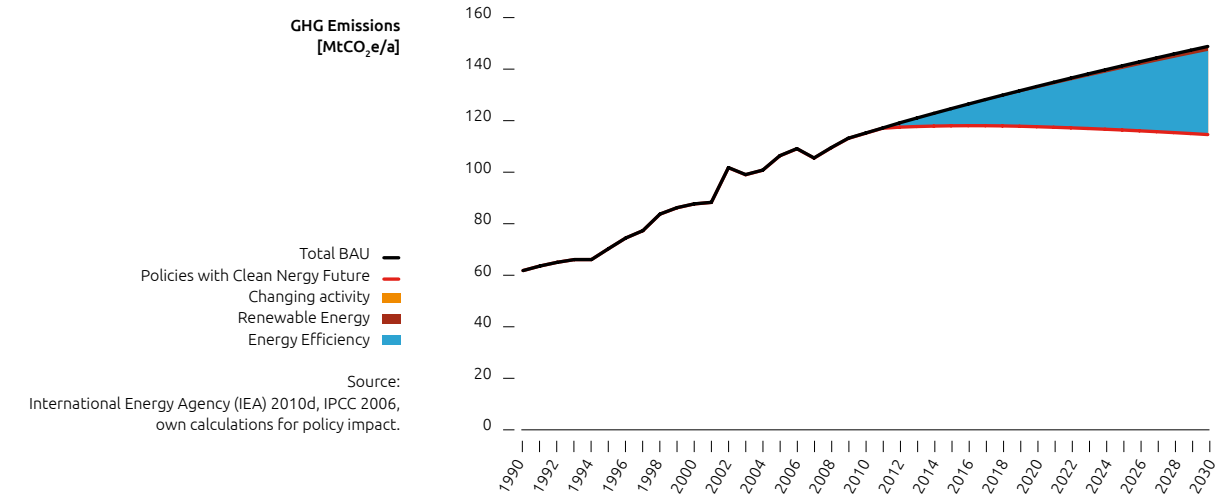
Incentives for energy-related retrofit could be improved and implemented at national level. To achieve a zero building trajectory, a clear timeline with increasing stringency from the 6 star performance requirement to 10 stars is needed.

Impact on emissions in 2020 and 2030

Emissions from the building sector increase in the business as usual scenario (BAU) by 36 % (2008 level) to 2030, see Figure 20. Policies implemented at the moment have the potential to decrease emissions by 29 Mt CO_2e in 2030.

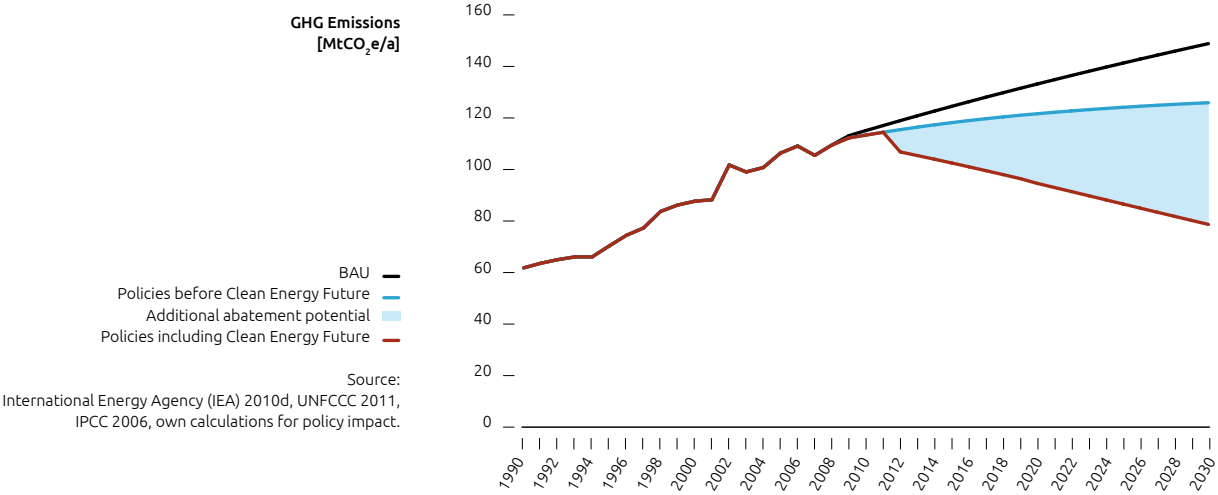
Projected impacts of the policies of the Clean Energy Future almost double the reduction (see Figure 22). This is due to the fact that energy prices are expected to grow what will have a significant impact on the electricity use in buildings. Energy efficiency will be further improved.

Figure 21
Building sector emissions projections for policies including measures from the Clean Energy Future package to 2030, by policy area



Source:
International Energy Agency (IEA) 2010d, IPCC 2006, own calculations for policy impact.

Figure 22
Impact from policies without the clean energy future measures and including Clean Energy Future policies on future emissions in the building sector to 2030



Source:
International Energy Agency (IEA) 2010d, UNFCCC 2011, IPCC 2006, own calculations for policy impact.

4.5 Transport

General situation

Australian transport is characterised through the vast area of the country and a strong concentration of population in urban centres. Almost 70% of Australians live in the major metropolitan areas, which are all located along the coast and have large distances between them (The Parliament Of The Commonwealth Of Australia 2006). 812,972 km of roads (42% paved and 58% unpaved) and 38,445 km of railway lines cover the continent. 19 major airports service national and international travel. In total 465 airports provide services and connect also remote parts of the country (CIA 2008).

The main investment over the last 50 years has been in road infrastructure (T-Mapper project Team 2010), while overall the investment in infrastructure has been found to be insufficient for a sustained period. Infrastructure investment has declined as a share of public expenditure by all Australian governments. Government capital expenditure has dropped from around 7.2% (as share of GDP) in the 1970s and early 1980s to 3.6% in 2003/04 (National Transport Commission 2008) resulting in an investment backlog in transport infrastructure.

Key Indicators

Size:	7,692,024 km^2
Road density (2007):	0.11 km / km^2
Vehicle ownership (2011):	730 cars / 1000 pop
Emissions (2009):	83.65 $MtCO_2e$
Share in national emissions (2009):	14 %

Sources: UNFCCC 2009d, T-Mapper project Team 2010, Australian Bureau of Statistics 2011d

The large dependence on road transport is demonstrated by one of the highest vehicle ownership rates of 730 vehicles per 1000 inhabitants (Australian Bureau of Statistics 2011f) and a growth in the passenger vehicle fleet of almost 12% between 2006 and 2011 (Australian Bureau of Statistics 2011d).

Road transport also plays an important role for domestic freight, with a share of around two thirds of the transport volume, followed by rail with 26% and only limited shipping and aviation. For short distances below 100 km, 80% of freight is moved by road (Department of Climate Change 2010). This is supported by an overall low level of gas/diesel prices. In July 2011 only Mexico, the US and Canada had lower fuel prices than Australia (Department of Resources 2011a).

Emissions from transport increased by 35% from 1990 to 2009 and now represent 13.9% of total emissions, compared to 13.5% in 1990. Civil aviation has seen the largest increase, more than doubling emissions in this period (UNFCCC 2009d). Under BAU the Australian Government expects emissions from transport to increase a further 15% between 2010 and 2020 (Australian Bureau of Statistics 2011d). This is also due to the high average emissions of the Australian vehicle fleet. In 2010 national average emissions for light vehicles was 212.6 g CO_2 per km (Department of the Environment 2010).

Responsibility for transport regulation and infrastructure lies largely with the state and territory Governments. However, there have been strong efforts to harmonise regulation at national level. The Australian Transport Council (ATC) was established in June 1993 to provide a forum for Commonwealth, State, Territory and New Zealand Ministers to consult and provide advice to governments on the coordination and integration of all surface transport and road policy issues at a national level (South Australian Government 2009). Infrastructure investment decisions however, mainly remain at state/territory level.

Overview of policies and their effectiveness

One focus of Australian transport policy at the national level over the last years has been the harmonisation of basic regulation, which has so far been the sole responsibility of the states and territories. Infrastructure investment has been - and still is - mainly focused on roads, which represent around 80% of overall spending. Other measures focus on information tools to provide both private users and businesses with data and tips how to reduce their emissions, for example through the 'Living Greener' website and the 'Truck Buyers Guide'. Existing emission standards so far do not cover greenhouse gases. This is planned within the 'Clean Energy Future' strategy, but is not part of the recently adopted set of Acts. The proposed levels of 190 g/km by 2015 and 155 g/km by 2024 are well below requirements for a substantial decarbonisation of the sector. Standards are only planned to start in 2015 and not earlier, which would allow for a more rapid uptake of more efficient vehicles, which are readily available on the market.

Investment planning continues along past priorities and does not foresee significantly higher shares spent on improvement of lower carbon transport modes, both for passenger and freight transport.

On state/territory level there are many efforts to improve public transport infrastructure as well as bike and walking infrastructure, especially in Perth and, to a lesser extent, in the other large metropolitan areas of Sydney, Adelaide, Melbourne and Brisbane. In most cases, the focus of the measures is on removing bottlenecks in public transport and increasing capacity and frequency of service.

'Reverse the effect'

Offsetting car emissions in Queensland

In 2009 QLD initiated the "Reverse the Effect" scheme, where car owners can offset their vehicle emissions. Voluntary donations are matched by the Government, which has allocated up to A$ 4.5 million. Contributions go to the Eco-fund Queensland for projects that support the Queensland Government's target of expanding protected natural areas and national parks in Queensland to 20 million hectares by 2020. The program also includes a website with information on how to reduce emissions from transport.

Additional to national information tools, most states have programmes to promote walking, cycling and public transport. The 'TravelSmart' program was started in Western Australia in the 90s, but quickly spread to the other states and territories. The programs work with communities, companies, schools and households to reduce dependence on car travel.

Table 9
Qualitative summary of policies for the transport sector

	Changing activity	Energy efficiency	Low carbon	
			Renewables	Nuclear / CCS / fuel switch
Highlights	▸ TravelSmart initiative in WA provides a good concept in directly working with communities to address travel behaviour (both activity and efficiency)		▸ Mandatory bioethanol (10%) and biodiesel (2%) quotas in NSW	
Requirements of the low carbon policy package	**Strategies to avoid transport or to move to non-motorised transport:** 4% avoided by 2020 **Strategies for modal shift:** 8% increase of capacity by 2020 **General incentives:** e.g. tax of the order of 100% of energy price	**Incentives for efficiency in light vehicles:** trajectory to reach 95g/km in 2020 for new cars **Incentives for efficiency in freight transport:** reduce specific emissions by 20% by 2020 **General incentives:** e.g. tax of the order of 100% of energy price	**Incentives for renewables in transport:** additional share of 10% by 2020 **Sustainability standards for biomass use:** national and imported	**Support for fossil fuel switching (to gas) and other low carbon technologies** **Support for electro mobility (cars and infrastructure)**: 5% electric cars by 2020
Gap of national policies to low carbon policy package	▸ Insufficient infrastructure investment and incentives to promote non-motorised transport. ▸ Insufficient investment in public transport infrastructure and services ▸ Low fuel prices provide little incentive for behavioural change	▸ Carbon emission standards for light vehicles under discussion are not yet implemented, below required levels and too late ▸ Very limited incentives for efficiency improvements for heavy vehicles apart from some information programs	▸ Strengthen incentives at national scale, especially for transport sectors that are not covered by the carbon price ▸ Implement a framework that ensures sustainability and effective carbon reductions from biofuels	▸ Incentives for low carbon technologies are very limited and need to be strengthened to facilitate the required increase ▸ There are currently no measures in place to promote electric mobility
Rating for 2050	**F**	**F**	**E**	**G**
Relevance for emissions in 2020	Medium relevance: Measures in this segment have medium to long term effects. Infrastructure set up, information dissemination and behavioural change require longer time frames to take full effect	Medium relevance: Efficiency measures already have short term effects. They have the potential to contribute substantially to reductions in 2020	Low relevance: Increasing the share of renewable fuels used will have direct impact. Larger scale deployment will require additional infrastructure and technical changes to vehicles, but moderate levels can be achieved in a short time frame	Low relevance: Some low carbon technologies are well advanced and widely available, like LPG, LNG, CNG and hybrid technologies. Others are still in an early development state and need further support to have long term effects

Note on rating: Rating represents the aggregated score per segment translated into G (poor) to A (excellent). Size of the letters resembles the importance of the segment towards developing a low carbon economy

Potential options for future actions

Given the projected large increases in overall transport activity, three areas could benefit from a change towards a low carbon transport system:

- The inclusion of heavy transport in the carbon price mechanism is already envisioned by the Government, but still requires a final decision and implementation.
- The Government also considers the implementation of light vehicle GHG emission standards in 2015. The envisaged standard could already start as early as 2012, which would allow a swifter uptake of more efficient vehicles. The system could be further improved with an inbuilt system of review and improvement over time.
- Massive infrastructure investment in urban public transport, bike and pedestrian infrastructure and rail infrastructure would be required to ensure a long term transition to low carbon transport modes.

Impact on emissions in 2020 and 2030

Emissions from the transport sector increase in the business as usual scenario (BAU) by 92 % compared to 2008 and by more than 153 % compared to 1990 (see Figure 23). Policies implemented at the moment have the potential to decrease emissions by 11.6 Mt CO_2e/a or 7 % compared to BAU in 2030. Most of emissions savings in the transport sector reflect efforts to the increased use of renewable energy and energy efficiency. About 20% of the reductions are expected to come from improving energy efficiency, although there is a substantially larger potential in this area.

The Clean Energy Future package has low impact in the transport sector. This is mainly due to the fact that heavy transport is as yet not included in the carbon price scheme and that the carbon price is expected to be too low to trigger major behavioural change in the sector. Especially in transport the price elasticity of fuels is low and strong price signals or additional measures are required to motivate change.

Figure 23
Transport sector emissions projections for policies including measures from the Clean Energy Future package to 2030, by policy area

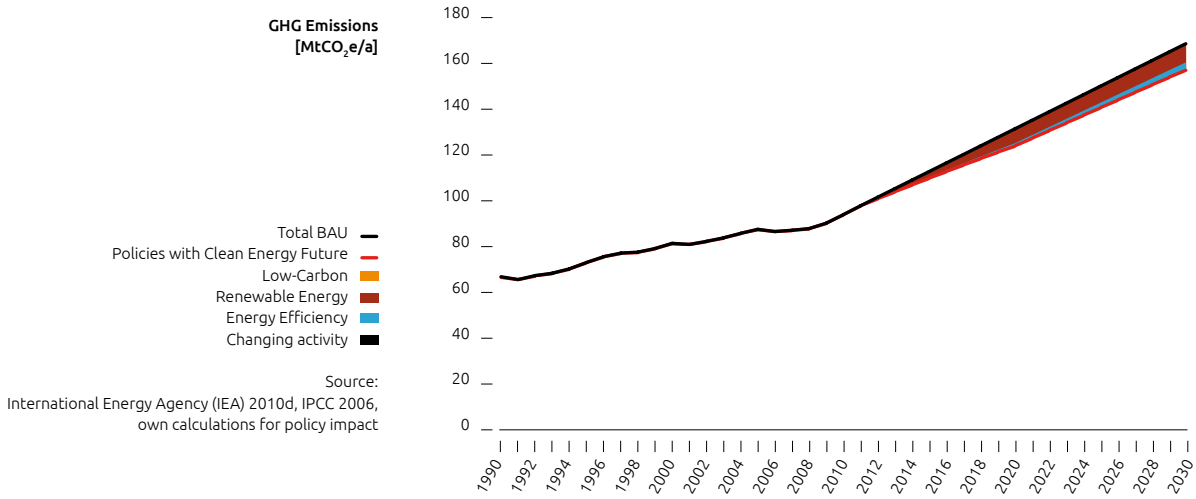
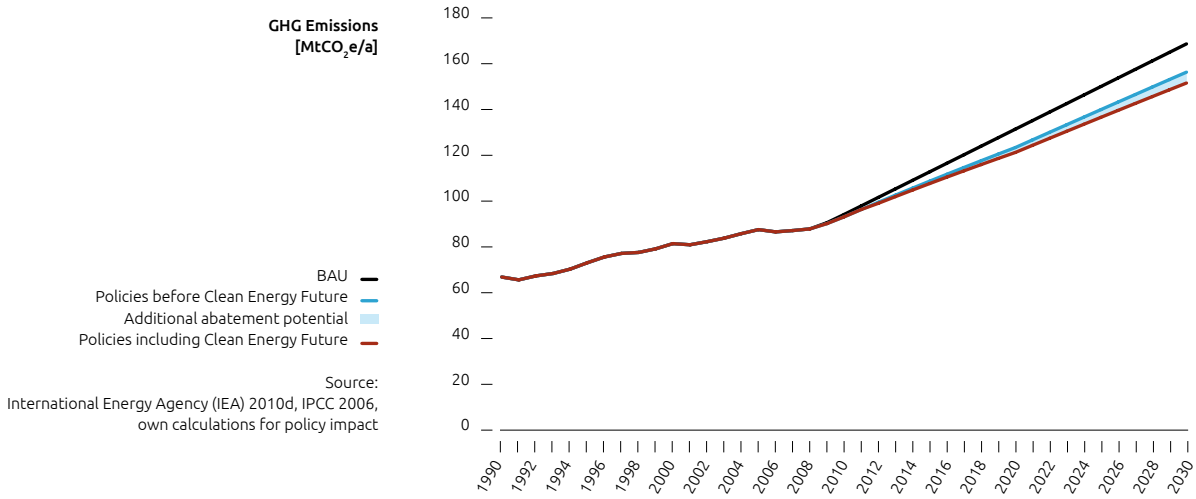


Figure 24
Impact from baseline and Clean Energy Future policies on future emissions of the transport sector to 2030



4.6 Agriculture and Land Use, Land Use Change and Forestry (LULUCF)

General situation

Agriculture and land use, land use change and forestry sector (LULUCF) are important sectors for Australia's overall emissions.

Both sectors are characterised by large fluctuations driven by climate variability between years and extreme weather events. Agriculture in particular is highly sensitive to management practices (Department of Climate Change 2008).

Key Indicators

Forest area:	107 million ha
Deforestation (`90-`10 annual):	260,000 ha (0.17 %)
Share of Agriculture emissions (2009):	15 %
Share of GDP from Agriculture (2010 est.):	4 %
Agriculture/labor force (2009 est.):	3.6 %
Share of protected area:	11 %
Farm area (2009):	417.2 million ha
Share in total land area:	54 %

Sources: Department of Climate Change 2010, CIA 2011, , U.N FAO 2010

Apart from being sources of greenhouse gases, Agriculture and LULUCF are the largest sources of air pollutants such as carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs), which can lead to the formation of tropospheric Ozone (a very short lived greenhouse gas) and affect the atmospheric lifetime of methane.

These gases, along with NOx, are emitted during biomass burning. Emissions increased between 1990 and 2007 by 21.5 % (CO), 6.2 % (NMVOCs), 42.7 % (NOx) respectively (Department of Climate Change 2010). They all belong to the group of indirect GHG emissions which have not been allocated global warming potentials and are therefore are not included within Australia's total aggregated emissions.

Kyoto Protocol and the sector

The sector is not only important in the domestic context, but also plays a crucial role in evaluating Australia's pledge. International rules require careful accounting for the different sources of agricultural, land-use change, land-use change and forestry emissions and removals. To understand the implications it is essential to be clear on what is included according to the rules and what is not. Box 3 gives a short overview of the most relevant articles of the Kyoto Protocol.

The relevant articles from the Kyoto Protocol enable a large degree of flexibility for Parties. Given the choices made by Australia for the first commitment period this means that not all of Australia's land use, land-use change and forestry and agriculture emissions and/or removals are covered either by the Kyoto protocol or by its pledges. Emissions and removals of carbon due to changes in agricultural soil are not accounted for - nor are forest management and revegetation.

Box 3

Kyoto accounting rules

Article 3.3
This article determines that emissions or removals resulting from land which was converted, after 31 December 1989, to or from a forest through afforestation, reforestation or deforestation must be accounted.

Article 3.4
This article covers emissions from land use that is not afforestation, reforestation or deforestation (ARD). This includes:

- forest management
- cropland management
- grazing land management, and
- revegetation.

The article allows Parties to decide at the beginning of each commitment period which of the activities they wish to include in their accounting. Australia has chosen not to include any article 3.4 activities in the first commitment period.

Article 3.7
This article is known as 'the Australia clause' as Australian Senator Robert Hill was its biggest advocate in the final stages of negotiations on the Kyoto Protocol and it provides considerable benefit for the country. Under Article 3.7 of the Kyoto Protocol, a country's allowed emissions of industrial GHGs can be significantly increased compared to a situation where this does not apply.
Article 3.7 is 'triggered' if there are net emissions in 1990 from the Land Use Change and Forestry sector, in which case emissions from deforestation (Land Use Change) in 1990 can be added to the 1990 baseline for calculating what emissions a country is allowed in the first (and likely subsequent) commitment periods of the Kyoto Protocol.

Australia is the only country for which Article 3.7 has created a significant benefit.

Australia's Kyoto protocol first commitment period commitment as listed in Annex B was for an 8% increase above 1990 levels of industrial GHGs, and with the effect of the base year addition due to 1990 deforestation becomes 42% above 1990 levels of industrial GHGs.

Between 1990 and 1997 when the Kyoto protocol was concluded, Australia's deforestation emissions declined by almost 50%, and, since then, those emissions have declined by a further 13%. We examine the effect of these declining emissions on Australia's Kyoto pledge later in this section. Australia's 5th national communication indicates an ongoing level of deforestation in the future with no policies to prevent it.

Agriculture

In 2008, the total estimated area of farms and pastoral land in Australia was 417 million ha, representing about 54% of Australia's total land area, with livestock grazing accounting for the largest use (Department of Climate Change 2010).

The agricultural sector includes more than 100,000 entities (Department of Climate Change 2008). Beef cattle farming is the largest sector representing around 33% of all agricultural businesses. Grain growers follow with 11%. 60% of agricultural production is exported. Virtually all of Australia's wool and cotton, around three-quarters of Australia's wheat and sugar, two-thirds of its beef, almost two-thirds of wine production, half of sheep meat and about half of Australia's milk production are exported (Department of Climate Change 2010; CIA 2011).

Australia's latest National Greenhouse Gas Inventory Report (2011) estimates that the agricultural sector produced 84.7 $MtCO_2e$ emissions in 2009, about 15 % of the total for industrial greenhouse gases in that year. Methane accounts for 65.3 $MtCO_2e$ and nitrous oxide 19.5 Mt CO_2. Between 1990 and 2009, greenhouse gas emissions from agriculture decreased by 2.1 $MtCO_2e$ (Department of Climate Change 2011b).

The activities responsible for emissions in the agricultural sector include livestock emissions, agricultural soils, prescribed burning of savannah, rice cultivation and field burning of agricultural residues.

Due to the large livestock industry, agriculture accounted for around 56.7 % of national CH_4 emissions in 2007. Livestock alone was responsible for 87.4 % of CH_4 emissions within the sector. Enteric fermentation and the decomposition of animal wastes are the sources (Department of Climate Change 2009). CH_4 emissions for livestock make up 7.2 % of net 2007 GHG emissions (all calculations based on CO_2e). In 2009, greenhouse gas emissions from livestock include enteric fermentation (54.7 $MtCO_2e$) and manure management (3.3 $MtCO_2e$).

Smaller quantities of emissions were generated through rice cultivation (0.05 $MtCO_2e$ which decreased 0.4 $MtCO_2e$ since 1990), burning of savannahs (12.1 $MtCO_2e$) and 0.3 Mt CO_2e from field burning of crop residues (Department of Climate Change and Energy Efficiency 2011f).

Methane emissions from agriculture slightly decreased by 4.0 % in 2007 compared to 1990 but still cause 7.2 % of total emissions in 2007 (Department of Climate Change 2009). N20 emissions from agriculture increased (1990-2007) by 25.3 % and represented 2.4 % of total net GHG emissions in 2007 (Department of Climate Change 2009). The application of fertiliser and animal wastes to agricultural soils causes these emissions. The increasing intensification of the livestock industries and application of fertilisers play an important role in the sector trend.

Land Use, Land Use Change and Forestry (LULUCF)

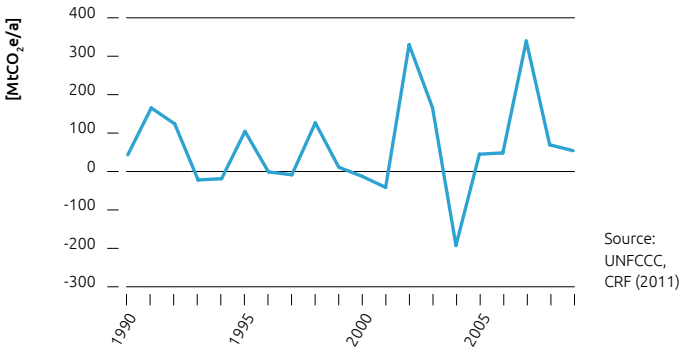
Forests cover 107 million hectares, almost 14 % of the total land area. 105 million hectares are native forest and 2 million hectares are plantation forest (Department of Climate Change 2010). The Australian forest definition specifies forests as areas with a vegetation height of two metres and crown cover of 20 %, and a minimum forest area of 0.2 hectares (Department of Climate Change 2010). Australian forestry plantations produce two-thirds of the country's log supply. Expansion of the plantation estate to three million hectares by 2020 is planned (Department of Climate Change 2010). A long-term decline in the volume of timber harvested from native forests is observed (Department of Agriculture 2008).

The LULUCF sector includes both removals of carbon as well as emissions of carbon dioxide and other greenhouse gases. Emissions from land use change and forestry sectors have a very high degree of inter-annual variability due to natural disturbances such as El Niño events, wild fires and other factors.

Figure 25 below shows the overall net time series of emissions and removals from the LULUCF sector in Australia since 1990. The data shown here is for the whole LULUCF sector which includes Article 3.3 and Article 3.4 activities under the Kyoto Protocol, not all of which Australia is accounting for in its international pledge. It is to be noted that this sector was a net source in 1990, partly due to the high level of deforestation, which triggered the ability of Australia to use article 3.7 of the Kyoto protocol to add deforestation emissions to the calculation of its assigned amount under the 1st period of the Kyoto protocol.

In what follows we do not analyse the whole LULUCF sector and instead focus on the Kyoto Protocol Article 3.3 activities. The development of the whole LULUCF sector is an important issue, but due to model limitations at this stage of the methodological development for this analysis it has been decided to leave this for the next update on Australia's policies.

Figure 25
Reported LULUCF emissions for Australia to the UNFCCC 1990 to 2009



Source: UNFCCC, CRF (2011)

Land use change GHG emissions in Australia are driven by deforestation, mainly due to clearing for agriculture and urban development, and declined from about 70 Mt CO_2e in 2002 to an estimated 53.3 Mt CO_2e in 2005, which was about 9 % of total emissions (Department of Agriculture 2008).

Over the decade 1990–2000, Australia had the sixth highest annual rate of land clearing in the world (Lindenmayer and Burgman 2005). However, in 2009, net emissions from deforestation were estimated to be 41.3 Mt CO_2e - a decline of 90.2 Mt COe2 from 1990 levels (Department of Climate Change 2011b). This development is because of increased restrictions on land clearing for agricultural land uses (Department of Climate Change 2010) due to native vegetation legislation in NSW and QLD, which protects these areas. However there are still some serious issues associated with illegal logging (Center for International Economics (CIE) 2009).

The National Greenhouse Gas Inventory estimates the net emissions from Article 3.3 afforestation, reforestation and deforestation (ARD) activities since 1990 (Article 3.3, and excluding Article 3.4) was 18.8 MtCO_2e in 2009 (Department of Climate Change 2011b). The sequestration from afforestation and reforestation in 2009 is estimated to be 22.6 MtCO_2e. The source for the ARD activities is a net debit under the Kyoto accounting rules for Australia.

Overview of policies and their effectiveness

Major stakeholders and government agencies engaged in the agriculture and LULUCF sector are:

- Australian Bureau of Agricultural and Resource Economics (ABARE)
- Department of Agriculture, Fisheries and Forestry (DAFF)
- Department of Climate Change and Energy Efficiency (DCCEE)
- Australian Climate Change Regulatory Authority
- Australian Greenhouse Emissions Information System (AGEIS)

Both agriculture and LULUCF are addressed with national and state policies. The Commonwealth Government's role is to coordinate a national approach to environmental and industry development issues, and it has constitutional powers relating to the regulation of interstate trade, financial

entities and external affairs powers such as the implementation of international treaty obligations. State and Territory Governments have a general responsibility for land use and management, including forest management (Department of Agriculture 2010).

Modifications of this balance of responsibilities may be constitutionally possible but is politically difficult within a federal structure, the most federal initiatives in this area being based upon incentives rather than law. At present, key LULUCF emission sources such as forest conversion to grassland, emissions from grassland remaining grassland and agricultural emissions such as those from livestock do not appear to be addressed effectively within existing and planned policies. The effectiveness of overall agriculture and LULUCF policies remains low since it is incentive-based and no binding targets or compliance mechanisms are applied.

Table 10
Qualitative summary of policies for the Agriculture and LULUCF sectors

	Changing activity	Other
Highlights	▸ *Caring for our Country* investment program to promote sustainable farming	▸ The Carbon Farming Initiative provides an incentive for different types of activities directed at reducing emissions and increasing sinks across all sub-sectors. Emission reduction certificates generated under the scheme are partly offsetting emissions in other sectors, but provide a good incentive to engage farmers and landowners.
Requirements of the low carbon policy package	**Incentives for sustainable consumption practices** **Consistent land use strategy exists and is implemented** **Land use register exists**	**Decrease livestock CH_4 and N_2O emissions:** by 3 % below BAU in 2030 **Decrease cropland and organic/peaty soils, all non-CO_2 emissions (including rice production):** 5 % below BAU in 2030 **Implement measures CO_2 on cropland:** on 100 % of the area available for this purpose by 2030 **Reduce grassland all non-CO_2 emissions:** 7 % below BAU in 2030 **Implement deforestation measures:** on 100 % of the forest area by 2030 **Promote the conversion of non-forest land to forests through afforestation and reforestation (A/R):** leading to A/R on 100 % of the area available for this purpose by 2030
Gap of national policies to low carbon policy package	▸ Insufficient measures to promote sustainable consumption ▸ Implement consistent land use strategy on a national level	▸ Increase non-offsetting activities in the sector ▸ Provide intensive complementary activities to ensure uptake of farmers and landowners, e.g. information dissemination, training, research and development
Rating for 2050	E	D
Relevance for emissions in 2020	Low relevance: Measures in this segment mainly have a long-term effect.	High relevance: Emissions from agriculture and LULUCF have a significant proportion in Australia and measures can directly contribute to emissions reductions both in the short and long term, in particular in forestry.

Note on rating: Rating represents the aggregated score per segment translated into G (poor) to A (excellent). Size of the letters resembles the importance of the segment towards developing a low carbon economy

Potential options for future actions

The Carbon Farming Initiative adds substantially to the efforts, targeting the full range of activities, i.e. farming practices to reduce CO_2 and CH_4, deforestation and degradation and afforestation, creating awareness and providing training to farmers and land owners.

Effects are, however, limited. Specifically the offsetting nature of the largest share of reductions under the Carbon Farming initiative does not give credit to the importance of the sector for Australia's emissions profile. The offsetting nature of reductions could be limited and a larger incentive provided for non-offsetting activities.

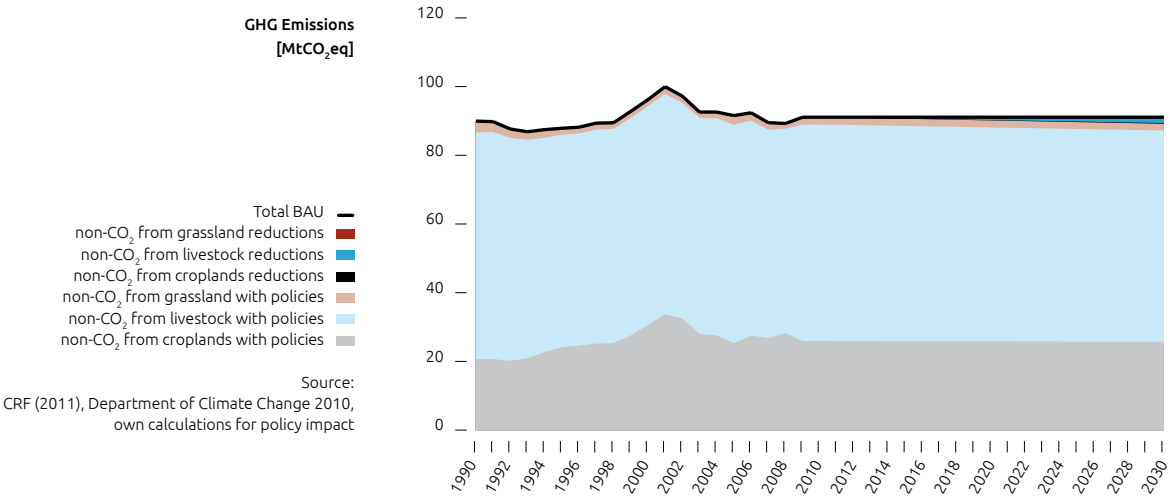
Impact on emissions in 2020 and 2030

Agriculture

For agricultural emissions the effect of policies is projected to be very small. For cropland and grassland reductions are too small to be visible in Figure 2 below. This is partly due to the fact that only a part of reductions achieved through the Carbon Farming Initiative will be net reductions, as the other part can be used to offset emissions from other sectors and has been attributed to those sectors.

Additionally the effects of measures in research & development and awareness raising & training, as initiated under the Carbon Farming Initiative and through other measures will likely not produce effects in the short and medium term, but are essential to trigger long term change.

Figure 26
Agriculture sector emissions projections for policies including measures from the Clean Energy Future package to 2030, by policy area



Source:
CRF (2011), Department of Climate Change 2010, own calculations for policy impact

Afforestation, Reforestation and Deforestation (ARD) Activities

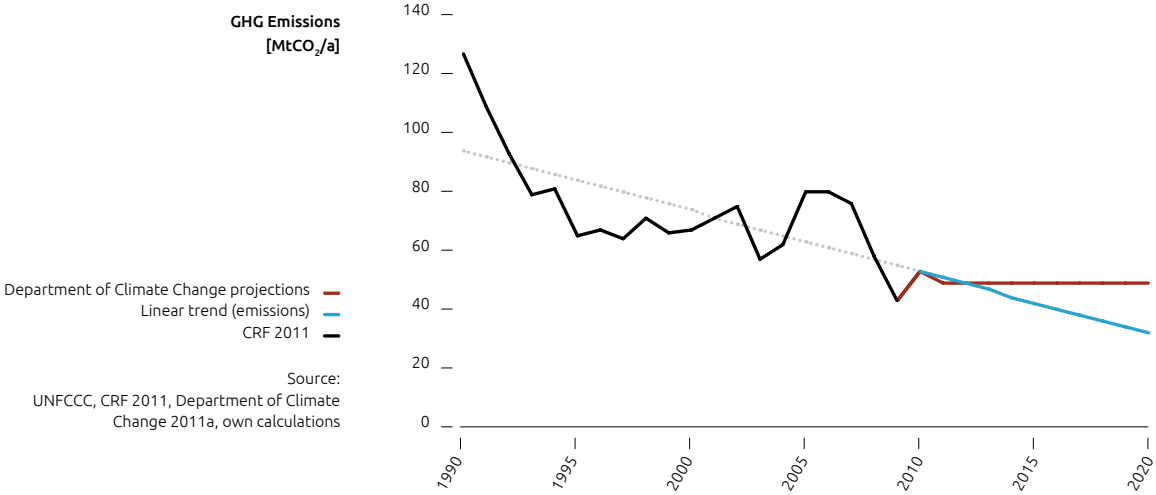
For LULUCF, i.e. land based CO_2 emissions, we have not calculated our own policy scenarios. We have evaluated the sector only qualitatively using available estimates on potential and evaluating the design of measures.

In this section we examine in more detail the specific afforestation, reforestation and deforestation (ARD) activities that are included in Australia's pledge to reduce its emissions by 5 % from 2000 levels by 2020. In this pledge LULUCF activities are restricted to ARD. In other the words, the pledge is set with respect to greenhouse gas emissions from all of the Annex A sources listed in the Kyoto protocol (which include agricultural emissions of greenhouse gases) and Kyoto Protocol Article 3.3 afforestation, reforestation and deforestation[18] categories (see Box 3). It is important to estimate the effect of projected levels of ARD emissions and/or removals to anticipate the level of industrial greenhouse gas emissions that would "be permitted" under the Australian pledge.

A reduced level of deforestation emissions, for example, as well as a continuing high level of removals from afforestation and reforestation activities, would both result in higher levels of "allowed" emissions of Annex A greenhouse gas emissions under the same pledge level. Conversely, higher deforestation emissions or reduced levels of afforestation and reforestation removals would reduce the "allowed" levels of industrial greenhouse gas emissions in 2020.

The figures below show the history, trends and projections made by Australia for deforestation and for Kyoto Protocol afforestation / reforestation categories through 2020. They show quite an interesting picture: it is clear that there is an overall decreasing trend in deforestation. Yet, in the official projections this decrease stops, and deforestation levels remain constant from around 2010.

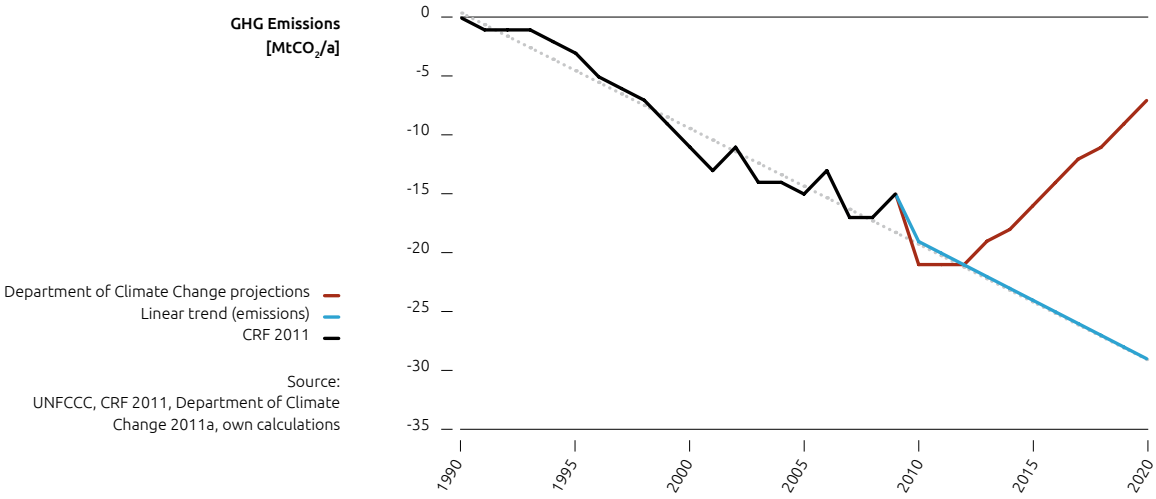
Figure 27
Deforestation emissions from 1990 to 2009 and projections to 2020



[18] Technically the deforestation activities apparently accounted by Australia in setting its pledge base year are not only Article 3.3 deforestation emissions, which are those due to activities since 1990, but also including ongoing emissions from land deforested before 1990.

A similar picture, in principle, applies to afforestation/reforestation, which shows an increasing sink from 1990 through 2008, which then holds and reverses after 2010 in Australia's projection, so that by 2020 removals are significantly less than present. If these projections are realised in practice, Australia will need to increase its efforts to reduce industrial greenhouse gas emissions. On the other hand, if the trend continues, Australia would need to do less in the industrial sector to meet its international pledge than is suggested by Australia's current afforestation/reforestation projections.

Figure 28
Afforestation and reforestation since 1990 (Kyoto Article 3.3) removals 1990 to 2009 and projections to 2020



Source:
UNFCCC, CRF 2011, Department of Climate Change 2011a, own calculations

5 | SUMMARY AND WAY FORWARD

This chapter summarises the policies in place and their impact on emissions and provides options for further action.

5.1 Australia's Clean Energy Future Package makes break with the past

Australia has long been regarded as lagging behind the rest of the world in terms of implementing climate policies. Although it does have in place a number of policies established over the last decade, these have not had a significant effect on the trajectory of greenhouse gas emissions growth.

Highlights

- ✓ The Clean Energy Future legislation package provides a significant overall incentive towards a low carbon economy, although coverage and stringency needs to be increased in the future.
- ✓ The Renewable Energy Target of 20% electricity consumption by 2020 will increase renewables by 13% from today.
- ✓ The Smart Travel initiative is a good concept on state level engaging the communities.
- ✓ A A$10 billion 'Clean Energy Fund' will support renewable energy, low pollution and efficiency investments.
- ✓ The 'Carbon Farming Initiative' will allow farmers and land managers to generate carbon credits.

The passage of the 18 Acts that form the Clean Energy Future Legislative Package through the House of Representatives on October 18, 2011 and the Senate on November 8 portends a major break in this history. This legislation establishes a framework for significant and long-lasting emission reductions. Nevertheless, the policies differ significantly in stringency and they don't completely cover some areas that could potentially have a large impact on emissions.

Due to the special provisions of the Kyoto Protocol's Article 3.7, Australia was able to account for the reduction in its deforestation emissions that occurred in the early 1990s without significantly slowing the growth of greenhouse gas emissions from the energy and other industrial sectors.

Australia is therefore well within reach of meeting its Kyoto target for the period 2008 to 2012, taking into account industrial greenhouse gas emissions, afforestation, reforestation and deforestation emissions and removals.

Prior to the adoption of the Clean Energy Future plan, there was insufficient policy to significantly change the upward trajectory of emissions (as might be inferred from the trend visible in Figure 29). In this context Australia was lagging behind the European Union, Japan, Norway and other industrialised countries, and behind the policy frameworks that China has put in place.

The comprehensive Clean Energy Future Plan defines a legislated strategy, which if fully implemented would almost reach Australia's 5% 'unconditional' reduction by 2020 from 1990 target domestically with deep and far-reaching policy changes. However, the plan gives no indication as to how Australia would reach its 'conditional' 15 or 25% reduction by 2020 from 1990 targets - or the long-term target of an 80% reduction by 2050 from 2000 levels.

The latter 2050 goal is a substantial improvement over the earlier position of a 60% reduction by 2050. In this context it is worth noting that a 2050 emission reduction globally of 80 to 85% from 1990 levels, which would be required to give a high probability of limiting warming to 2°C ultimately. This would require 95% or more reductions from the developed countries by 2050 in order for global per capita emissions to be approximately equal in that year.

With the new 2050 goal Australia has joined the EU (80-95%) as the only Annex I countries to come close what is needed on this time frame. The low carbon policy package described in this report and that is consistent with meeting internationally agreed long-term goal of holding global warming below 2°C above preindustrial levels would require, for developed countries, at least a 95% reduction from 1990 levels and would likely need to be anchored in a legally binding manner[19].

While the legislation puts the appropriate instruments in place to achieve the necessary change, its long-term effectiveness will depend on the ability of successive Governments to increase stringency and coverage of the instruments over time.With very high per capita emissions and a rising population, Australia's starting point is difficult – and shows that the longer a country delays strong policies, the more difficult it will be.

We recognise that the threat by Australia's Leader of the Opposition to withdraw the current efforts does create uncertainty for investment and decreases effectiveness of the instrument. However, we have evaluated the impact of policies under the assumption that the currently implemented measures and efforts continue at the present level, independent of possible changes in the administration.

The Clean Energy Future Plan has the potential to become the cornerstone instrument for low carbon development in Australia - but requires substantial enhancement. The policies differ significantly in stringency and do not completely cover some areas that could potentially have a large impact on emissions.

[19] Developing countries will also need to have made commitments to bring emissions below 1990 levels by this time.

5.2 How do sectors compare to the 'low carbon policy package'?

Electricity

Table 11
'Low carbon policy package' for the electricity sector

Changing activity	Energy efficiency	Low carbon	
		Renewables	Nuclear / CCS / fuel switch
(Electricity production is driven by the demand of the other sectors)	▸ Efficiency of fossil fuel power plants ▸ Combined heat and power production (CHP) ▸ Distribution losses	▸ General incentives for the production of electricity from renewable energy sources ▸ Support different technologies ▸ Support for adapted electricity grids ▸ Sustainability standards for biomass use ▸ Removal of administrative and grid barriers	▸ Policies that influence fuel choice ▸ Support for biomass CCS ▸ Support for coal CCS ▸ Support for substantial increase of nuclear nuclear Note: last two elements rated as barrier for 100 % renewables scenario

Australia's electricity system is dominated by coal powered thermal generation. The carbon price through the new legislation will provide incentives to increase efficiency. The transitional assistance programme will allow Australia to allocate a capped amount of free carbon permits to coal-fired power plants that meet certain standards. The short time frame for this intermediate assistance of 2016-2017 ensures that the incentive is maintained.

Energy efficiency is addressed by policies that have a more supportive character - except in NSW where obligations to electricity retailers apply. Hence, the effect of the carbon price on efficiency will be low compared to the carbon price needed to achieve a short-term improvement.

Renewable electricity generation is supported by a renewable target, implemented through an obligation scheme at the national level, supported by the new Australian Renewable Energy Agency (with a substantial budget) and state level feed in tariffs. The target of 20% renewable electricity by 2020 (up from 7% today) is a step forward and it is very likely that the target will be achieved. However, it does not reflect Australia's huge renewable energy potential.

Furthermore, a risk of failure remains in regard to the extension of grid structures necessary for a successful implementation of the renewable energy target. Current and policies included in the Clean Energy Future plan do not set out clear incentives to promote renewable energy oriented grid structures.

In the past policy very much concentrated on Carbon Capture and Storage (CCS). The government targeted large amounts of support for CCS (more than many other countries), but this came at the cost of a lack of policies in other areas. Since 2006, several government programmes and initiatives have supported research and demonstration projects. It now turns out that most of the funds were not spent, largely due to technical difficulties and financial uncertainties. The strategy to focus on CCS was unsuccessful.

The low carbon policy package has two variants. Under our vision of a carbon free future, we rate Australia's strategy for CCS as slightly positive ('F'). Under our vision of a 100% renewable future, we rate the emphasis placed on CCS as a barrier to the implementation of renewable energy, as it is diverting attention and resources, resulting in a 'G'.
The new Clean Energy Future Plan adds a uniform carbon price incentive to the earlier implemented support mechanisms, specifically the renewables target. The new scheme will have an additional positive - if as yet small - effect on the relative attractiveness of fossil fuel powered electricity generation and renewable energy.

Industry

Table 12
'Low carbon policy package' for the industry sector

Changing activity	Energy efficiency	Low carbon		Other
		Renewables	Nuclear / CCS / fuel switch	
▸ Restructuring industry towards high material efficiency	▸ Efficiency in industry ▸ General incentives (energy taxes and subsidies, ETS)	▸ Renewables in industry ▸ General incentives (energy taxes and subsidies, ETS) ▸ Sustainability standards for biomass use	▸ Support for CCS on biomass and process emissions ▸ Support for coal and gas CCS Note: last element rated as barrier for 100 % renewables scenario	▸ Reduce N_2O process emissions ▸ Reduce fugitive CH_4 from oil and gas production ▸ Reduce CH_4 from waste ▸ Reduce emissions of F-gases

Australia has no policies to support the redesign of products to be less material-intensive, long lasting and 100% recyclable or biodegradable as required by the low carbon policy package. This is essential for Australia to shift to a low carbon economy in the long term.

Energy efficiency incentives are small, but the Clean Energy Future plan adds incentives and a long-term perspective. The direct support for renewables in industry is low compared to the low carbon vision.

CCS is already practiced for oil and gas recovery, research is supported for future storage reservoirs as well as technologies for fugitives from coal mining. Under the vision of a carbon free future, Australia's strategy for CCS in industry is rated 'F'. Under the vision of a 100% renewable future, the emphasis placed on CCS is rated as a barrier to the implementation of renewables, as it is taking attention and resources away, resulting in an 'G'.

The carbon price mechanism fully covers non-energy industrial emissions from N2O (nitrite acid production), CH4 (coal mining), PFCs (aluminium sector) and landfill, which will add significant incentives for reductions, many of which are achievable at low cost.

Buildings

Table 13
'Low carbon policy package' for the buildings sector

Changing activity	Energy efficiency	Low carbon	
		Renewables	Nuclear / CCS / fuel switch
▸ Urbanisation policy that leads to energy efficient development	▸ Efficiency standards for new buildings ▸ Support to increase energy efficient retrofit rate ▸ Incentives for efficient electrical appliances ▸ General incentives (energy taxes and subsidies) ▸ Removal of barriers, e.g. subsidies	▸ Support for renewables in new and existing buildings ▸ General incentives (energy taxes and subsidies) ▸ Sustainability standards for biomass use	▸ Support for fossil fuel switching (to gas)

The building sector contributes relatively little to total emissions compared to other developed countries. Energy efficiency is key, but there is no strategy to enhance building standards towards zero emissions buildings. The focus of current policies is not on the building envelope, but on energy efficiency standards for appliances. These need to be applied to all household and office appliances and equipment over time with increasing stringency to be in line with the low carbon policy package. Despite the huge potential, there is only limited support for renewable energy used in buildings, for example solar hot water systems.

The limiting factor for most households is the availability of up front investment capital. This could be overcome through tailored incentives that provide affordable access to finances.

Transport

Table 14
'Low carbon policy package' for the transport sector

Changing activity	Energy efficiency	Low carbon	
		Renewables	Nuclear / CCS / fuel switch
▸ Strategies to avoid transport or to move to non-motorised transport ▸ Strategies for modal shift ▸ General incentives (energy taxes and subsidies)	▸ Incentives for efficiency in light vehicles ▸ Incentives for efficiency in freight transport ▸ General incentives (energy taxes and subsidies)	▸ Incentives for renewables in transport ▸ Sustainability standards for biomass use	▸ Support for fossil fuel switching (to gas) and other low carbon technologies ▸ Support for electro mobility (cars and infrastructure)

Transport emissions in Australia are significant, but policies to reduce them are very limited. There is no strategy for modal shift, nor sufficient investments planned to provide an attractive infrastructure for passengers and freight. While vehicle ownership tax rates could be linked to emissions, they are instead linked to vehicle price, with the exception of one territory (ACT).

Until now, Australia had limited incentives to reduce emissions per km. The new climate legislation will add an incentive of approximately 6 cents a litre, while the low carbon policy package would require an incentive by an order of magnitude higher. The inclusion of heavy transport would cover an important element of the sector and could contribute substantially to reducing emissions from the sector.

The new legislation also plans to introduce mandatory emission standards from 2015, with levels that are still under discussion, but well less stringent than the requirements for a low carbon future.

There are limited incentives to increase use of biofuels, including targets of 7% biofuels by 2012 in three states. There is no framework for sustainable biomass import. In addition, no incentives for electric mobility are provided. The smart travel initiative is theoretically a good concept, engaging communities and working towards reduced transport, modal shift and raising awareness on efficiency in transport.

Industry

Table 15
'Low carbon policy package' for the agriculture, land use, land use change and forestry sector

Changing activity	Other
▸ Consistent land use strategy3 exists and is implemented ▸ Incentives for sustainable consumption practices ▸ Land use register exists	▸ Decrease livestock CH4 emissions ▸ Decrease cropland and organic/peaty soils, all non-CO2 emissions (including rice production) ▸ Implement measures CO2 on cropland ▸ Reduce grassland all non-CO2 emissions ▸ Implement deforestation measures ▸ Promote the conversion of non-forest land to forests through afforestation and reforestation (A/R)

Emissions from agriculture and forests are very important for Australia given the vast space that the country covers. Accordingly, there is a comprehensive land use strategy and several laws are in place to ensure the implementation of the strategy. However, policies to reduce emissions directly are very limited. The Carbon Farming Initiative adds substantially to the efforts, targeting the full range of activities, i.e. farming practices to reduce CO_2 and CH_4, deforestation and degradation and afforestation.

Effects are, however, limited. Specifically the offsetting nature of the largest share of reductions under the Carbon Farming initiative does not give credit to the importance of the sector for Australia's emissions profile.

We discuss the impact of these policies further in section 5.3 under "Achieving the international pledge".

Table 16
Highlights of Australian policy

	Changing activity	Energy efficiency	Renewables	Low carbon	Other
General	▸ The binding target of 80% by 2050 is in line with low carbon vision. ▸ Clean Energy Finance Cooperation with a budget of A$ 10 billion will invest in businesses seeking for funding of innovative clean energy and technologies.				
Electricity supply	–	▸ Generator Efficiency Standards which set efficiency standards for new entrants ▸ The Clean Energy Investment plan for generators receiving free permit in the ETS	▸ The Renewable Energy scheme with a target of 20% in 2020, including a strict implementation with high penalties for participating parties	▸ Carbon price mechanism will stop the new construction of coal power plants. Gas will be used in future ▸ Closure of 2000 MW brown coal power plants and replacement by highly efficient gas power plants	–
Industry		▸ Energy Efficiency Opportunity Program (EEOP) - an energy efficiency audit scheme ▸ The carbon price mechanism	▸ The A$ 200 million Clean Technology Innovation Program, which is foreseen to support R&D for renewable energy, low pollution technology and energy efficiency in industry ▸ The carbon price mechanism	▸ Clean Energy Initiative: A$ 1.7 billion for CCS in Industry, funding to support construction and demonstration of large-scale integrated carbon capture and storage projects in Australia	▸ the Carbon Price mechanism will fully cover CH4, N2O and PCF as well as emissions from landfill ▸ HFCs and SF6 will be covered by a tax ▸ carbon farming initiative covering landfill before 2012
Buildings	▸ The *National Urban Policy* analyses major cities and the population strategy. Strategic plans are to be in place from 1 January 2012	▸ Several programmes for energy efficiency improvements as Equipment Energy Efficiency Programme, Phase-out inefficient lighting, High Efficiency Strategy for Heating, ventilation and air condition, the National energy savings initiative, with a focus on households ▸ Phase-out of GHG-intensive water heaters, Rebates for residential buildings in many states to support the exchange of water heating systems ▸ Building Code of Australia (BCA), the Low Carbon Communities programme and Tax Breaks for Green Buildings programme.	▸ Phase-out of GHG-intensive water heaters also supports renewable water heaters. ▸ Renewable Energy Bonus Scheme - Solar Hot Water Rebate (REBS) ▸ National Solar Schools Programme	No relevance for Australia.	–
Transport	▸ TravelSmart initiative in WA provides a good concept in directly working with communities to address travel behaviour (both activity and efficiency)		▸ Mandatory bioethanol (10%) and biodiesel (2%) quotas in NSW		–
Agriculture / Forestry	▸ Insufficient measures to promote sustainable consumption ▸ Implement consistent land use strategy on a national level	–	–	–	▸ Increase non-offsetting activities in the sector ▸ Provide intensive complementary activities to ensure uptake of farmers and landowners, e.g. information dissemination, training, research and development

Table 17
Gaps in policies compared to the low carbon vision

	Changing activity	Energy efficiency	Renewables	Low carbon	Other
General	▸ Ambitious binding greenhouse gas reduction target, consistent with major effort-sharing approaches (-80% to -95% by 2050 for developed countries) ▸ Comprehensive and consistent long term strategy beyond 2020				
Electricity supply	–	▸ Active support for CHP ▸ Enhancement of grid development and further efforts to reduce distribution losses ▸ Removing subsidies	▸ While the rating is high, there is a risk of failure of the target in case of no or low incentives to improve grid access for Renewable Energies ▸ The deployment of REN should be more differentiated	▸ Policies, financing mechanisms and strategies that support the increasing use of CCS for coal and biomass	–
Industry	▸ No policies in place to support increasing material efficiency, long product lifetime	▸ No mandatory implementation of identified measures in EEOP ▸ Tax too low for stimulating energy efficiency	▸ No direct support for renewable energy ▸ No framework for sustainable biomass import	▸ Low support for coal, gas, biomass and process emissions CCS	▸ No absolute reduction in CH_4 from mining. These emissions are covered by policy but due to rapid expansion will only be stabilised
Buildings	▸ Implementation of strategic plans and embedding of climate as a core element in urban planning	▸ No or very low support for energy efficient retrofitting. ▸ Buildings must fulfil the energy performance requirements according to 6 stars, but the path to 10 star buildings (nearly zero energy) is not defined. ▸ The non-residential sector is not covered by all measures.	▸ Incentives for renewables are mainly for hot water. No coverage of all technologies (e.g. heating systems) and no national coverage.		–
Transport	▸ Insufficient infrastructure investment and incentives to promote non-motorised transport. ▸ Insufficient investment in public transport infrastructure and services ▸ Low fuel prices provide little incentive for behavioural change	▸ Carbon emission standards for light vehicles under discussion are not yet implemented, below required levels and too late ▸ Very limited incentives for efficiency improvements for heavy vehicles apart from some information programs	▸ Strengthen incentives at national scale, especially for transport sectors that are not covered by the carbon price ▸ Implement a framework that ensures sustainability and effective carbon reductions from biofuels	▸ Incentives for low carbon technologies are very limited and need to be strengthened to facilitate the required increase ▸ There are currently no measures in place to promote electric mobility	–
Agriculture / Foresty	▸ Insufficient measures to promote sustainable consumption ▸ Implement consistent land use strategy on a national level	–	–	–	▸ Increase non-offsetting activities in the sector ▸ Provide intensive complementary activities to ensure uptake of farmers and landowners, e.g. information dissemination, training, research and development

Table 18
Rating against the low carbon policy package[20]

	Changing activity	Energy efficiency	Renewables	Low carbon	Other
General	–	–	–	–	B
Energy supply	–	E	A	LC F REN G	–
Industry	G	D	F	LC F REN G	F
Buildings	F	D	E	No score	–
Transport	F	F	E	G	–
Agri-culture/ Forestry	E	–	–	–	D

Scoring matrix

Assess-ment value	Rating	Interpretation
>=		
0	G	No or very limited policies
0.57	F	Few policies, ambition level low
1.14	E	Some policies with medium ambition level
1.71	D	Comprehensive package or good ambition level for a wide range of policies
2.29	C	Comprehensive policy package, ambition level good
2.86	B	Pathway is set, minor improvements required
3.43	A	Consistent with low carbon development

[20] Size of the symbols indicate importance (mitigation potential), letter indicates stringency compared to low carbon policy package (A= emission development consistent with a global path towards 2°C with or without external support, G=no or very limited policies).

5.3 Impact of policies on GHG emissions in 2020 and 2030

Domestic action

Australia's GHG emissions excluding LULUCF (Land Use, Land Use Change and Forestry) have increased by 75 % since 1990 (2008 levels) and, under BAU, are projected to grow further to around 731 Mt CO_2e until 2030. This would represent an increase of 187 % compared to 1990 levels.

With the new Clean Energy Future Plan, this emissions growth could be dramatically reduced, leading to 74 % above 1990 levels in 2030 - a reduction of almost 200 Mt CO_2e or 27 % below BAU in 2030. Reductions in 2020 are expected to be 16 % below BAU, but total emissions would still be 38 % above 1990 levels.

Analysing per capita emissions provides additional insights. The Australian average per capita carbon emissions in 2008 were 29.7 t CO_2e/capita. Only countries such as Bahrain, Brunei, Kuwait and Qatar have higher per capita emissions. Australia's per capita emissions are nearly twice the OECD average and more than four times the world average (Garnaut 2008).

Projections including the Clean Energy Future Package indicate a reverse in this growing trend. While per capita emissions continue to increase in the BAU scenario, they are projected to decrease to 19.6 t CO_2e/capita in 2030 including the Clean Energy Future.

Analysing energy intensity and carbon intensity

Development of the energy intensity - energy use per GDP - and carbon intensity - emissions per unit of energy - are important factor in evaluating the ability of a country to transform towards a low carbon economy.

Energy intensity in the past 20 years has been steadily decreasing. However, BAU projections indicate a slowing down of this trend. Policies implemented, specifically the renewables target, are projected to improve intensity beyond the long-term trend, towards 180 ktoe / billion US$. While positive, this falls short of the just announced (non-binding) target of APEC countries of achieving a 45 % reduction in energy intensity compared to 2005 levels by 2035. If the present trend continues until 2035 energy intensity could reach 165 ktoe/billion US$, a 39 % reduction from 2005 levels.

Figure 29
Emissions and emission reductions (excl. LULUCF) for 'Policies including Clean Energy Future' up to 2030

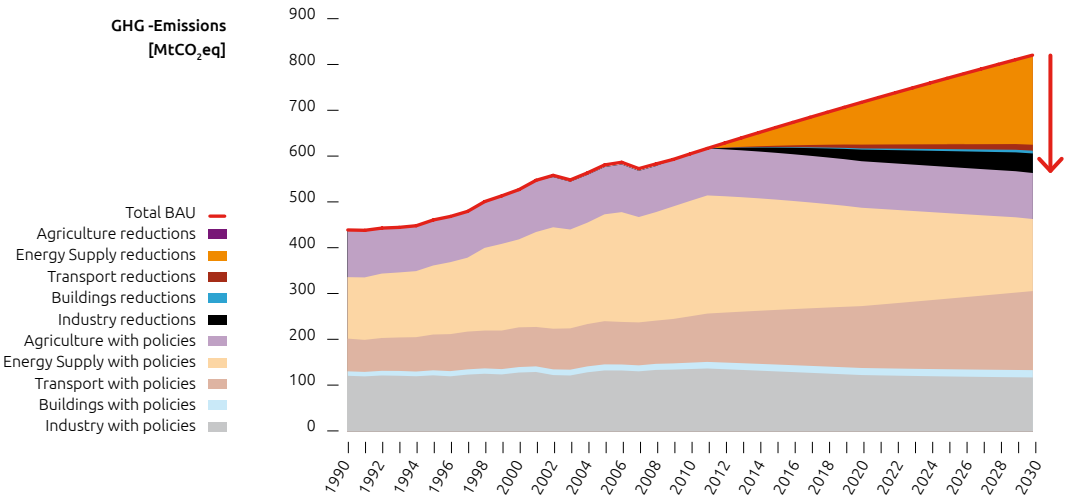
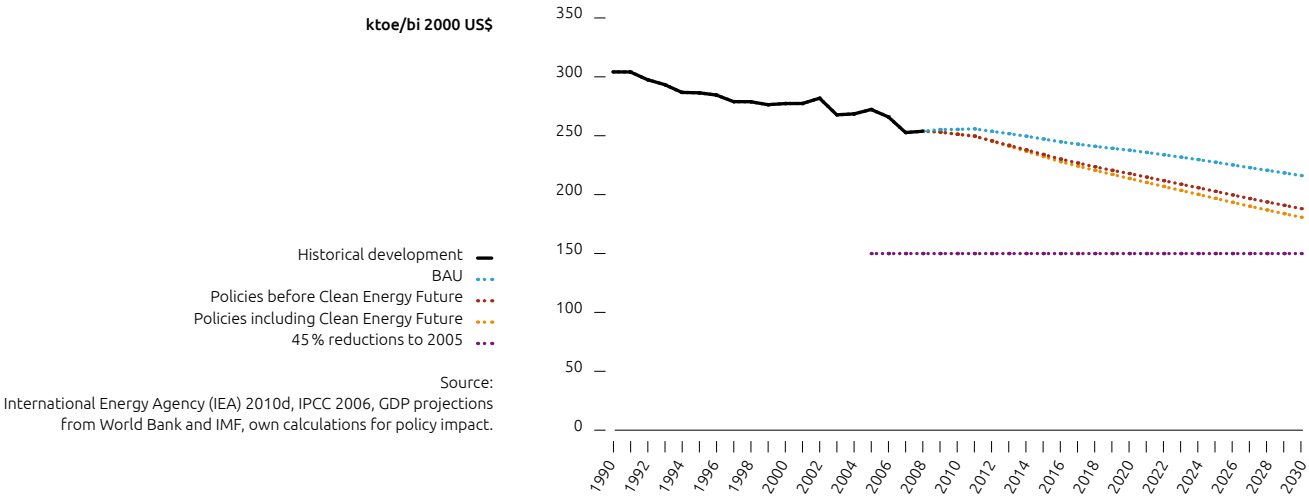


Figure 30
Energy intensity projections to 2030



Carbon intensity has declined historically, yet overall it remains at a high level. In the BAU this is projected to continue, but slower than the historical trend. Policies put in place with the Clean Energy Future package have the potential to accelerate decarbonisation and could reach around 3 kt CO_2 / ktoe by 2030, a 16 % reduction below BAU and 6 % below the policies in place before the package was introduced.

Table 19 gives a summary of the development of the most important parameters both for historic development and different projection scenarios.

Figure 31
Carbon intensity projections to 2030

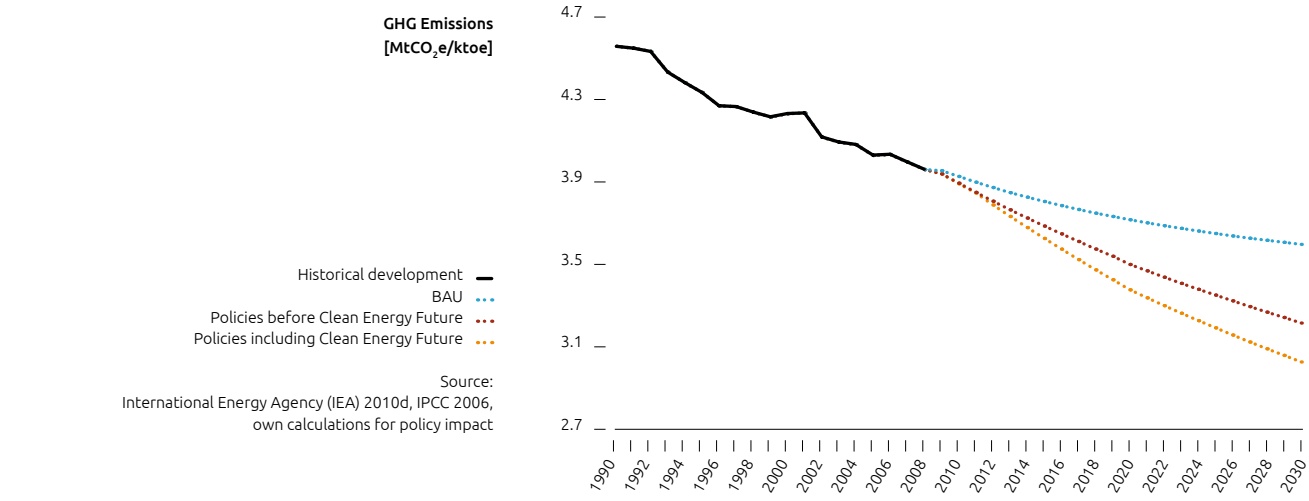


Table 19
Summary of historic and projected data per decade for main indicators

		Historic				Projections					
	Source/comments	**1971-80**	**1981-90**	**1991-00**	**2001-10**	**2011-20**			**2021-30**		
Population											
Total (million)	World Population Prospects: The 2010 Revision (UN)	13,92	15,97	18,23	20,69	23,64			26,68		
Average annual growth rate		1,4%	1,5%	1,1%	1,5%	1,3%			1,0%		
GDP											
Total (bi_2000_US_dollars)	World Bank World Development Indicators, International Financial Statistics of the IMF, HIS Global Insight, and Oxford Economic Forecasting	185,20	247,84	339,51	478,58	618,33			838,64		
Average annual growth rate		2,8%	3,0%	3,6%	3,0%	3,0%			2,7%		
Primary Energy						**BAU**	**Policies before Clean Energy Future**	**Policies including Clean Energy Future**	**BAU**	**Policies before Clean Energy Future**	**Policies including Clean Energy Future**
Total primary energy supply (ktoe)	CAT			95.823	126.453	153.804	148.088	145.537	191.635	176.455	164.477
Average annual growth rate				2,6%	2,2%	2,4%	1,9%	1,4%	1,8%	1,4%	0,9%
						Current policies	New policies	450 scenario	Current policies	New policies	450 scenario
Average annual growth rate	WEO 2011			3,4%	2,2%	2,0%	1,8%	1,4%	1,3%	1,0%	0,3%
Energy intensity (toe/Million US$)				282,2	264,2	248,7	239,5	235,4	228,5	210,4	196,1
Average annual growth rate	CAT			-0,9%	-0,8%	-0,6%	-1,1%	-1,6%	-0,9%	-1,2%	-1,7%
						Current policies	New policies	450 scenario	Current policies	New policies	450 scenario
	WEO 2011			-1,2%	-1,0%	-0,9%	-1,2%	-1,5%	-1,3%	-1,7%	-2,3%
	Garnaut 2011						-1,9%			-1,9%	
CO_2 emissions						**BAU**	**Policies before Clean Energy Future**	**Policies including Clean Energy Future**	**BAU**	**Policies before Clean Energy Future**	**Policies including Clean Energy Future**
Total emissions ($ktCO_2$-e)	CAT			417.562	510.903	584.451	541.746	529.769	689.890	577.225	523.933
Average annual growth rate				1,9%	1,4%	1,7%	0,6%	0,0%	1,4%	0,6%	-0,1%
						Current policies	New policies	450 scenario	Current policies	New policies	450 scenario
Average annual growth rate	WEO 2011			2,7%	1,6%	0,6%	0,3%	-0,4%	-0,4%	-1,3%	-4,4%
Carbon Intensity (tCO_2/toe)				4,36	4,04	3,80	3,66	3,64	3,60	3,27	3,19
Average annual growth rate	CAT			-0,7%	-0,8%	-0,6%	-1,2%	-1,4%	-0,4%	-0,8%	-1,0%
						Current policies	New policies	450 scenario	Current policies	New policies	450 scenario
	WEO 2011			-1,2%	-1,0%	-1,5%	-1,5%	-1,8%	-1,7%	-2,2%	-4,7%
	Garnaut 2011						0,3%			0,3%	
CO_2 per capita (tCO_2/thousand)	CAT			22,9	24,7	24,7	22,9	22,4	25,9	21,6	19,6
Average annual growth rate				0,7%	-1,6%	0,5%	-0,6%	-1,2%	0,4%	-0,4%	-1,1%
						Current policies	New policies	450 scenario	Current policies	New policies	450 scenario
	WEO 2011			1,5%	0,1%	-0,7%	-1,0%	-1,7%	-1,3%	-2,2%	-5,3%

Achieving the international pledge

One of the key issues is evaluating how the Clean Energy Future package places Australia in relation to its international emission reduction pledges. Due to the accounting rules of the Kyoto Protocol, this requires putting together the actions on sources of the greenhouse gases covered by the Kyoto Protocol's Annex A[21] (energy and industrial emissions from all sectors excluding LULUCF) along with the projections for Kyoto Protocol afforestation, reforestation and deforestation (ARD) activities (i.e. only part of the full LULUCF sector) for 2020 or with only emissions from deforestation.

Figure 30 and Figure 31 put all of these issues into context and compare the emissions including land use emissions (Figure 30) and of industrial greenhouse gases that would result from the present policies and compare them to those that would be "allowed" under Australia's international pledge (Figure 31).

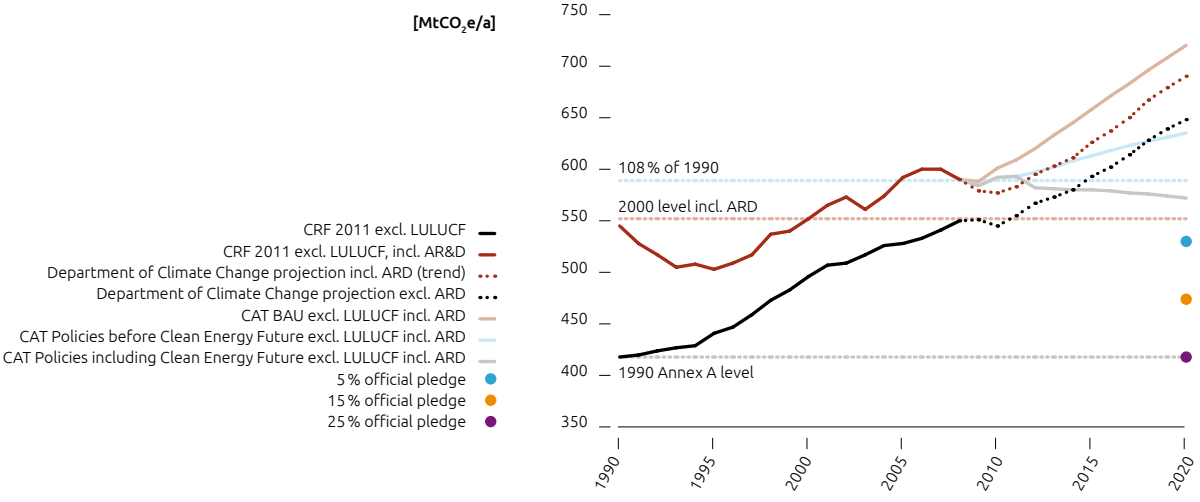
Analysing emissions including afforestation, reforestation and deforestation

Article 3.7 of the Kyoto Protocol allows Australia to calculate its base year emissions as the sum of Annex A GHG emissions in 1990 and its deforestation emissions in 1990[22]. The emission target for the first commitment period of an 8 % increase relative to 1990 is applied this base year. Effectively, Australia is allowed a 42 % increase in Annex A emissions in the period 2008-2012 compared to 1990.

First, we evaluate Australia's 5 % reduction from 2000 levels by 2020 pledge using a 2000 base year that includes Annex A emissions and emissions from afforestation, reforestation and deforestation (ARD). This is the way Australia has defined its pledge.

Figure 32 shows the projected effects of the Clean Energy Future policies, including Australian Government projections of ARD on Annex A plus ARD greenhouse gas emissions to 2020 compared to the range of international pledges Australia has made. This indicates that the effect of the Clean Energy Future policies as estimated by us is not yet sufficient to meet Australia's unilateral pledge of a 5% reduction by 2020 domestically.

Figure 32
Clean Energy Future policies and Australia's international pledges including afforestation, reforestation and deforestation (ARD), CRF = the UNFCCC's Common Reporting Format



[21] This is used to refer to GHG sources in Annex A of the Kyoto Protocol (Energy, Industrial processes, Agriculture, Waste) and the GHGs listed there: CO_2 - Carbon dioxide, CH_4 – Methane, N_2O - Nitrous oxide, PFCs – Perfluorocarbons, HFCs – Hydrofluorocarbons, SF_6 - Sulphur hexafluoride.

[22] For 1990 emissions from afforestation / reforestation activities were zero, so total ARD emissions for this year are equal to pure deforestation emissions

Figure 32 compares Annex A GHG emissions plus afforestation, reforestation and deforestation (ARD) BAU trends to both the effects of policies - and the range of international pledges Australia has made (5%, 15%, 25%). It shows, for comparison, the historical data for Annex A GHG emissions only.

Figure 33 below shows the Clean Energy Future policies on Annex A GHG emissions, taking into the account the LULUCF accounting framework favoured by Australia.

Analysing likely industrial emissions in 2020 compared to 1990 levels

Figure 33 shows the Clean Energy Future policies on Annex A GHG emissions, taking into the account the LULUCF accounting framework favoured by Australia, which applies an additional rule.

Figure 33 shows the estimated emissions of Annex A GHG emissions resulting from the Clean Energy Future package in 2020, taking into account two different estimates of ARD emissions in 2020.

We calculated the "allowed" Annex A GHG emissions under the -5% by 2020 pledge.

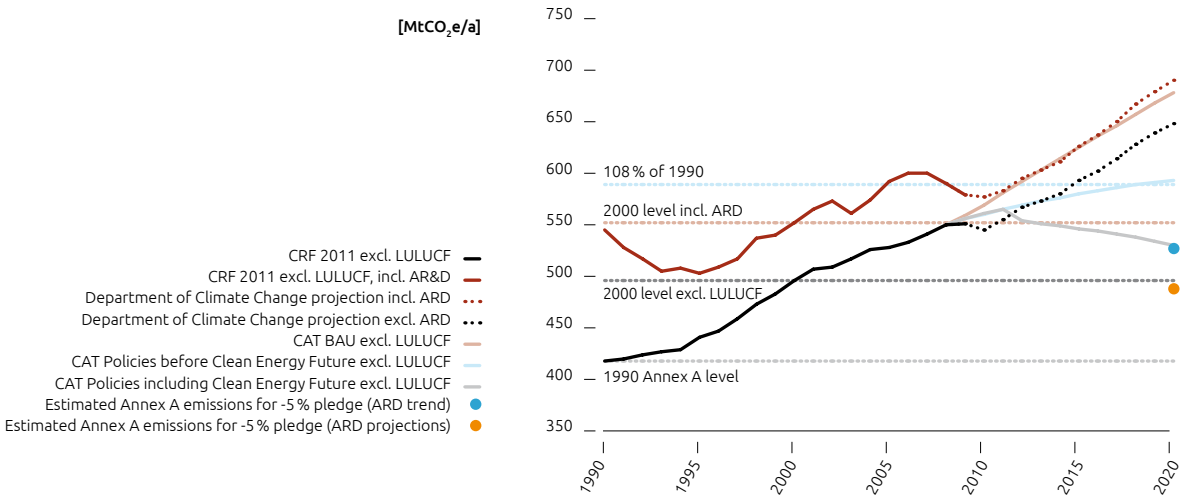
In the first estimate, we used the ARD recent historical trend that continues to 2020 with decreasing deforestation emissions and increasing storage of carbon. The allowed Annex A GHG emissions would be 26% above 1990 levels. In this case, the Clean Energy Future package would be **close to sufficient** to meet this pledge.

In the second estimate, we used the Australian Government's projections for ARD. The results here show that the "allowed" 2020 Annex A emissions would be 17% above 1990, in which case the Clean Energy Future package would be **insufficient** to meet the -5% by 2020 pledge.

For the more ambitious international pledges of 15% and 25% below 2000 levels by 2020, the ARD government projections and extended trend cases translate into allowed Annex A GHG emissions in the range of 3-13% above 1990 and -1 to -10% below 1990 respectively. Only in the latter case would emissions of Annex A gases drop below 1990 levels.

In all cases these reductions are less ambitious than what Australia needs to do to be on a path towards keeping global warming below 2°C, the temperature limit that it signed up to in both Copenhagen and Cancun.

Figure 33
Clean Energy Future policies and energy and industrial GHG emissions



5.4 Potential options for further action

Climate change poses acute risks for this unique continent. Projections show that without any action to tackle climate change, average temperatures across Australia will increase between 2.2 to 5°C by 2070 (compared to 1990) (Garnaut 2008). Studies indicate that warming of 2°C will overwhelm the capacity of many of natural ecosystems to adapt. For example, the survival of the Great Barrier Reef will be in danger as higher ocean temperatures and acidity levels cause major changes to coral reefs (Australian Government 2011j).

The previous analysis has clearly outlined that Australia has taken significant steps with the introduction of the Clean Energy Future Legislative Package. It has also shown that these efforts are not yet sufficient to bring Australia on a trajectory that is compatible with temperature increases below 2°C. We identified further policies and actions that could contribute substantially to increase the emission reduction. They include:

Climate strategy

- Australia could agree on the more ambitious end of its short-term targets for 2020 (e.g. 25% below 2000) to be better prepared to reach its 2050 target of -80%. While the legislation puts the appropriate instruments in place to achieve the necessary change, it is only a first step to meet the 5% target. Its long-term effectiveness will depend on the ability of successive Governments to increase stringency and coverage of the instruments over time.
- Australia could decide not to include deforestation emissions in their base year. This would increase the level of effort required to meet their target and reduce the allowed industrial greenhouse gas emissions in 2020.

Electricity supply

- Given the vast renewable resources available in Australia, the government could give significantly more support to renewable energy, in particular in industry, buildings and transport with deeper targets for 2020 and 2030. Additional incentives to those already introduced could help development in such direction. The Clean Future Energy Plan only provides limited additional incentives for renewable energy.
- Changing a centralised distribution structure to a decentralised and smart grid oriented system is necessary to ensure a fast deployment of renewable energy. When considering large-scale geothermal and solar thermal generation in remote areas, high voltage direct current (HVDC) transmission line technology would be particularly necessary.

Industry

- Energy efficiency in industry and electricity generation could be further stimulated by a national white certificate scheme, which is already in planning but it's unclear if it will be implemented. Some states have introduced similar schemes, so there is already significant experience to draw on.
- Additional financial support for research in methane-capturing technologies in the mining sector would lead to more emission reductions. Waste emissions could also be targeted with policies that increase recycling rates to avoid landfilling and methane capturing at landfill sites.

Buildings

- More attention needs to be given to activities in non-residential buildings. This includes incentive schemes that could also cover commercial buildings, as well as the inclusion of commercial equipment in performance standards. Overall performance standards for appliances could be increased and a system for regular revision and update (e.g. Top-runner approach) implemented.
- Incentives for energy- related retrofit could be improved and implemented at national level.

Transport

- The inclusion of heavy transport in the carbon price mechanism is already envisioned by the Government, but still requires a final decision and implementation.
- The Government is considering the implementation of light vehicle GHG emission standards in 2015. The envisaged standard could already start as early as 2012, which would allow a swifter uptake of more efficient vehicles. The system could be further improved with an inbuilt system of review and improvement over time.
- Massive infrastructure investment in urban public transport, bike and pedestrian infrastructure and rail infrastructure would be required to ensure a long term transition to low carbon transport modes.

Agriculture and forestry

- Australia could take further action to ensure that deforestation emissions are reduced by addressing land clearing emissions in urban areas, addressing illegal deforestation by providing incentives to land holders and stop old growth forest clearing.
- Australia could move to stop old growth forest logging (e.g. in Tasmania) as these forest systems are significant carbon stores.
- Australia could further enhance agriculture policies to promote sustainable land management through good farm and rangeland management.

ANNEX I | POLICY EVALUATION IN DETAIL

This annex provides detailed descriptions of the policies in place in Australia in the different sectors, the scoring for each indicator and the rationale for the assessment.

I.1 General climate strategy

Table 20
Policies and measures on a general climate strategy

Policies / measures	Rationale for evaluation	Score
Does the country have a stringent and nationally binding GHG target or budget until 2050? **National** For 2020, Australia proposed to decrease its emissions to 5-15-25 % below 2000. The 5 % target is unconditional, while the 15 % and 25 % depending on international negotiation outcomes. Australia's 2050 target is a pledge to reduce emissions to 60 % below 2050 from 2000 levels (Climate Action Tracker). **State / Regional** South Australia (SA) legislated a target to reduce by 31 December 2050 greenhouse gas emissions within the State by at least 60 %. Further details are included in the main text of this chapter (Government of South Australia 2007). The ACT legislated the most ambitious target where emissions should be reduced by 40 % by 2020 and 80 % by 2050, based on 1990 levels. Further details are included in the main text of this chapter (ACT Government 2011b). Victoria, one of the four largest emitters introduced a target to reduce 20 % by 2020 (based on 2000 levels) (Department of Sustainability and Environment 2011). **Clean Energy Future** According to the climate plan, the government has implemented a new long-term target by 80 % below 2000 levels by 2050.	**Policies including Clean Energy Future** The binding target of 80 % by 2050 is in line with low carbon vision. **Policies before Clean Energy Future** The 2050 target is not binding. Targets for 2020 range from generally less ambitious to ambitious compared to other developed countries. The effect of State level targets on the national total is small. SA legislated a target to reduce greenhouse gases at 60 % by 2050 which is very ambitious but has a rather small impact on the total emissions as SA accounts for 5-6 % of the total emissions in Australia. The same for Act which has a very ambitious short-term target but accounts for less than 0.5 % to the total emissions. The binding targets set by VIC and ACT for 2020 accounts for a reduction of 8 % of the total emissions in 2000 and the 2050 targets set by SA and ACT would lead to 4 % reduction of emissions (200 levels) what is still very low (own estimation).	0 1 2 3 **4** 0 **1** 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Does the country have an ambitious and comprehensive climate strategy towards a low carbon economy also beyond 2020? **National** In July 2011 the Clean Energy Future Plan was launched and in November approved by the Australian senate. This plan will cut pollution by at least 5 % compared with 2000 levels by 2020. The main instrument of the strategy is the introduction of a carbon tax which will be replaced by a emission trading scheme in 2015 (Australian Government 2011k). **State / Regional** South Australia's greenhouse strategy 2007-2020 includes targets for emission and renewable energy as well as budgets and funds for actions (Government of South Australia 2007). NSW "Investing in a better future" plan includes a strategy to reach the 60 % reduction by 2050 target and actions for clean energy use in future (NSW Government 2010). ACT climate change strategy 2007-2025 Department for Territory and Municipal Services 2007, The ACT climate change strategy 2007-2025 (Department of the Environment 2010) includes a strategy and action plan and sets out a target of reducing GHGs by 60 % of 2000 levels by 2050. Queensland Climate Change Strategy 2007 (Queensland Government 2007) Climate Smart 2050 establishes Queensland's long-term goals and provides a platform for the government, community and industry to move to a low-carbon future. Tasmania framework for action on climate change Tasmanian Climate Change Office 2008, Tasmania framework for action on climate (Tasmanian Climate Change Office 2009). The framework sets a course toward achieving four key objectives: 1. reducing greenhouse gas emissions to at least 60 % below 1990 levels by 2050 2. adapting to the changes in climate 3. capturing the new social, economic and environmental opportunities that climate change will present and 4. demonstrating national and international leadership as a model low-carbon economy, and contribute to global climate change solutions.	**Policies before Clean Energy** Future Australia has a comprehensive strategy, covering all sectors to reach the 5 % target in 2020. The strategy sets also a target for 2050 but most policies and measures are mainly focusing on the 2020 target. Additionally there are strategies in 5 states which are covering most sectors and committed targets.	0 1 **2** 3 4 0 1 **2** 3 4
Does an integrated long-term innovation strategy tailored towards a low carbon development exist, with sufficient resources for research and development? **National** There is a range of funds as for example the Low Emission Technology Demonstration Fund (LETDF) and the Clean Energy Initiative. While the LETDF is especially focusing on CCS, the Clean Energy Initiative has two out of three sub-incentives promoting innovation in RE, the A$ 1 billion Australian Centre for RE and the Solar Power Flagship program (A$ 1.5 billion) (Department of Climate Change and Energy Efficiency 2011a). **Clean Energy Future** The strategy includes an innovation strategy covering the following measures: Clean Energy Finance Cooperation with a budget of A$ 10 billion will invest in businesses seeking for funding of innovative clean energy and technologies. (e.g. wave energy and large scale solar, no investments in CCS); a 5 year Clean Technology Innovation Program of A$ 200 million will support research and development in RE and low emission technology. The Australian Renewable Energy Agency will administer a A$ 3.2 billion budget for research and development, demonstration and commercialisation of renewable energy.	**Policies including Clean Energy Future** The innovation strategy in the Clean Energy Future Plan includes different measures/funds and allocated the administration to a central organisation. Compared to implemented funds, the expected funds for innovation are quite high (with A$ 10 billion and A$ 200 million). **Policies before Clean Energy Future** No or very low support for Renewable energies. In 2007 five out of six project were fossil fuel related, only one solar photovoltaic project (Riedy 2007).	0 1 2 **3** 4 0 **1** 2 3 4
	Total corresponds to	**3.1** **B**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

I.2 Electricity and heat

Energy efficiency

Table 21
Policies and measures on energy efficiency in the electricity and heat sector

Policies / measures	Rationale for evaluation	Score
Incentive to increase efficiency of fossil fuel power plants **National** The Generator Efficiency Standard (GES) was introduced in 2001. It is a mandatory standard for all fossil-fuelled power generating plants that meet a set of criteria: 30 MWe capacity or above, 50GWh/a electrical output, and others. Performance standards for new plants have been set at: Natural gas plants - 52 % Thermal Efficiency Sent-out (nSO) - Higher Heating Value (HHV); Black coal plants - 42 % nSO (HHV); and Brown coal plants - 31 % nSO (HHV) (Department of the Environment 2011). **State / Regional** NSW has introduced two measures to improve efficiency. In 2004 they introduced the Energy Saving Obligation for electricity retailers and other parties who buy or sell electricity (Energy Savings Scheme, ESS). Total energy savings requirements are fixed for each year of the scheme, as a given percentage of the electricity sales. The target for the first year was set at 0.4 % of total electricity sales, and will gradually increase to 4 % in 2014 (Department of Climate Change 2010). The NSW Greenhouse Gas Abatement Scheme (GGAS) started on 1 January 2003. GGAS aims to reduce greenhouse gas emissions associated with the production and use of electricity. It achieves this by using project-based activities to offset the production of greenhouse gas emissions. It requires individual electricity retailers and other parties who buy or sell electricity in NSW to meet mandatory benchmarks based on the size of their share of the electricity market. If these parties, known as benchmark participants, fail to meet their benchmarks, a penalty is assigned (NSW Government 2011b). The ACT GGAS mirrors the NSW scheme. The benchmark is 7.27 tonnes of carbon dioxide equivalent (t CO_2e) per capita by 2007. **Clean Energy Future** Setting a price for carbon dioxide will increase costs for electricity generated from fossil fuels. Improving efficiency in the energy supply sector will lower these costs for operators (further details see also Box 1 in section 3.2). The Clean Energy Investment plans will be relevant for generators receiving free permits. Those operators are required to prepare and make publicly available their Clean Investment Plans which will identify proposals to reduce pollution from existing facilities and to invest in R&D or low or zero emission capacity (Australian Government 2011k).	**Policies including Clean Energy Future** The introduction of the carbon price might have an effect on the energy efficiency in the energy supply sector but the rather low carbon price (A$ 23 per tonne compared to the necessary modelled 100 US$ per tonne (the benchmark towards a low carbon economy) will have a low impact. The Clean Energy Investment plans might have an effect assuming that operational improvements will take place. It is still unclear what mitigation can be expected by the Clean Energy Investment plans. **Policies before Clean Energy Future** The performance standards are implemented on national level but no study to prove that the average efficiency will be affected by 2030 available. There is no evidence that the standard is more than BAU. GPS is only for new plants so old plans are unaffected.	0 1 **2** 3 4 0 1 **2** 3 4
Level of support for CHP **National** No incentive on national level found. **Clean Energy Future** The Clean Energy Program, worth A$ 800 million, supports investment for manufacturing businesses to invest in EE equipment including co-generation plants.	**Policies including Clean Energy Future** The Clean Energy Program would increase the share of CHP plants, but not clear to which share **Policies before Clean Energy Future** No incentive found but since 1995 growth rates to 2160 MW installed capacity in 2004 (PLATTS 2006).	0 1 **2** 3 4 0 **1** 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Policies to reduce distribution losses **National** No direct incentive found. The Smart Grid, Smart City project is a A$ 100 million energy efficiency initiative designed to encourage the development of an innovative smart grid network in Australia. This will establish a commercial-scale, integrated system of renewable energy, smart grid and smart meter technology and infrastructure within a city, town or region (Department of Resources 2011e). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** No direct technical incentive found, but Smart Metering Programme that might have an influence on the distribution losses.	**0** 1 2 3 4 **0** 1 2 3 4
Barriers		
Subsidies applicable in the electricity sector **National** Subsidies in Australia are received by tax credits mainly for the fuel itself. Since 2000 those subsidies are decreasing. On federal level two programmes supporting coal producer in Australia were by the latest OECD study ("Inventory of estimated budgetary support and tax expenditures for fossil fuels") detected. Expenditures for Capital expenditure deduction for mining, and exploration and prospecting deduction (A$ 35.06 million) were in 2010 by A$ 36.70 million. Considering the expenditures for gas, this value almost double to A$ 69.52 million in 2010 (Oecd 2011). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** Emissions from the energy sector were at 230 Mt CO_2e in 2010 The resulting subsidies are rather low at A$ 0.2 per–t CO_2e.	-4 -3 -2 **-1** 0 -4 -3 -2 **-1** 0
	Total	**1.7**
	corresponds to	**E**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Renewables

Table 22
Policies and measures on renewable energy sources in the electricity and heat sector

Policies / measures	Rationale for evaluation	Score
Level of support for RES-E **National** In September 2009, the Australian Government set a target to source 20 % of its power generation from RE by 2020 and provided a budget of A$ 30 billion (Office of the Renewable Energy Regulator (ORER) 2011a). The main instrument to achieve this target is the Renewable Energy Target scheme including a legislated target of 45,000 gigawatt-hours a year by 2020. The measure will operate until 2030. The basis is a certificate scheme, which requires electricity retailers and other large electricity buyers to source an additional share of their electricity from renewable or specified waste products. Certificates can be generated by a renewable energy power station, or small-scale solar panel, wind or hydro system; or by displacement of a solar water heater or heat pump (Department of Climate Change and Energy Efficiency 2011g). **State / Regional** In several states feed-in or bonus schemes are in place. The range for feed-in tariffs differs from 40-60 cent per kWh. Most programs are focusing on wind and solar. See also Box 2. In June 2004, Solar Cities was announced as a Commonwealth-Government initiated and supported program ("the Program") to assist whole communities in different locations across Australia to rethink the way they use and produce energy. The Program was deliberately designed to test, using a range of business models and suppliers for their delivery, the uptake barriers to - and the benefits of - a range of solar supply and energy demand-reduction options (Australian Institute of Petroleum 2011). **Clean Energy Future** The proposed carbon tax / ETS scheme will make investment in renewable production capacity more attractive to investors.	**Policies including Clean Energy Future** The Carbon Tax in the first fixed period will be at 2 cent per kWh so only a small additional incentive over the feed in tariffs. **Policies before Clean Energy Future** The implemented scheme is very ambitious and overshoots our highest set benchmark which is 10 % in 10 years. Australia needs to generate additional 13 % of REN till 2020 what is very likely to be reached. The obligation to reach the target is placed on the retailers as they have to pay high penalties compared to the REC price.. The penalty in case of failure to surrender adequate LGC (=Large-scale generation certificate) or STC (=Small technology certificate) at the end of the year requires the retailer to charge A$ 65 per MWh (Office of the Renewable Energy Regulator (ORER) 2011b). Considering that it is not tax deductible, the real value could theoretically be as high as A$ 94 what compared to the average price of RECs (A$ 15 to 40) is quite high. Compared to other industrialised countries this is a very strict measure as it puts considerable pressure on retailers for reaching their quotas (Local Power 2011). Solar city program is a project aiming to contribute to a sustainable urban development. To date (June 2011); 5,031 kW of PV and 20,174 smart meters have been installed and 10,945 home energy assessments have been delivered. The emission abatement potential is relatively small. However since this is pilot project for the trial of new sustainable models for electricity supply, this is evaluated positive.	...2 3 4 **5.5** ...2 3 4 **5.5**

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Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Support for different technologies **National** There is a range of funds in place to foster development of Renewable Energy. The Renewable Energy Demonstration Program (REDP) provides large grants to fund non-solar renewable energy power generation demonstration projects using various technologies across a range of geographic areas, up to one third of the eligible expenditure on each project. The grants support the commercialisation and deployment of large scale, grid feeding, renewable energy projects. The REDP started on 20 February 2009 and applications closed 15 April 2009. Four projects were subsequently announced: Two geothermal projects (A$90 million and A$62 million), one ocean energy (A$66 million), and one integrated energy (A$15 million) were successful (Minister for Resources and Energy 2009). The Geothermal Drilling Program (GDP) provides assistance to companies developing geothermal resources. It covers the cost of proof-of-concept projects including geothermal drilling, reservoir development and associated activities. The GDP is a competitive, merit-based grants programme provided as a dollar-for-dollar matched funding up to 50 % of the total eligible expenditure and is capped at A$7 million per proof-of-concept project. The final round of funding has closed, with seven projects each receiving A$7 million each (Department of Resources 2011f). **Clean Energy Future** According to the Clean Energy Future plan, innovation in RE will be supported by a A$ 200 Clean Technology Innovation Program, which will provide grant for early-stage commercialisation of RE.	**Policies including Clean Energy Future** In terms of diversification of REN deployment in Australia, the Clean Finance Cooperation (CEFC) will strengthen the current efforts by having a renewable energy investment stream facilitating research in REN such as geothermal and wave as well as large scale power generation. **Policies before Clean Energy Future** Different incentives on national level found. Supporting high cost RE technologies as ocean energy and geothermal. But since the RET is not giving quotas for other REN and is mainly focusing on wind and solar the funds are not in line with this measure.	0 1 **2** 3 4 0 1 **2** 3 4
Stringent framework for sustainable biomass import **National** No framework found. There is a tax for imported biofuels in place of 95 % duty per galloon on the US biodiesel (Australian Bureau of Statistics 2011a). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** No regulations on support or framework development for sustainable biomass import.	**0** 1 2 3 4 **0** 1 2 3 4

Barriers

Administrative environment **National** According to (Schiavi 2010) there are many barriers to overcome before the 20 % share in 2020 is likely to be reached. There are difficulties in financing, barriers related to grid connections, project delays resulting from state and national assessment and approval processes, conflicts with local communities etc. The renewable energy industry will require significant political support to compete with the fossil fuel industry (which is very powerful in Australia) and subsidies must be removed (Froome 2010). Spatial planning and subsequent approval procedures are a constant restraint on new renewables development, especially wind. Victoria has a law that permission is needed from communities located 2km away from a planned REN project. As the information availability about REN is still very low a lot of people and communities are opposing the wind farms (State Government of Victoria 2011d). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** In order to reach the set target for REN the spatial planning issue has to be overcome, but as there are also other options for REN available this barrier is rated with zero. Also taking into account the high penalties which retailers have to pay in case of failure this burden will be solved.	-4 -3 -2 -1 **0** -4 -3 -2 -1 **0**

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Stability of support **National** The REN scheme gives political stability, what is important for investments and planning for retailers. Different feed-in scheme on state level provide stability for the next 10-15 years. **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** In general it can be said, that since the REN scheme was introduced investments in this sector increased. Different feed-in schemes on state level provide stability to private homeowners.	-4 -3 -2 -1 **0** -4 -3 -2 -1 **0**
Preferential grid access and congestion management for renewable electricity **Policies before Clean Energy Future** The main instrument for promotion of renewables in Australia - the renewables target - creates a regulatory environment that drives the market towards deployment of renewable production sources. Grid access in this context is not seen as a barrier. **Policies including Clean Energy Future** No additional policies.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** The renewables target generates a framework where this is not rated as a barrier.	-4 -3 -2 -1 **0** -4 -3 -2 -1 **0**
Investment & implementation strategy for RE oriented grid structures **National** Several new rules addressing renewable energy integration issues have been implemented including: technical connection standards for wind generation (2007) and central-dispatch arrangements for wind and other intermittent generations (2008). The MCE has proposed a new rule (Scale Efficient Network Extensions) that would improve efficiency of access for new generators in prospective areas, such as new renewable development areas) Department of Resources 2011g. **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** There are policies to integrate RE in the distributions networks under discussion, but it is unclear when they will be implemented. This is considered as the biggest risk for the implementation on REN but has potential to be overcome because of the design of the RET.	-4 -3 -2 **-1** 0 -4 -3 -2 **-1** 0
	Total corresponds to	**4.8** **A**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Low carbon

Table 23
Policies and measures on low carbon options in the electricity and heat sector

Policies / measures	Rationale for evaluation	Score (low carbon)	Score (100 % renewable)
Policies that influence fuel choice **National** No incentive on national level found. **State / Regional** The Queensland Gas Scheme sets requirements for electricity retailers to source a minimum percentage of their electricity from eligible gas-fired electricity provided above a baseline production amount. The current targets for the gas scheme are to increase the share from 13 % in 2008 and 2009, to 15 % in 2010 and more than 18 % for any year after 2010. (Queensland Government 2011a) **Clean Energy Future** Closing 2000 MW inefficient coal power plants an replacing them with more efficient gas or REN will improve the general efficiency. The introduction of a carbon price will reduce the profitability of some coal generators, eventually leading to the retirement of some of the most emission-intensive power plants (though there is great uncertainty about the timing of retirements). However, carbon pricing will also make existing lower emission generators, such as gas generators, more profitable (Clean Energy Plan).	**Policies including Clean Energy Future** The planned tax of A$ 23 per t CO_2e and the estimated price development (see Box 1) will not lead to a direct fuel switch or retirement of old, inefficient power plants, but will avoid the new building of coal power plants. Furthermore, coal power plants will receive free certificates till 2016. The closure of 2000 MW is very likely as the first contract is almost signed. The Hazelwood brown coal power plant (1600 MW) is very likely to be closed by 2020 (Reed 2011; Jackson 2011 pers. comm.). **Policies before Clean Energy Future** Regulation only on state level available with low effect on overall emissions.	0 **1** 2 3 4 **0** 1 2 3 4	0 **1** 2 3 4 **0** 1 2 3 4
Incentives for biomass CCS No information found	**Policies before Clean Energy Future** No information found on incentives for biomass CCS	**0** 1 2 3 4 **0** 1 2 3 4	**0** 1 2 3 4 **0** 1 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score (low carbon)	Score (100% renewable)
Incentives for coal CCS **National** Various funds support the development of CCS for Coal. CCS is considered as a long term strategy to carbon mitigation, therefore a number of funding programs support the deployment of low emission fossil fuel generation incl. CCS were initiated by the Australian Government. More than 80% of all government funds allocated to large-scale CCS demonstration projects in Australia were allocated to power generation projects, with a limited number of CCS projects being developed in other industries (Global CCS Institute 2010). Currently there are three funds on national level in place: The CCS flagship Program, which was launched in 2009 with an allocated budget of about A$ 1.9 billion. Aim: support depending on size 2-4 large scale integrated CCS projects. Four projects are nominated for pre-feasibility studies. The National Low Emission Coals initiative was established in 2008, with an allocated budget of A$ 400 million. The central focus is accelerating the development and deployment of technologies that will reduce emissions from coal use (major focus on CCS) (Department of Resources 2011h). The Low Emissions Technology Development Fund was established in 2006 with a budget of A$ 330 million for low emission fossil fuel projects (incl. CCS). Australia has also introduced the world's first legislation allowing offshore geological storage and is undertaking the world's first commercial release of offshore exploration areas for greenhouse gas storage assessment. The Offshore Petroleum and Greenhouse Gas storage Act 2006 allows industry to explore for and develop Carbon dioxide storage sites in offshore areas. **State / Regional** Clean Coal Technologies Fund (Queensland) A$ 300 million / Energy Technology Innovation Strategy (Victoria) A$ 117 million (Queensland Government 2009). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** Even though there have been a lot of funds in place, most of them were not completely spent. There is one project under development (Sequestration hub project) with likelihood to deliver reductions in the near /middle future. It is still unclear what came out of government spending on CCS demonstration. But so far little interest by companies (electricity and industry) to engage, as long as other lower cost options are easily available. Problems with acceptance in the public and low efficiency. I.e. not likely to see substantial deployment of CCS within the next 20 years (Reed 2011; Nelson 2011 pers. comm.).	0 **1** 2 3 4 0 **1** 2 3 4	-4 -3 -2 **-1** 0 -4 -3 -2 **-1** 0
Active support for nuclear energy **National** Australia does not use nuclear energy, even though there is Uranium mining. In 2010-11 Australia produced over 7000 tonnes of uranium oxide concentrate. It is the world's third-ranking producer, behind Kazakhstan and Canada. (World Nuclear Association 2011) The current government has a no nuclear power plant policy (Minister for Infrastructure and Transport 2011). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** No nuclear power use.	**0** 1 2 3 4 **0** 1 2 3 4	-4 -3 -2 -1 **0** -4 -3 -2 -1 **0**
	Total	**0.7**	**0.3**
	corresponds to	**F**	**G**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

I.3 Industry

Changing activity

Table 24
Policies and measures on changing activity in the industry sector

Policies / measures	Rationale for evaluation	Score
Support the redesign of products to be less material intensive, long lasting, 100% recyclable **National** No information found on regulations for less material intensity or better recyclability of products.	**Policies before Clean Energy Future** No visible strategy on material intensity and re-cyclability of products	0 1 2 3 4 0 1 2 3 4
	Total corresponds to	**0.0** **G**

Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Energy efficiency

Table 25
Policies and measures on energy efficiency in the industry sector

Policies / measures	Rationale for evaluation	Score
Schemes that lead to sufficient additional improvements in energy efficiency in industry **National** The Energy Efficiency Opportunity Programme is a mandatory programme for corporations that use more than 0.5 PJ (139 GWh) of energy per year. The legislation come into effect 2006 and aimed to improve the identification and uptake of cost-effective energy efficiency opportunities productivity while reducing GHGs and energy management system, behaviours and technology within largescale energy consuming companies. Currently there are 227 companies registered that comprise 45 % of total Australian energy end use and 60 % of businesses energy end use. Participating companies must undertake a comprehensive assessment of their energy use to identify cost-effective energy efficiency opportunities and report to government and public (Department of Resources 2011c). **State / Regional** Since 2008, the Industry Greenhouse Program in Victoria requires all commercial and industrial sites that use more than 100 Tj of energy or 120 million liters of water a year to participate on the program. These businesses need to assess their resource use, register with environment authority and prepare a plan to improve efficiency. Identified actions with a three-year or shorter payback period have to be implemented. According to the Environment Protection Authority of Victoria 1000 businesses have registered since 2008 and report 1.1 Mt CO_2 reductions annually (Environment and Resource Efficiency Plans (EREP) 2008). **Clean Energy Future** The planned carbon tax would improve efficiency in all sectors covered by the system. Additionally there is a plan to introduce a national energy savings initiative with a white certificate scheme. This would place obligations on energy retailers to help their households and business customers find and implement energy savings. The national scheme would replace the energy efficiency schemes in NSW, Victoria and SA. The Government has allocated A$ 800 million over seven years to the Clean Technology Investment grant based program. It will be mainly spent on manufacturing businesses investing in energy efficiency equipment. Eligible Activities supported by the program are, for example, waste heat recovery, including co-generation, insulation, heat exchange recovery on heating, ventilation and air-conditioning (HVAC) systems, condenser heat recovery in industrial refrigeration as well as intelligent control systems for production and factory management (Department of Innovation Industry 2011).	**Policies including Clean Energy Future** The benchmark is assessed as follows: According to the Clean Energy Plan the carbon price will start at A$ 23 per t CO_2e. Assuming the current net grid factor for carbon is around 930g CO_2e per kWh will lead to additional A$ 0.021 per kWh generated by the carbon price. The average price for electricity in Australia was A$ 39-49 per MWh (0.039-0.049 per kWh) in 2008. The tax is between 40 - 50 % of the current electricity price. According to the benchmark, a tax of 100 % of the electricity price would increase efficiency significantly. Furthermore, not all industries are covered by the carbon price as industries with high volumes traded on international markets are excluded. The Clean Technology Investment Program is a good initiative by the government and will support businesses to change their current efficiency portfolio. According to (Climate Works Australia 2011) there is a potential of 6.5 Mt CO_2e abatement. **Policies before Clean Energy Future** EEOP: There is no clear approach as to how the identified energy efficiency opportunities should be implemented and no transparent report about abatement potential available.	0 1 **2** 3 4 0 **1** 2 3 4
Policies that support the demonstration of breakthrough technologies No information found	**Policies before Clean Energy Future** No information found on support of breakthrough technologies.	**0** 1 2 3 4 **0** 1 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Barriers		
Subsidies, tax exemptions for energy-intensive industry for conventional fuel supply and consumption No subsidies supporting industry found.	**Policies before Clean Energy Future** No Subsidies found.	-4 -3 -2 -1 **0**
	Total corresponds to	**1.8** D

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Renewables

Table 26
Policies and measures on renewable energy sources in the industry sector

Policies / measures	Rationale for evaluation	Score
Effective policies in place that lead to increasing the use of renewable energy in other industry **National** No incentive found. **Clean Energy Future** A carbon price has the potential to make renewable generation more competitive relative to coal, leading to a transition away from conventional coal-fired generation and towards renewable technology. Once a carbon tax is in place, industry with a high electricity demand will have to pay high prices for fossil fuel sourced electricity. This could motivate them to produce own electricity from RE. Furthermore, there is the A$ 200 million Clean Technology Innovation Program, which is foreseen to support R&D for renewable energy, low pollution technology and energy efficiency in industry.	**Policies including Clean Energy Future** There is only low support compared to other measures for REN in industry. The 200 million Clean Technology Innovation fund will cover REN in industry, but it is likely that they will not be able to compete with the low cost option from energy efficiency options. Compared to the BASELINE scenario, there is a policy considering REN, but the effect small. **Policies before Clean Energy Future** No implemented incentive found.	**0** 1 2 3 4 0 **1** 2 3 4
Stringent framework for sustainable biomass import **National** No information about a stringent framework found but there is a tax of 95 % duty per gallon on US biodiesel (Australian Bureau of Statistics 2011a).	**Policies before Clean Energy Future** No information found.	**0** 1 2 3 4 **0** 1 2 3 4
Barriers		
Subsidies, tax exemptions for energy intensive industry for conventional fuel supply and consumption No subsidy found.	**Policies before Clean Energy Future** No subsidies found.	-4 -3 -2 -1 **0** -4 -3 -2 -1 **0**
	Total corresponds to	**0.8** **F**

Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Low carbon

Table 27
Policies and measures on low carbon options in the industry sector

Policies / measures	Rationale for evaluation	Score (low carbon)	Score (100% renewable)
Incentives for coal / gas CCS development in industry **National** Clean Energy Initiative: A$ 1.7 billion for CCS in Industry, funding to support construction and demonstration of large-scale integrated carbon capture and storage projects in Australia, which may include gasification, post-combustion capture, oxy-firing, transport and storage technologies (Department of Resources 2011b). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** Most of the funds concerning CCS were never spent.	0 **1** 2 3 4 0 **1** 2 3 4	-4 -3 -2 **-1** 0 -4 -3 -2 **-1** 0
Incentives for biomass and process emission CCS development in industry **National** Clean Energy Initiative: A$ 1.7 billion for CCS in Industry, funding to support construction and demonstration of large-scale integrated carbon capture and storage projects in Australia, which may include gasification, post-combustion capture, oxy-firing, transport and storage technologies (Department of Resources 2011b). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** There was no specific information if the Clean Energy initiative has also programmes in biomass and process emissions. Assumed not to take place.	**0** 1 2 3 4 **0** 1 2 3 4	**0** 1 2 3 4 **0** 1 2 3 4
	Total corresponds to	**0.5** **F**	**0.0** **G**

Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Non-energy

Table 28
Policies and measures on non-energy related emissions in the industry sector

Policies / measures	Rationale for evaluation	Score
Policies to reduce N_2O emissions in industry **National** No information found Australia's N_2O emissions (Table 3.5) were 0.1 Mt in 2007, equivalent to 25.0 Mt CO_2. This was 24.5 % more than in 1990. (UNFCCC 2009c) **Clean Energy Future** The Carbon Price scheme will fully cover emissions from N_2O in industry. N_2O emission occurs mainly as a by-product in the Nitric Acid Production[1]. Nitric acid is used as a raw material mainly in the manufacture of nitrogenous agricultural fertiliser. Nitric acid is produced by three producers in Australia; Wesfarmers, Orica and Queensland Nitrates (Department of Climate Change 2011).	**Policies including Clean Energy Future** The carbon price scheme will incentivise low carbon investment in the nitric acid producing sector, where the significant abatement potential is currently not being realised. Companies can also bring their emissions down dramatically at relatively low cost. By comparison, the cost of abatement in Germany is expected to be between €0-€10 /t CO_2e in 2020. (Department of Energy and Climate Change (DECC) 2011; Ecofys 2009) **Policies before Clean Energy Future** No policies found.	0 1 2 **3** 4 **0** 1 2 3 4
Incentives to reduce fugitive CH_4 emissions from oil and gas production **National** Greenhouse Gas Challenge Program - The Greenhouse Challenge programme was a joint voluntary initiative between the Australian Government and industry under which companies/associations committed to limiting their greenhouse gas (GHG) emissions. The measure ended in July 2009 without replacement (Department of the Environment 2009). Greenhouse Gas Abatement Program (GGAP) - was a competitive grants program established in 2001 and designed to reduce net emissions by supporting activities likely to result in substantial emissions reductions or offset emissions. A number of grants were issued for projects that generated electricity from coal mine methane in the coal fugitives subsector. No further grants are being offered. **State / Regional** In 2010 The NSW Clean Coal Fund (A$ 100 million) granted two demonstration projects for CH_4 mitigation in the coal sector. The CSIRO Centre for Environment, Social and Economic Research/ Reducing Fugitive Emissions from Open Cut Coal Mines using Enhanced Drainage of Coal Mine Methane and Centennial (Coal) Mandalong Pty Ltd/ Greenhouse Abatement Facility Demonstration (NSW Government 2009). **Clean Energy Future** The carbon tax will fully cover the fugitive emission sector. A Coal Mining Abatement Technology Support Package (A$ 70 million over six years) will support the coal industry to implement technologies.	**Policies including Clean Energy Future** The "Clean Energy Future" Plan also covers fugitive emissions and proposes additional support for largscale mining. The mining sector has grown since 1990, therefore no historical maximum has been reached so far. Assuming that 10 % from 2008 levels is the benchmark for our assessment, the target for 2020 is set as 4 Mt CO_2e. As the production of oil, gas and coal is expected to grow exponentially in the future, the carbon price will at least have the effect of stabilising emissions till 2020 (The Treasury 2011). **Policies before Clean Energy Future** There have been projects and grants in place for two years. It's difficult to estimate the long term effect since most of the grants and projects have ended.	0 **1** 2 3 4 **0** 1 2 3 4

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[1] high temperature catalytic oxidation of ammonia (NH 3).

Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Decrease in landfill gas emissions **National** Waste issues are mainly covered by state-based regulation with large differences in scope and stringency of regulation. The new national policy (2009) on waste sets up a process to harmonise these regulations over the different states. The main focus is not on emissions, but on an overall harmonisation. However, due to the large difference in requirements it is likely that it will produce a positive effect on emissions in the long terms, since 'laggards' will likely need to ramp up their regulation. Effects and time line are difficult to determine. **Clean Energy Future** There are two policies covering emissions from landfill. The carbon price covers new waste, i.e. waste that is deposited in old/new landfill sites after 2012. Operators need to calculate emissions separately for the two types of landfill. Emissions from landfill before 2012 fall under the carbon farming initiative. The carbon farming Initiative is a carbon offset scheme that creates new economic opportunities for farmers and landholders by reducing carbon pollution. Reduced pollution from legacy landfill waste will also be covered by this scheme (Australian Government 2011j).	**Policies including Clean Energy Future** The carbon price is covering emissions from new landfill. "Old" landfill will be covered by the carbon farming initiative. Emissions from landfill are influenced by population growth and waste produced per capita. 10% of the historical maximum 19 Mt CO_2e in 1990) would be a target of 1.9 Mt CO_2e in 2030 (according to our benchmark). Taking into account that there are several low cost technologies for the waste sector are available, it is likely but quite challenging to reach a mitigation of 1.9 Mt CO_2e. **Policies before Clean Energy Future** The current national waste policy has no direct effect on emissions.	0 1 **2** 3 4 0 **1** 2 3 4
Policies to reduce F-gas emissions **National** The group of F-Gases consists of HFCs (hydrofluorocarbons), SF_6 (sulphur hexafluoride) and PFC (perfluorocarbons). The largest share of total F-gas emissions in Australia is from the HFCs due to increased use of refrigeration and air conditioning, foam blowing, fire extinguishers, aerosols/metered dose inhalers as well as solvents. In 2009 6,250 kt CO_2e were emitted by the use of HFCs. SF_6 are a by-product of electrical equipment production accounts for 60 kt CO_2e. PFCs which are mainly generated in the aluminium production, decreased since the early 90th to 308 kt CO_2e (Department of Climate Change 2011). For control of emissions from synthetic greenhouse gases (SGG) e.g. F-Gases the "Ozone Protection and synthetic Greenhouse Gas Management Act 1989" was introduced which applies consistent controls on the use of ODS (ozone - depleting substances) and SGG used to replace ODSs. The legislation established a system of controlled substance licences and reporting requirements for the import, export or manufacture of ODS, HFCs and PFCs. In 2005 an additional permit scheme to regulate the use and handling of ODS and SGGs was introduced. For refrigeration and air-conditioning and fire-protection industries, minimum industry standards to reduce emissions were implemented. In 2009, amendments to the legislation were made to help minimise ODS and SGG emissions and to streamline compliance and enforcement (Department of Climate Change 2010). **Clean Energy Future** According to the Acts, only PFCs from aluminium smelting will be covered by the carbon tax. HFCs and SF_6 will be subject to an equal carbon price which will be applied through existing legislation on synthetic greenhouse gases - the Ozone Protection and Synthetic Greenhouse Gas Management Act.	**Policies including Clean Energy Future** PCFs will be covered by the carbon price; other synthetic GHGs will be subject to another price system. Examples from other countries which also introduced taxes or prices (e.g. Norwegian and the Danish) on HFCs state that it had a significant impact on reducing the climate impact of HFCs: on one hand the use of natural refrigerants has increased, while at the same time both leakage rates and the quantity of HFCs used in facilities have decreased (Beyond HFCs 2011). **Policies before Clean Energy Future** Even though PFC emissions have decreased by about 87% between 1990 and 2007 r from better management of the aluminium smelting process and a shift of production to smelters with lower PFC emissions rates, there is an overall increase of F-gases since 1996 mainly due to refrigeration and air conditioning. (Syed 2010a)	0 1 **2** 3 4 **0** 1 2 3 4
	Total	**0.9**
	corresponds to	**F**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

I.4 Buildings

Changing activity

Table 29
Policies and measures on changing activity in the building sector

Policies / measures	Rationale for evaluation	Score
Urbanisation policy that leads to energy efficient development **National** No policies. **Clean Energy Future** The National Urban Policy is not part of the Clean Energy Future package, but builds on current work by the Council of Australian Governments (COAG) Reform Council on Capital City Strategic planning systems. The consultation processes analyses major cities and the population strategy. Strategic plans are to be in place from 1 January 2012 (Australian Bureau of Statistics 2011d). Since it is part of the efforts to address all aspects that affect GHG emissions and since it will start only in 2012 we have included the evaluation within this scenario.	**Policies including Clean Energy Future** The National Urban policy will be implemented from 2012 on. It is assumed that this will have a positive effect on the energy efficient development. However there is no data available that allows drawing conclusions on the order of magnitude (in kt CO_2 emissions or GWh of saved energy). **Policies before Clean Energy Future** No policies.	0 **1** 2 3 4 **0** 1 2 3 4
	Total	**1**
	corresponds to	**F**

Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Energy efficiency

Table 30
Policies and measures on energy efficiency in the building sector

Policies / measures	Rationale for evaluation	Score
Incentives for use of efficient appliances **National** In 2009, the Council of Australian Governments (COAG) agreed to a comprehensive 10 year National Strategy on Energy Efficiency. Key programs delivered under the strategy aiming at appliances are summarized below (Wilkenfeld 2009). The Equipment Energy Efficiency Program (E3) is a collection of coordinated programs that deliver economic and environmental benefits to the community. The E3 program, which is co-funded by the Australian Government, state and territory governments (and New Zealand Government), focuses on household appliances and equipment, and commercial and industrial equipment (Wilkenfeld 2009). E3 sets mandatory minimum energy performance standards and provides energy efficiency labelling. Products are considered for inclusion within the program on the basis that the community will benefit from their regulation. The individual product energy efficiency target is either the equivalent of world-best regulatory target or a more stringent level developed specifically for Australia (Wilkenfeld 2009). It is currently estimated that the E3 Program will yield a cumulative economic benefit to Australia of A$ 22.4 billion by 2024. It is estimated that the Equipment Energy Efficiency Program saves about 22 TWh in the residential sector and 10 TWh in the non-residential sector per annum in 2020 (Wilkenfeld 2009). Together that corresponds to about 13 % of the total consumption projected by the ABARE 2010 projections (Australian Sustainable Built Environment Council 2010). The National Strategy on Energy Efficiency (update 2010) proposes measures that include acceleration of Australia's current MEPS (Minimum Energy Performance Standards) and labelling program through the Equipment Energy Efficiency (E3) Program) (Council of Australian Governments (COAG) 2010). Phase-out of inefficient lighting has been announced by the government already in 2005 as part of the Greenlight Australia, a subprogram of the National Framework for Energy Efficiency (Council of Australian Governments (COAG) 2010). Uptake of efficient lighting such as compact fluorescent lamps will be encouraged. The move to more efficient lighting is expected to save around 30 Terawatt hours of electricity that corresponds to about 1 % of electricity savings per year in average and 28 million tons of GHG between 2008 and 2020 (Department of Climate Change 2010). The Heating, ventilation and air-condition (HVAC) High Efficiency Systems Strategy aims to improve the efficiency of HVAC systems in Australia, especially regarding the maintenance and operation of existing systems (Department of Climate Change 2010). The government started the Living Greener Initiative that provides information about opportunities to achieve higher energy efficiency in households in various areas, including appliances (Australian Government 2011f). The National Solar Schools Program. The program offers eligible primary and secondary schools the opportunity to compete for grants of up to A$ 50,000 (GST exclusive), to install solar and other renewable power systems, solar hot water systems, rainwater tanks and a range of energy efficiency measures including energy efficient lighting, skylights, ceiling fans, sensors, shade awnings, double glazing and automatic doors (Australian Government 2011g). ►	**Policies including Clean Energy Future** The expansion of the ESI to a national level would increase impact both through additional coverage and reduced complexity. Additionally the carbon price will provide an incentive for the use of more efficient appliances. **Policies before Clean Energy Future** The minimum energy efficiency requirements for electrical appliances are slightly lower than those set by the Ecodesign Directive (European Union 2011). The minimum requirements for water source heat pumps and air conditioning systems in Australia are for example in the range between 3.2 and 3.5 COP (Coefficient of Performance, i.e. ratio of useful output to the amount of (energy) input of different equipments/ appliances).). The efficiency classes by the European Commission (however still not implemented) ranges from A+++ (corresponds to a COP of 5.1) to G (corresponds to a COP < 1.9). On this scale, Australia's minimum requirements correspond to class A to B (CLASP 2011; Wilkenfeld 2009). The MEPS (Minimum Energy Performance Standards) are a well targeted energy efficiency regulation that has a proven track in unlocking emissions reductions and energy saving potential already. MPES can be enhanced and accelerated. There is no need to replace working electric appliances. That implicates that the technologies used in the existing buildings that fitted some time ago and are less efficient than those that are available now to a major part are locked-in in the existing building stock until the end of their lifetime. A barrier to the full implementation of energy efficiency enhancements is the long lifespan of equipment and appliances. This makes it even more important consumers are supported to make the choice for the most efficient solution available at the time.	0 1 2 3 **4** 0 1 2 **3** 4

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Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
▸ **Incentives for use of efficient appliances** **State / Regional** Western Australia is currently planning Energy 2031 the state's strategic energy initiative with own measures and goals which are so far not specified (Government of Western Australia 2011d). In Victoria the Energy Saver Incentive offers discounts on many selected energy saving products and appliances of companies registered in the Victorian Energy Efficiency Target Scheme (State Government of Victoria 2011a; Victorian Energy Efficiency Target 2011). Western Australia is currently planning Energy 2031 the state's strategic energy initiative with own measures and goals which are so far not specified (Government of Western Australia 2011d). **Clean Energy Future** The Australian government plans a national Energy Savings Initiative (ESI) which is projected to save about 5 % of electricity and gas by 2020 (Climate Works Australia 2011). Objective is to place obligations on energy retailers to find and implement energy savings in households and businesses. An ESI would help consumers to save money by encouraging the identification and take-up of energy efficient technologies. A national ESI that replaces existing state energy efficiency schemes in New South Wales, Victoria and South Australia would reduce complexity and duplication and allow energy consumers in states without existing schemes to benefit (Australian Government 2011b).		
Level of energy and/or CO_2 taxes (electricity) **National** No specific energy / CO_2 taxes at present. **Clean Energy Future** The planned carbon price / ETS will address the absence of a price signal for carbon emissions. It cannot be estimated at the moment to what extend the electricity price is supposed to rise (Australian Sustainable Built Environment Council 2010 Council of Australian Governments (COAG) 2010).	**Policies including Clean Energy Future** The introduction of a future carbon price will affect the electricity price and therefore influence the consumer behaviour. According to the Clean Energy Plan the carbon price will start at A$ 23 per t CO_2e. Assuming the current net grid factor for carbon is around 930g CO_2e per kWh will lead to additional A$ 0.021 per kWh generated. The average price for electricity in Australia was A$ 39-49 per MWh (0.039-0.049 per kWh) in 2008. The tax is between 40 - 50 % of the current electricity price. **Policies before Clean Energy Future** Until today relatively low energy prices in Australia have provided consumers in Australia with little incentive to reduce their energy consumption.	0 **1** 2 3 4 0 **1** 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Barriers		
Subsidies, tax exemptions for electricity use in buildings No subsidies found.	**Policies before Clean Energy Future** No subsidies found.	-4 -3 -2 -1 **0** -4 -3 -2 -1 **0**
Incentives (fuels)		
Ambitious efficiency standards for new buildings **National** Building codes in Australia are regulated at national level. New residential, commercial, public sector buildings and major retrofits (>1,000 m²) are subject to meeting the code. The Building Code of Australia (BCA) has energy efficiency provisions for all building classifications. Australia revised the BCA to account for energy efficiency as part of its strategic reduction of greenhouse gas emissions. To complement passage of the housing provisions, Australian governments agreed to implement a consistent Nationwide House Energy Rating Scheme (NatHERS) to enable householders to assess the energy efficiency of houses and make more informed choices about housing purchases and renovation (International Energy Agency (IEA) 2010a). Unique standards are set for each climate zone taking into account the extremes of the local weather conditions. Each standard set has been developed to allow comparisons of building within and between climate zones. From 1 May 2011 the 6 star requirements will enter into force. Depending of the climate zone, a 6 star building would consume between 39 and 349 MJ/m² per year. NatHERS developed a detailed table of requirements for the different locations in Australia. The maximum of 10 stars is the highest standard and depending on climate zone would lead to a maximum energy consumption reaching from 119 MJ/m² (in Darwin) to nearly 0 MJ/m² or even 0 MJ/m² many other climate zones. To allow time for consumers and builders to get used to the new requirements, there will be a 12-month transition period. From 1 May 2012, the 6-star requirements (including lighting efficiency) will be mandatory for all new buildings (Government of Western Australia 2011a). The NatHERS 6 star standard puts on a trajectory towards more energy efficient buildings and according to governance arrangements will be reviewed regularly for potential upgrade thereafter (Nationwide House Energy Rating Scheme (NatHERS) 2011). It is likely that the National Buildings Framework, which is under development, will set out a longer term trajectory (Riedy 2011). Energy efficiency disclosure. Under the program from 1 November 2010, most sellers or lessors of office space with a net area of 2,000 square metres or more to rent are required to obtain and disclose an up-to-date energy efficiency rating. From 1 November 2011 a full Building Energy Efficiency Certificate (BEEC) will need to be disclosed. One year later it starts for residential buildings. There will be a transition period before (Australian Government 2011b). ▸	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** The indicator measures if there is a policy that leads to zero energy buildings and by when that will happen. Australia has set unique standards for each climate zone. At the moment, buildings have to be built fulfilling the energy performance requirements according to 6 stars, which already is a trajectory towards lower energy consumption in buildings. Due to its dependence on different climate zones, this scheme cannot easily be compared to other well known standards of different countries. Even if built according to the 10 stars standard, a zero energy building is not reached in every climate zone.. However the path from 6 to 10 stars is not defined (yet). It is likely that the National Buildings Framework, which is under development, will set out a longer term trajectory.	0 **1** 2 3 4 0 **1** 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
▸ **Ambitious efficiency standards for new buildings** The Energy Efficiency in Government Operations (EEGO) policy aims to reduce the energy consumption of Australian Government operations with particular emphasis on the energy performance of its buildings until 2011 [International Energy Agency (IEA)]. The Low Carbon Communities program provides low income households with financial support for energy efficiency activities. The program has a budget of A$ 300 million (Department of Climate Change and Energy Efficiency 2011d). **State / Regional** Several states have adopted their own regulations to strengthen efficiency standards for new and retrofitted buildings. In New South Wales, every development application for new residential buildings is required to have a Buildings Sustainability Index (BASIX) certificate (NSW Government 2011c). The Building Sustainability Index (BASIX) was introduced by the NSW Government in 2004 to ensure that new homes are designed and built to high energy and water efficiency standards. Each new home in NSW must meet a greenhouse gas emission reduction target compared with the average home built before the introduction of BASIX. For Sydney and coastal NSW, this target is 40 % (NSW Government 2011c). In Queensland, all new commercial buildings are required to achieve a National Australian Built Environment Rating System (NABERS) four-star rating by 2010. In all other states, NABERS remains a voluntary program (Queensland Government 2011a). **Clean Energy Future** The package does not include measures in this area.		
Sufficient incentive for high retrofit rates **National** In February 2009, the Australian Government's A$ 3.2 billion Energy Efficient Homes Package was established. The package recognises that two of the most effective residential energy efficiency measures for the existing housing stock are retrofitting ceiling insulation and installing more energy efficient hot-water units. The package is anticipated to save GHG emissions up between 35 and 45 million tons CO_2 by 2020 (Department of Climate Change 2010). The program consisted of two streams: the home insulation program and the solar hot water rebate program. Under the Home Insulation Program, assistance of up to A$ 1,200 is available to help eligible owner-occupiers, landlords and tenants install new ceiling insulation in their existing privately owned homes, rental and other properties (Department of Climate Change 2010) The Home Insulation Program had a budget of around A$ 348 million in the 2010-2011 period. So far under the HIP, around 1.2 million households were insulated at a cost of around A$ 1.45 billion (Australian Government 2011d). According to the government website, the program was shut down in February 2010 due to escalating safety and compliance concerns (installer deaths and fire incidents). The following Home Insulation Safety Plan started in April 2010, the before supported and insulated households were repaired and over 150,000 households in general inspected (Australian Government 2011d). ▸	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** Most of the policy measures target raising the efficiency of new buildings and assets (such as appliances) but not at retrofitting existing buildings. The share of money available from the Energy Efficient Homes Package that went to the retrofit of buildings is unclear. Due to the closure of the home insulation program there is no policy measure that aims at retrofitting the existing residential building stock at the moment. The Green Loans and Green Starts program has been closed in February 2011 and does not have any follow-up programs. ▸	**0** 1 2 3 4 0 1 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
▸ **Sufficient incentive for high retrofit rates** The Green Loans and Green Starts Program, active from July 2009 until February 2011, was an Australian Government initiative to promote energy efficiency in Australian homes by providing free technical support. The assessments were voluntary and provided householders with valuable information and advice on actions to save energy and water. The Green Loans and Green Starts Program conducted over 600,000 home assessments during its course (Australian Government 2011c). Clean Business Australia is a partnership with Australian business and industry for tackling climate change, supporting various activities. One element was the Green Building Fund. Most funding of the Clean Business Australia policy is directed towards retrofitting existing commercial office buildings. The program has recently been expanded to include hotels and shopping centres. Grants ranging from A$ 50,000 to A$ 500,000 are available for up to 50 % of project costs. As of 20 December 2010, six rounds of funding had occurred. A limited number of grants were provided for improving industry capability in the operation of commercial office buildings under Stream B of the program (now closed to new applications). Grants of up to A$ 200,000 were available, covering up to 50 % of project costs (International Energy Agency (IEA) 2010b). Round 7 of the Green Building Fund closed on 29 March 2011 (AusIndustry 2011a). The National Solar Schools Program considers- apart from the solar focus- also double glazing (Australian Government 2011g). The Tax Breaks for Green Buildings program was announced as part of the 2010 Government election commitment. From 1 July 2012, eligible businesses that invest in improving the energy efficiency of their existing buildings will be able to apply for a Tax Break. The Tax Break will cover specified expenditure which is incurred as part of a qualifying retrofit of an existing office building, hotel or shopping centre. The retrofit must be assessed by an accredited National Australian Built Environment Rating System (NABERS) assessor before and after the project. To be eligible for the Tax Break, the building must achieve a significant improvement in energy efficiency (Department of Climate Change and Energy Efficiency 2011h). The Low Carbon Communities program provides low income households with financial support for energy efficiency activities. The program has a budget of A$ 300 million (Department of Climate Change and Energy Efficiency 2011d). **State / Regional** In Victoria, the "Zero Emission Neighbourhoods" (ZEN) is a A$ 6 million. grant program which aims to assist the development of up to six precincts that aspire to significantly reduce greenhouse gas emissions (State Government of Victoria 2011e). In New South Wales; since July 2007, the Building Sustainability Index (BASIX) also covers all residential alterations and additions which cost more than A$ 50,000 (NSW Government 2011c). **Clean Energy Future** The package does not include measures in this area.	The low carbon communities program supports low income households. The effect cannot be evaluated since the program has not released the guidelines yet, but will do so in early 2012 (Department of Climate Change and Energy Efficiency 2011d).The effect of the green fund that addresses hotels, shopping centres and commercial offices cannot be estimated due to lack of evaluation studies for this program; however the total renovation rate will not rise significantly due to the total floor area of these buildings (estimated to be less than 7 %). In summary, at the moment, there are no incentives to renovate the existing residential building stock that corresponds to about 89 % of the floor area. Existing and planned measures mainly aim at retrofitting the non residential building stock. Due to lack of evaluations of the impacts of these programs in terms of renovated floor area and saved energy, it is difficult to evaluate how much floor area will be renovated in which quality. One of the main barriers for retrofitting is the access to upfront capital. Australia has a low aggregation of incentives, i.e. policies that aggregate small scale activities, which are not able to overcome the barrier on large scale Skarbeck 2011. The same can be said of the tax breaks for Green Buildings program. It is said that there will be provided A$ 1 billion in support to the property industry over 8 years to improve the energy efficiency of older, less-efficient buildings starting in 2012 Jackson 2011.	

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Efficiency improvement for other than heating fuel uses (cooking, hot water uses) **National** The Equipment Energy Efficiency Program (E3) sets standards for hot water heaters. Phase-out of GHG-intensive water heaters. The National Hot Water Strategy has developed a 10 year strategy framework (2010-2020) for low-emission water heaters that aims at progressively transform the market for residential water heaters towards low-emission alternatives (Council of Australian Governments (COAG) 2010; Department of Climate Change 2010). The phase-out takes place in various stages. Stage 1 was planned for 2010 according to the Government. This phase out will result in the reduction of greenhouse gases by about 78.7 million tonnes over twenty years from 2010-2030 (Department of Climate Change and Energy Efficiency 2011f). **State / Regional** In New South Wales, the Government's A$ 700 million Climate Change Fund was established in July 2007. A$ 170 million out of that goes to the NSW Home Saver Rebates providing rebates for hot water systems, hot water circulators, rainwater tanks and dual flush toilets. The Building Sustainability Index (BASIX) ensures that new homes are designed and built to high energy and water efficiency standards (NSW Government 2011c). In Victoria there exists the Victorian Energy Efficiency Target (VEET) scheme, which is not a rebate scheme. It allows accredited businesses to create certificates when they help households to implement selected energy efficiency improvements. Credits are granted for example when a consumer replaces an older appliance; however in some cases it also is granted when buying a new appliance without replacing an old one (Victorian Energy Efficiency Target 2011). The Victorian Government offers rebates for efficient water heaters. The rebates vary depending on their size (amount of water produced) and on their performance (solar contribution), as well as relative cost of installation. The range of rebate reaches from A$ 300 to A$ 1600.(State Government of Victoria 2011b). Queensland supports energy efficient hot water systems through rebates of up to A$ 1,000 for the replacement of existing electric hot water systems with a solar hot water system or heat pump. From 1 January 2010, every house owner that lives in a house or townhouse located in a reticulated natural gas area and has an electric resistance hot water system that needs to be replaced is required to install a greenhouse efficient hot water system - either gas, solar or heat pump. (A reticulated natural gas area is an area where a gas distributor can supply gas to the meter of the property at no cost. The property owner will still be responsible for the internal connection costs from the gas meter outlet to the hot water system. Owners of existing houses or townhouses located outside a reticulated natural gas area will still be permitted to install an electric system, however, it is recommended you consider a greenhouse efficient option) (Queensland Government 2011b). Householders do not need to replace existing electric hot water systems that are in good working order (Queensland Government 2011a). The Western Australian Government provides rebates to householders who install environmentally friendly, gas-boosted solar water heaters (natural gas and LPG) (Government of Western Australia 2011b). ▸	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** Water heating is the largest single source of greenhouse gas emissions from most Australian homes. On average, each electric hot water system produces around four tonnes of greenhouse gases every year. That's equivalent to running an average sized car for a year. Electric hot water systems use at least three times the greenhouse gases produced by other more efficient technologies such as solar or gas hot water systems. Commencement dates for Stage 1 of the phase-out of electric hot water systems are dependent on individual state and territory decisions. Until now only Queensland and South Australia have implemented stage one of the Phase-out of GHG-intensive water heaters, i.e. they have obligations for retrofitting electric heating waters systems with more emissions efficient hot water systems in case the old heater breaks down. The requirements depend on type and size of building. Considering the importance of the phase-out of electric water heaters it surprises that the other governments have not started the phase-out. With an assumed lifetime of about 15 years, around 7% of hot water heater systems need to be regularly replaced every year. In case of replacement with electric water heaters they are locked in until end of their lifetime. There is no need to replace working electric storage hot water systems. The more efficient technology water heaters only need to be purchased when the existing unit breaks down or is replaced (unless an exemption applies) (Department of Climate Change and Energy Efficiency 2011f). ▸	0 1 **2** 3 4 0 1 **2** 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
▸ **Efficiency improvement for other than heating fuel uses (cooking, hot water uses)** In South Australia, installing a water heater in a new home or as part of an alteration or addition to a home has to follow certain rules. These rules may depend on the type of home one live in, where the home is in South Australia, the type of water heater being replaced, the location of the water heater on the property. There exists a step-by-step guide to determine the existing water heater options. There are some situations where a water heater installation is exempt from the requirements (South Australian Government 2011c). **Clean Energy Future** The package does not include measures in this area.	The non-residential sector is not affected by the national and state rebate schemes (Nelson 2011). Outlook: Implement stage one of the Phase-out of GHG-intensive water heaters, in other states and extend obligations to other types of buildings, as foreseen in stage two of the phase-out.	
Level of energy and/or CO_2 taxes (fuel) **National** No taxes at present. **Clean Energy Future** The carbon price / ETS will address the absence of a price signal for carbon emissions. It cannot be estimated at the moment to what extend the electricity price is supposed to rise (Australian Sustainable Built Environment Council 2010 Council of Australian Governments (COAG) 2010). (Australian Sustainable Built Environment Council 2010 Council of Australian Governments (COAG) 2010).	**Policies including Clean Energy Future** The introduction of a carbon price will affect the electricity price and therefore influence the consumer behaviour. **Policies before Clean Energy Future** Until today, relatively low energy prices in Australia have provided consumers with little incentive to reduce their energy consumption.	0 1 **2** 3 4 **0** 1 2 3 4
Barriers		
Subsidies, tax exemptions for electricity use in buildings **National** The government gives electricity subsidies to low income households only, but not to the majority of the households; however it is planned to cut subsidies in the future. Apart of the general subsidization of the fuel sector no direct subsidies for fuel use in buildings could be found (Taxation News & Information 2011). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** Current policies subsidize low income households	-4 -3 **-2** -1 0 -4 -3 **-2** -1 0
Solutions to the landlord tenant problem **State / Regional** There are some State and city-level regulations to combat the landlord-tenant problem. Environmental upgrade agreements are being used as a way of financing retrofits of existing multi-residential buildings. These schemes have already been introduced in NSW and in Victoria in the City of Melbourne (as part of the 1,200 Buildings Program). They allow for the cost of retrofits to be recouped through increases in Council rates, which avoid the split incentive that exists in rental properties. **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** The average ownership rate in Australia is about 70 % (Australian Housing and Urban Research Institute (AHURi) 2010); however within the country it varies significantly. In urban centres, such as Inner Sydney (45 % ownership) and Inner Melbourne (43 %) the ownership is much smaller (Australian Bureau of Statistics 2003). ▸	-4 **-3** -2 -1 0 -4 **-3** -2 -1 0

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Barriers		
▸ **Solutions to the landlord tenant problem**	The landlord-tenant dilemma is therefore a barrier and until today is only addressed in the minority of the cases (one state and City of Melbourne). The impacts of the existing schemes have not been evaluated and can only be assumed.	
Proper implementation and enforcement of new buildings standards **National** No studies or evaluations could be found. Constructing a building without a building permit is according to the "Building Act 1993" fined with at least 100 penalty units (A$ 10,000) (Australian Building Commission 2008). New buildings do not get approval unless they comply with the star rating. Presumably this is enforced with the building inspections. It is assumed that defiance of energetic requirements is also subject to penalties. **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** The existence of building permit control and penalties allow the assumption that building standards are enforced.	-4 -3 -2 -1 **0** -4 -3 -2 -1 **0**
	Total	**2.2**
	corresponds to	D

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Renewables

Table 31
Policies and measures for renewable energy supply in the building sector

Policies / measures	Rationale for evaluation	Score
Use of renewable heating/cooling **National** No policy found **State / Regional** In Australian Capital Territory, the Wood Heater Replacement Program offers a subsidy to eligible householders for reducing air pollution by replacing an old wood heater with a new main supplied. The 2011 Wood Heater Replacement Program runs from 1 March 2011 and closes on 31 December 2011 (Australian Capital Territory Government 2011). In New South Wales, the Government's A$ 700 million Climate Change Fund was established in July 2007. A$ 170 million out of that goes to the NSW Home Saver Rebates providing rebates for hot water systems, hot water circulators, rainwater tanks and dual flush toilets. Part of that rebates go to renewable energy systems. The Victorian Government offers rebates for efficient water heaters. The rebates vary depending on their size (amount of water produced) and on their performance (solar contribution), as well as relative cost of installation. The range of rebate reaches from A$ 300 to A$ 1600 (State Government of Victoria 2011b). The Queensland Government is offering rebates of up to A$ 1,000 to eligible customers to replace existing electric hot water systems with a solar hot water system or heat pump. Since 1 January 2010 owners of existing houses and townhouses (class 1 buildings) located in a reticulated natural gas area have been required to install a greenhouse efficient hot water system (i.e. gas, solar or heat pump) when their existing electric hot water system needs replacing. Householders do not need to replace existing electric hot water systems that are in good working order (Queensland Government 2011a). In South Australia, installing a water heater in a new home or as part of an alteration or addition to a home has to follow certain rules that depend on the type of water heater being replaced, the type and size of building. A new solar water heater or a new electric heat pump water heater may be eligible for a A$ 500 solar hot water rebate from the South Australian Government (South Australian Government 2011b). The Victoria Government offers the Victorian Government Warmer Winter Discount a discount of A$ 700 off the full supply and installation costs of a gas space heater (State Government of Victoria 2011c, 2011b). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** Some states in Australia offer rebates for installing a heat pump. No information was found about how many buildings used that possibility. The use of renewable for heating and / or cooling is not obligatory. The effect is estimated to be minimal.	0 **1** 2 3 4 0 **1** 2 3 4
Cooking and hot water supply **National** Phase-out of GHG-intensive water heaters. The National Hot Water Strategy has developed a 10 year strategy framework (2010-2020) for low-emission water heaters that aims at progressively transform the market for residential water heaters towards low-emission alternatives (Council of Australian Governments (COAG) 2010; Department of Climate Change 2010). The phase-out takes place in various stages. Stage 1 was planned for 2010 according to the Government. This phase out will result in the reduction of greenhouse gases by about 78.7 million tonnes over twenty years from 2010-2030 (Department of Climate Change and Energy Efficiency 2011f). ▸	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** In case of replacement, so far, only Queensland and South Australia oblige to install a more efficient one (see rationale under "efficiency improvement for other than heating fuel uses (cooking, hot water uses) ▸	0 1 **2** 3 4 0 1 **2** 3 4

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Policies / measures	Rationale for evaluation	Score
▸ **Cooking and hot water supply** The Renewable Energy Bonus Scheme - Solar Hot Water Rebate (REBS) is available to help eligible home-owners, landlords or tenants to replace their electric storage hot water systems with solar or heat pump hot water systems. Under REBS, eligible households can claim a rebate of A$ 1,000 for a solar hot water system or A$ 600 for a heat pump hot water system (Australian Government 2011i). The "National Solar Schools Program" offers eligible primary and secondary schools the opportunity to compete for grants of up to A$ 50,000, to install solar and other renewable power systems, solar hot water systems, rainwater tanks and a range of energy efficiency measures including: Energy efficient lighting, Skylights, Ceiling fans, Sensors, Shade awnings, Automatic doors, Double glazing. Since the program commenced on 1 July 2008 total funding of more than A$ 128 million has already been paid to over 2,800 schools. Between 2007 and 2008 the Green Vouchers for Schools programme was active. The programme offered grants of up to A$ 50,000 to Australian primary and secondary schools to for the installation of rainwater tanks and/or solar hot water systems. State / Regional In Western Australia the "Solar Water Heater Subsidy Scheme" offers rebates to householders who install environmentally friendly gas-boosted solar water heaters with the scheme extended until 30 June 2013 (A$ 500 for natural gas-boosted solar water heaters and A$ 700 for bottled LPG-boosted solar water heaters (Government of Western Australia 2011c). In New South Wales, the Government's A$ 700 million Climate Change Fund was established in July 2007. A$ 170 million Out of that goes to the NSW Home Saver Rebates providing rebates for hot water systems, hot water circulators, rainwater tanks and dual flush toilets. The Building Sustainability Index (BASIX) ensures that new homes are designed and built to high energy and water efficiency standards (NSW Government 2011c). In Victoria the Energy Saver Incentive offers discounts on many selected energy saving products and appliances of companies registered in the Victorian Energy Efficiency Target (VEET) scheme which is not a rebate scheme, but it can save you money. It works by allowing accredited businesses to create certificates when they help you make selected energy efficiency improvements to your home. Credits are granted normally when a consumer replaces a older appliance; however in some occasions it also is granted when buying a new appliance without replacing an old one (State Government of Victoria 2011c; Victorian Energy Efficiency Target 2011). Also in Victoria there are rebates for efficient water heaters: A$ 400 for a 5-star instantaneous or storage hot water heater (4+ stars for internal systems), A$ 700 for concession card holders, as above and A$ 300 installation rebate for occupants of a flat or apartment (State Government of Victoria 2011b). In Queensland the cost of installing an energy efficient hot water system is being reduced. The Queensland Government is offering rebates of up to A$ 1,000 to eligible customers to replace existing electric hot water systems with a solar hot water system or heat pump. Since 1 January 2010 owners of existing houses and townhouses (class 1 buildings) located in a reticulated natural gas area have been required to install a greenhouse efficient hot water system (i.e. gas, solar or heat pump) when their existing electric hot water system needs replacing. Householders do not need to replace existing electric hot water systems that are in good working order (Queensland Government 2011a). ▸	The requirements depend on type and size of building. No state requires changing a heater before end of his lifetime. At present, half of the existing stock is composed of electric resistance heaters. Assuming a lifetime of about 15 years; every year there have to be replaced about 7 % of the heaters with a more efficient heater. That implicates that in total; about 3.5 % of the heaters will be replaced with a more efficient one every year; however; only in Queensland and South Australia Due to the fact that South Australia and Queensland are responsible for about 18 % of the total emissions in the building sector in Australia, the benchmark is weighted accordingly. The two states would achieve a rating of four. The other states would achieve a rating of 2. This is due to the fact, that they have less exchange rates than Queensland and SA due to lack of obligation to replace old heaters with more efficient ones, and also due to the fact, that they have larger exchange rates than 0 because of the financial incentives they are granting. The calculated weighted benchmark therefore is (18 % * 4 + 82 % * 2 = 2.36). Outlook: Implement stage one of the Phase-out of GHG-intensive water heaters, in other states and extend obligations to other types of buildings, as foreseen in stage two of the phase-out.	

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
▸ **Cooking and hot water supply** In South Australia, installing a water heater in a new home or as part of an alteration or addition to a home has to follow certain rules that depend on the type of water heater being replaced, the type and size of building. A new solar water heater or a new electric heat pump water heater may be eligible for a A$ 500 solar hot water rebate from the South Australian Government (South Australian Government 2011b). **Clean Energy Future** The package does not include measures in this area.		
Level of energy and/or CO_2 taxes See above	See above	0 1 **2** 3 4 **0** 1 2 3 4
Framework for sustainable biomass import No regulation found	**Policies before Clean Energy Future** No regulation found.	**0** 1 2 3 4 **0** 1 2 3 4
Barriers		
Solutions to the landlord tenant problem **State / Regional** There are some State and city-level regulations to combat the landlord-tenant problem. Environmental upgrade agreements are being used as a way of financing retrofits of existing multi-residential buildings. These schemes have already been introduced in NSW and in Victoria in the City of Melbourne (as part of the 1,200 Buildings Program). They allow for the cost of retrofits to be recouped through increases in Council rates, which avoid the split incentive that exists in rental properties (Riedy 2011; Skarbeck 2011). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** The average ownership rate in Australia is about 70 % (Australian Housing and Urban Research Institute (AHURi) 2010); however within the country it varies significantly. In urban centres, such as Inner Sydney (45 % ownership) and Inner Melbourne (43 %) the ownership is much smaller (Australian Bureau of Statistics 2003). The landlord-tenant dilemma is therefore a barrier and until today is only addressed in the minority of the cases (one state and City of Melbourne). The impacts of the existing schemes have not been evaluated and can only be assumed.	-4 **-3** -2 -1 0 -4 **-3** -2 -1 0
	Total corresponds to	**1.2** **E**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Low carbon

Table 32
Policies and measures for low carbon technologies in the building sector

Policies / measures	Rationale for evaluation	Score
Switching from oil/ coal to gas **State / Regional** In Australian Capital Territory, the Wood Heater Replacement Program offers a subsidy to eligible householders for reducing air pollution by replacing an old wood heater with a new more efficient one. The 2011 Wood Heater Replacement Program runs from 1 March 2011 and closes on 31 December 2011 (Australian Capital Territory Government 2011).	This benchmark is considered to be irrelevant since in Australia just gas and electricity are used for heating and cooking.	**No score as it is not relevant for Australia.**
	Total	**No score.**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

I.5 Transport

Changing activity

Table 33
Policies and measures on changing activity in the transport sector

Policies / measures	Rationale for evaluation	Score
Avoid traffic and to move to non-motorised transport **National** The 'Greenhouse Gas Abatement Programme' (GGAP) was planned to run between 2008 and 2012 and included a programme where 186,000 households were to participate in voluntary programmes to change travel behaviour, both to shift to other transport modes as well as avoiding motorised transport, at a cost of AUD21.4 million (T-Mapper project Team 2010). The programme did have a budget allocated in 2008 and 2009, but not any more in 2010 (Department of Environment 2009) since it was terminated after the strategic review of Australia's climate change programmes (The Parliament Of The Commonwealth Of Australia 2006) . The 'Living Greener' information campaign includes information on smart travel on its website (Australian Bureau of Statistics 2011f). The 2005 national cycling strategy provided a good basis for tackling the most important elements to promote cycling in Australia, including integrated planning, infrastructure and promotional activities. Implementation is overseen by the Australian Bicycle Council. As part of the strategy implementation, an information website "http://www.cyclingresourcecentre.org.au/" was built to promote cycling (Austroads 2011). However, the strategy had no specific funds allocated, apart from A$ 40 million spent on cycling related infrastructure as part of the Economic Stimulus Package in 2009. Evaluation of success is mixed (Austroads 2011). **State / Regional** There are substantial initiatives on state/regional level to promote cycling and walking. WA provides grants of A$ 1.75 million per year for Perth and regional bike paths, although applications for projects for the 2011/12 period would require around twice as much funding. (Federal Chamber of Automotive Industries (FCAI) 2011) NSW has provided an average of A$ 5 million for local bike projects per year for 5 years up to 2010 (Australian Government 2011l). In 2009 QLD initiated the "Reverse the Effect" scheme, where car owners can offset their vehicle emissions. Voluntary donations are matched by the Government, which has allocated up to A$ 4.5 million, and go to the Ecofund Queensland for projects that support the Queensland Government's target of expanding protected natural areas and national parks in Queensland to 20 million hectares by 2020. The programme also includes a website with information on how to reduce emissions from transport (Australian Transport Council 2011). All states/territories implemented voluntary "TravelSmart" programsmes, initiated originally in Western Australia in the 90s. The programmes work with communities, companies, schools and households to reduce dependence on car travel (Department of Transport 2011b). The programmes were partly co-funded from the central Government, partly through the GGAP, which has terminated. The TravelSmart Australia website is no longer maintained, (Queensland Government 2011c) but the programs on state level continue. Activities target both avoiding of traffic, increased use of bikes and walking, but also increased use of public transport. The new NSW bike plan published in 2010 foresees investment of A$ 158 million in bike infrastructure over the next 10 years. (Australian Government 2011l) The Queensland Government has planned to invest A$ 235 million in the South East Queensland integrated regional cycle network between 2005 and 2026, within their ClimateSmart 2050 strategy (Department for Planning and Infrastructure 2006). ▸	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** On national level activities are restricted to information provision via internet. This does not provide sufficient incentive for individual change in behaviour. Regarding the promotion of cycling the national strategy is a good starting point, but without funding attached to allow implementation of measures will not trigger the envisaged results. On state/territory level there are good initiatives on the way, especially in the highly populated states in the west, southeast and east. The "TravelSmart" concept of working with communities has produced good results in the past. It is difficult to evaluate how the termination of GGAP co-funding of the TravelSmart activities will influence the positive effects of the programs. If investments in bike infrastructure in NSW and QLD are implemented as planned they could improve the attractiveness of cycling for short distances and to go to work. As they represent a large share of the population this could influence transport activity, but not significantly towards avoiding 4 % of transport. How urban planning activities in Adelaide will in fact influence transport modes and activity are at this point difficult to evaluate, but the concept is certainly worth a positive mention.	**Policies including Clean Energy Future** 0 **1** 2 3 4 **Policies before Clean Energy Future** 0 **1** 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
▸ **Avoid traffic and to move to non-motorised transport** As part of the SA climate change strategy a new 30-year plan was published for Adelaide, building on the principle of integrated urban planning to incorporate climate mitigation and adaptation issues. How far this plan can be put into practice remains to be seen, but it certainly provides a solid basis for further activities towards carbon efficient transport in the city (South Australian Government 2011a). **Clean Energy Future** The package does not include measures in this area.		
Modal shift to low carbon transport modes **National** Investment in public transport infrastructure is largely focused on road infrastructure. Over the past 15 years an average of 80 % of public expenditure on infrastructure construction went into roads, with an average 17 % into railways and 3 % into ports and harbours. In the 2009/10 period there was a substantial shift towards railways infrastructure investment representing 23 % of total investment (Bureau of Infrastructure 2011). The government has committed to invest around A$ 7.7 billion between 2008-09 and 2013-14 to improve and expand Australia's passenger and freight rail infrastructure, A$ 1.2 billion as part of the Economic Stimulus Package. This is part of an overall road and rail package of A$ 36.2 billion, the Nation Building Program. Rail investment represents 21 % of the total investment, no substantial increase in share to historic spending (NSW Government 2011c). Businesses using taxable fuel for rail transport (passenger and freight) purposes can claim tax credits. They can claim the full 38.143 cents per litre for vehicles running on the tracks, and 50 % for maintenance equipment used off the tracks (Department of Infrastructure and Transport 2011a). **State / Regional** Transport infrastructure is mainly under the responsibility of the states and territories. There are substantial activities under way to improve public transport infrastructure, especially in the large cities. In NSW the "Rail Clearways" program aims to simplify the Sydney CityRail network and allow more reliable and frequent services. Between 2005 and 2011 nine projects have been completed, three are currently under construction and one is planned (Department of Transport 2011a). Additionally the "Rail Growth Plan" was designed to increase capacity. Phase 1 to reduce congestion and overcrowding has been completed, phase 2 aiming to maximise capacity is ongoing (Australian Government 2008). There are various programs in SA to expand public transport infrastructure and increase frequency through additional buses/carriages and improved planning. The target is to increase the use of public transport to 10 % of weekday passenger vehicle kilometres travelled by 2018 (Department of Climate Change 2010). All states/territories implemented voluntary "TravelSmart" programs, initiated originally in Western Australia in the 90s. The programs work with communities, companies, schools and households to reduce dependence on car travel (Department of Transport 2011b). The programs were partly co-funded from the central Government, partly through the GGAP, which has terminated. The TravelSmart Australia website is no longer maintained, (Queensland Government 2011c) but the programs on state level continue. Activities target both avoiding of traffic, increased use of bikes and walking, but also increased use of public transport.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** At national level there is no evidence for a substantial push towards public transport or to promote rail and shipping for freight. Infrastructure spending, which is the foundation for modal shift is relatively stable in relation to spending on road infrastructure. On state/territory level activities to promote modal shift are more prominent and part of the efforts to reduce congestion problems in metropolitan areas as well as to reduce negative environmental effects. Since most of transport emissions come from the metropolitan areas, activities here have the potential to influence consumer choices. In particular, the TravelSmart programs have shown good results in the past. Their overall impact has been estimated at 500 kt CO_2 in 2009 (SKM-MMA 2011). However, most activities are designed to influence passenger transport, while serious efforts to shift freight away from the road are limited. The plans in WA could improve public transport infrastructure in a way to promote public transport. However, this only applies to a small part of the relevant emissions, so the overall effect will be limited.	**0** 1 2 3 4 0 1 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
▸ **Modal shift to low carbon transport modes** ACT and QLD have programs in place to improve planning of public transport to improve service quality and efficiency (The European Parliament and the Council of the European Union 2009; Australian Government 2011k). The Government of Western Australia is currently developing a "Public Transport Plan 2031", which foresees infrastructure investments of A$ 2.9 billion and fleet expansion cost of A$ 1.2 billion over the next 21 years (Department of Transport 2011c). **Clean Energy Future** The package does not include measures in this area.		
Level of energy and/or CO_2 taxes **National** Excise tariffs are 39.143 cents per litre since 2001 for all fuel products, except gasoline and kerosene used as fuel in aircrafts, which have a reduced tariff at 3.556 cents per litre (Australian Taxation Office 2011). Before 2001 excise tax was subject to the indexation to changes in the consumer price index. This was stopped in 2001, leading to continuous tax cuts in real terms (The Parliament Of The Commonwealth Of Australia 2006). The Goods and Services Tax (GST) also applies to fuels and currently is 10 % (which in the case of fuels is applied after excise tax) (NSW Transport 2011a). While in 2002 taxes (excise and GST) represented around 54 % of the national average retail price for petrol, this share has decreased to 40 % in 2010. For diesel the share has been fluctuating between 33 % and 41 % in the 2007-2010 period (Australian Institute of Petroleum 2011). **Clean Energy Future** The new Carbon Price will apply to domestic aviation, domestic shipping and rail transport. Other transport fuels will not be part of the carbon pricing mechanism. Instead fuel tax credits / excise tax will be adjusted to reflect the carbon price. Transport fuels for cars and light vehicles are planned to be permanently exempt from the planned carbon price. While the Government also intends to expand the coverage of the carbon price to include heavy on-road vehicles from 1 July 2014, this measure was not agreed by the Multi-Party Climate Change Committee (Australian Bureau of Statistics 2011e). Implementation is therefore not ensured, especially since it is a heavily debated subject. The potential of including heavy vehicles in the scheme are estimated to be substantial and could reduce emissions from transport by approximately 30 % by 2050 (Reedman and Graham 2011). Effects after the fixed price period will strongly depend on expected carbon prices [see Box 1].	**Policies before Clean Energy Future** The current, fixed tax rate leads to a decreasing share of taxes in total retail price over time. Assuming a constant overall price level and a 2 % inflation rate, taxes would be around 33 % of the total retail price in 2020. With likely to be expected increased oil prices this share would decrease further. **Policies including Clean Energy Future** The tax adjustment reflecting the carbon price of A$ 23 per tonne translates into roughly 6 cent per litre, which would increase the tax level by approximately 5 %. For aviation fuels the effect is 5.6 to 6.6 cents per litre for the fixed price period (CAPA 2011). This is not sufficient to trigger behavioural change towards lower carbon transport modes. Effects after the fixed price phase will be determined by the stringency of the cap and the resulting carbon price. For the projected range of carbon prices between A$ 27 and A$ 60 the effect on aviation fuels would be between 6.6 and 17.2 cents per litre, for other transport fuels between 7 and 15.6 cents per litre. Assuming a carbon price in the middle range of the projections, aggregate tax effects are around 40 %. The inclusion of heavy transport is not included in the evaluation as it currently is very uncertain.	0 **1** 2 3 4 0 **1** 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Barriers		
Incentives which promote higher fuel use **National** Gasoline and kerosene used as fuel in aircrafts, which have a reduced tariff at 3.556 cents per litre (Australian Taxation Office 2011). The Fuel Tax Act 2006 provides the basis for fuel tax credits to businesses and replaces the older Fuel Sales Grants Scheme. Businesses can claim credits for fuel used to run their business, but this does not include the use in light vehicles on public roads, i.e. it mainly covers freight transport (Australian Government 2006; Riedy 2007). Employees using a vehicle provided by their employers are subject to a fringe benefit tax. Regulation how to calculate the taxable amount has just been adjusted in June 2011. The method to use a sliding scale for statutory rates, decreasing with distance travelled, provided an incentive to drive more. Starting from 2011 the statutory rates will move to a single flat rate of 20%, independent of distance travelled. There is a transitional period with full implementation by April 2014 (Australian Government 2011h). Excise tax exemption for condensate from petroleum industry was abolished in May 2008. Although it was abolished, condensate remains subject to a lower rate than that applied to fields discovered before 1975. The latest OECD inventory on fossil fuel subsidies classifies this measure as to be continued and leading to significant tax expenditures of A$ 580 million in 2010 (Oecd 2011). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** Some adverse incentives have been reduced or are in the process of being reduced. However, there are still incentive schemes in place that provide a strong incentive in favour of higher fuel use and fuel intensive transport modes, especially regarding freight and air transport.	-4 -3 **-2** -1 0 -4 -3 **-2** -1 0
	Total	**0.6**
	corresponds to	**F**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Energy efficiency

Table 34
Policies and measures on energy efficiency in the transport sector

Policies / measures	Rationale for evaluation	Score
Incentives to reduce light vehicle emissions per kilometre National There was a voluntary industry initiative through the Federal Chamber of Automotive Industries (FCAI) to reduce national average carbon emissions from 252 g CO_2 per km in 2002 to 222 g CO_2 per km in 2010. The target to improve by 12 % in 8 years was overachieved according to industry numbers reporting 212.6 g CO_2 per km in 2010. However, there has been no follow up on this initiative to date (Department of the Environment 2010). There are different measures to increase information provision to consumers, including the web based platform "Green Vehicle Guide", that provides information on fuel consumption, GHG emissions and other air pollutants for different vehicles since 2004. Rating occurs to a defined standard (NSW Transport 2011b). These standards are currently in the process of updating to reflect continuous efficiency improvement (GreenVehicleGuide 2011). Another measure to increase transparency to consumers is the "Fuel Consumption Labelling" regulation (ADR 81/02) for light vehicles. Since 2004 the Australian Government requires all new vehicles to be labelled on the front screen, stating fuel use and CO_2 emissions. In 2009 the rule was amended to include advanced labelling requirements, specifying not only combined fuel use, but also distinguish between urban and extra-urban fuel use (Australian Taxation Office 2010a). The government has also set an internal target for the government fleet procurement in line with the Green Vehicle Guide. Vehicles are supposed to achieve a rating of at least 10.5 (out of 20) in the overall rating. According to government reporting 75 % of leased vehicles achieved this in 2009/10, an 11 % increase from the previous period (Australian Taxation Office 2010b). There are currently standards for fuel quality and for vehicle emissions (ADR 79/02) in place. However, vehicle emission standards are not explicit on greenhouse gas emissions, but regulate CO, NOX, Hydrocarbons and particulates. The norms have followed EU regulation with some delay and Euro 5 norm is scheduled to come into force in November 2013, Euro 6 in November 2016 (GreenVehicleGuide 2010; ComLaw 2008). The "New car plan for a greener future" which was adopted in 2008 was designed to enhance innovation and investment in the Australian automotive sector towards vehicles and components with lower fuel use and greenhouse gas emissions. The plan included a range of measures, the most important are (Department of Innovation 2008): ▸ the Automotive Transformation Scheme (ATS) from 2011 to 2020 with A$ 3.4 billion to support "investment in research and development to increase competitiveness and productivity". Eligible participants can claim 15 % of investment in plants and equipment. ▸ the Green Car Innovation Fund (GCIF) planned from 2009 for 10 years was designed to supply up to A$ 1.3 billion for research, development and commercialisation of technologies that significantly reduce fuel consumption, GHGs or vehicle weight. The fund provided 25 % of overall funding, but was abolished on 27 January 2011 (Australian Government 2011e). ▸	**Policies including Clean Energy Future** Mandatory standards, which are planned as part of the Clean Energy Future package, are a significant step in the right direction and once implemented are a good instrument to increase ambition. However, the envisioned level of standards is still far behind comparable standards in other parts of the world and below the required level for a drastic reduction in transport emissions. **Policies before Clean Energy Future** Australia is starting from an extremely low level of average fleet efficiency. This implies that drastic measures are required to induce a change towards the desired goal. There is a patchwork of activities both on national and on state level. Most of the measures are based on voluntary action and include provision of information to customers, which are important but render limited effects. Government initiatives to improve the efficiency of the public fleet are also commendable, but the goals set here are also far from the state of the art technology.	0 **1** 2 3 4 **0** 1 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score

▸ **Incentives to reduce light vehicle emissions per kilometre**

Since 2000 a "Luxury Car Tax (LCT)" applies. For the 2009–10 financial year, the LCT rate was 33 %. The tax applies to vehicles with a GST-inclusive value above the LCT threshold. In 2009–10, the threshold was A$ 75,000 for fuel-efficient cars and A$ 57,180 for other cars. Primary producers can claim a refund of up to A$ 3,000 for one eligible car purchased or leased in a financial year. Tourism operators can claim a refund of up to A$ 3,000 for each eligible car purchased or leased in a financial year (Australian Taxation Office 2009).

State / Regional Vehicle registration and stamp duty are under the responsibility of states/territories. Criteria for light vehicle registration charges vary between states, however, none of these parameters relate directly to fuel consumption or CO_2 emissions with the exception of ACT. Since 2008, ACT uses a "green vehicle" stamp duty scheme where stamp duty rates on new vehicles are directly linked to environmental performance, measured via the Green Vehicle Guide (ComLaw 2005). The ACT scheme is intended to be revenue neutral, with higher polluting vehicles paying slightly higher duty rates to offset concessions provided to lower emission vehicles. A number of states offer concessions or benefits to drivers of hybrid vehicles (Queensland, Victoria and South Australia; Vehicle Fuel Efficiency Working Group 2009).

In line with the Commonwealth government, New South Wales, Queensland, Tasmania and the Australian Capital Territory, government fleet purchasing policies are directly linked to Green Vehicle Guide ratings, while generally all states/territory governments have adopted policies aimed at reducing government fleet greenhouse emissions over time (Vehicle Fuel Efficiency Working Group 2009; T-Mapper project Team 2010).

Clean Energy Future Mandatory CO_2 standards are planned for light vehicles from 2015. The Government has proposed average mandatory CO_2 emissions standards of 190 g per km by 2015 and 155 g per km by 2024, as a starting point for discussion with industry and stakeholders. (Australian Bureau of Statistics 2011e) For comparison: the EU has set average CO_2 emissions for new passenger cars at 130 g CO_2 per km from 2010 and at 95 g CO_2 per km from 2020 (The European Parliament and the Council of the European Union 2009).

The transport ministry is also discussing the voluntary inclusion of fuel use and emissions information in advertisements and promotional material with the industry as part of the National Strategy on Energy Efficiency (Department of Infrastructure and Transport 2011c).

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Incentives to reduce heavy vehicle emissions per kilometre **National** There are currently standards for fuel quality and for vehicle emissions (ADR 80/03) in place. However, vehicle emission standards are not explicit on greenhouse gas emissions, but regulate CO, NOX, Hydrocarbons and particulates. Current standards for heavy vehicles are following Euro 5 standards (Government of Western Australia 2011e). The Commonwealth Government together with Victorian and New South Wales Governments jointly developed the "Truck Buyers Guide" to provide qualitative information on issues associated with the fuel efficiency and environmental performance of heavy vehicles (ACT Government 2011a). **State / Regional** NSW Government runs the Clean Fleet and Fleet Wise programs to assist fleet managers improve the environmental performance of their fleets through provision of information and through voluntary standards followed by participants (Road and Traffic Authority of New South Wales RTA 2006; Press Office Prime Minister of Australia 2011). On 8 December 2008, the Victorian Government announced the Freight Futures Sustainability Partnership. This scheme is modelled on the United States Smart Way program, and will see government partnering with freight operators toward the achievement of improved environmental outcomes, including reduced CO_2 emissions. This will provide a framework, through which information can be provided to industry stakeholders on emission reduction technologies for heavy vehicles (Vehicle Fuel Efficiency Working Group 2009). **Clean Energy Future** The Government intends to apply an effective carbon price to fuel used by heavy on-road transport from 1 July 2014 through changes in fuel tax credits. This would significantly broaden coverage of the carbon price as heavy on-road vehicles account for over 25 % of road transport emissions. As rail, domestic shipping and domestic aviation will face an effective carbon price, extending coverage to include heavy on-road vehicles would provide consistent treatment across the freight sector (Australian Bureau of Statistics 2011e).	**Policies including Clean Energy Future** The effect of the carbon price has already been included above related to carbon taxes. There are no further measures announced that would directly influence heavy vehicle efficiency. **Policies before Clean Energy Future** There are currently no measures in place that go beyond information provision and voluntary programs. Both on national and state level activities are likely to have only marginal impact towards the required goal to increase efficiency by 25 % in 2020. While the Freight Futures Sustainability Partnership in Victoria is a good step in the right direction, it would need to be linked to strict emissions targets, be applied nationally and sufficient incentive would need to be provided for operators to participate to achieve a significant impact.	**0** 1 2 3 4 **0** 1 2 3 4
	Total	**0.6**
	corresponds to	**F**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Renewables

Table 35
Policies and measures on renewable energy sources in the transport sector

Policies / measures	Rationale for evaluation	Score
Incentives to increase renewable energy sources **National** Excise tariffs are 39.143 cents per litre since 2001 for all fuel products, except gasoline and kerosene used as fuel in aircrafts, which have a reduced tariff at 3.556 cents per litre (Australian Taxation Office 2011). Before 2001 excise tax was subject to the indexation to changes in the consumer price index. This was stopped in 2001, leading to continuous tax cuts in real terms (The Parliament Of The Commonwealth Of Australia 2011b). Import duties equivalent to the national excise tax apply to imported biodiesel and bioethanol, but contrary to national fuel these are not refundable through the grant scheme (USDA Foreign Agricultural Service 2011). The Goods and Services Tax (GST) also applies to fuels and currently is 10 % (which in the case of fuels is applied after excise tax) (NSW Transport 2011a). While in 2002 taxes (excise and GST) represented around 54 % of the national average retail price for petrol, this share has decreased to 40 % in 2010. For diesel the share has been fluctuating between 33 % and 41 % in the 2007-2010 period (Australian Institute of Petroleum 2011). **State/Regional** NSW has a biofuel legislation in place since 2007. The law required a minimum ethanol content of 2 % across all petrol sales in the state. The legislation was amended in 2009, increasing the ethanol content to min. 4 % from 1.1.2010; to 6 % from 1.1.2011 and 10 % (E10) from 1.7.2011. It additionally introduced the requirement of a minimum share of biodiesel of 2 % from 1.1.2010 and 5 % from 2012 (NSW Government 2007). **Clean Energy Future** The new Carbon Price will apply to domestic aviation, domestic shipping and rail transport. Transport fuels for cars and light vehicles are planned to be permanently exempt from the planned carbon price. The inclusion of heavy on-road vehicles from 1 July 2014 is unclear (see above). The carbon price will provide a comparable advantage for renewable fuels.	**Policies including Clean Energy Future** Due to the limited coverage and uncertainty of the inclusion of heavy transport the effects of the comparative advantage for biofuels is estimated to be very limited (see calculations above). **Policies before Clean Energy Future** According to IEA data the share of biofuels in transport in 2008 was around 0.4 % (International Energy Agency (IEA) 2008). There are currently no national measures in place to trigger the required increase of almost 1 % per year. Initiatives on state level, especially in NSW, have the potential to significantly increase the share of biofuels. Since NSW has a share of 32 % of overall fuel consumption the legislation is expected to increase the share of biofuels to approximately 4 % in 2020 (SKM-MMA 2011). If this example was followed on national level, while ensuring sustainability of biofuel production, this would lead to the required increase by 2020.	0 1 **2** 3 4 0 1 **2** 3 4
Framework for sustainable biomass There is no framework in place to ensure the sustainability of imported biomass. **Clean Energy Future** The package does not include measures in this area.		**0** 1 2 3 4 **0** 1 2 3 4
	Total corresponds to	**1.6** **E**

Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Low carbon

Table 36
Policies and measures on low carbon options in the transport sector

Policies / measures	Rationale for evaluation	Score
Support for fuel switch from oil to natural gas or other low carbon technologies **National** The LPG vehicle scheme provides grants for the conversion of vehicles to LPG and for the purchase of new LPG fitted vehicles between July 2010 and June 2014. Grants for retrofit are declining with each year and started at A$ 1.500, currently provide A$ 1.250 and will decline to A$ 1.000 next year. Grants for new vehicles are set at constant A$ 2.000 (AusIndustry 2011b). The program has been capped to 25.000 eligible claims per year as of January 2011 (Council of Australian Governments (COAG) 2010). However, LPG fuel sales have slowly decreased since the all-time high in 2005-06 and are almost back to year 2000 levels (Bureau of Infrastructure 2011). Currently the general rate of fuel tax of 38.143 cents per litre applies to petrol and diesel also applies to biodiesel, renewable diesel and ethanol, but not to liquefied petroleum gas (LPG), liquefied natural gas (LNG), compressed natural gas (CNG) or methanol. New legislation approved in July will reduce the tax exemption in a phased approach starting 1st December 2011 and will be fully implemented by 1st July 2015. The rates of excise and excise-equivalent customs duty are based on the energy content of the fuels with a 50 % discount for LPG, LNG and CNG to reflect the benefits from these fuels (The Parliament Of The Commonwealth Of Australia 2011b; The Parliament Of The Commonwealth Of Australia 2010-2011). **State / Regional** Perth participated together with other cities in a fuel cell bus trial from 2004 to 2007. While the trial was quite successful and 300 t CO_2e were cut, there has been no follow up activity. All new buses purchased for the Perth bus fleet are CNG powered (NSW Government 2011a). The Queensland government committed to mandating a blend of 5 % ethanol in all petrol produced in Queensland by 2010. This mandate supports the government's A$ 7.3 million Ethanol Industry Action Plan to develop Queensland's ethanol industry and future. **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** Australia has a long history in supporting LPG as an alternative to gasoline and diesel. Since the introduction of LPG in 1999 the sales have been relatively stable, with a peak from 2003 to 2006. Apart from the fuel tax grants for LPG, CNG and LNG there is no tool to support other low carbon technologies. The first trials of fuel cell technology for Perth buses has not led to further activities in this direction.	**0** 1 2 3 4 **0** 1 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Incentives for electric mobility **National** Currently there are no measures in place to actively promote electric mobility. A wide range of actors are discussing effects and potentials for electric mobility, thus providing the basis for the political discussion (see for example Järvinen et al. 2011) On 20 May 2011 the Australian Transport Council approved the development of a National EV Roadmap. The roadmap would then "identify the goals, timeframes, tasks and responsibilities for Australian governments and EV market participants in promoting the safe, timely and efficient uptake of EVs nationally" (Department of Infrastructure and Transport 2011b). **State / Regional** The Queensland Government is member of the "EV20 Taskforce", an international 'coalition of the willing', convened by The Climate Group. They also developed an "Electric Vehicle Roadmap", which so far provides the basis for public discussion rather than providing explicit support (Department of Environment and Resource Managment 2010). Victoria is currently running an Electric Vehicle Trial with 180 households, running over 5 years (AusIndustry 2011b). **Clean Energy Future** The package does not include measures in this area.	**Policies including Clean Energy Future** No additional policies. **Policies before Clean Energy Future** On national level there are no measures in place to promote electric mobility. On state/territory level there are some initiatives, which currently only are in a first stage, setting out a roadmap or testing on a limited scale. No activities are in place that would lead to a rapid take up of electric vehicles. It is a step in the right direction to develop a strategy on electric mobility. However, to allow a rapid implementation it is essential that measures are put in place within the next years. It needs to be ensured that the roadmap is developed rapidly and then directly translated to concrete measures.	**0** 1 2 3 4 **0** 1 2 3 4
	Total corresponds to	**0.0** **G**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

I.6 Agriculture and Land Use, Land Use Change and Forestry (LULUCF)

Changing activity

Table 37
Policies and measures on changing activity from Agriculture and LULUCF

Policies / measures	Rationale for evaluation	Score
Activities to promote sustainable consumption practices No information found on support of sustainable consumption practices.	No information found	0 1 2 3 4 0 1 2 3 4
Consistent land use strategy **National** No information of a specific land use strategy found so far. **State / Regional** The states have individual land use strategies, partly on the state level, partly for specific regions. **Clean Energy Future** Regional Natural Resource Management Planning for Climate Change is included in the Australian Governments Climate Change Plan as an element of the Carbon Farming Initiative, a land sector measure (Department of Climate Change and Energy Efficiency 2011b; Australian Government 2011k).	**Policies before Clean Energy Future** Existing strategic land use programs cover only five years, it remains unclear 1) if they cover all land uses, 2) if they have a medium to long term perspective, 3) if they present a consistent strategy. **Policies including Clean Energy Future** The envisioned resource management planning for climate change is promising.	0 1 2 3 4 0 1 2 3 4
Policy tools to secure implementation of strategy **National** The Caring for our Country investment program of A$ 2 billion (July 2008 to June 2013) supports regional natural resource management groups, local, state and territory governments, indigenous groups, industry bodies, land managers, farmers, landcare groups and communities to protect Australia's natural environment and sustainably produce food and fibre. Under the Sustainable Farm Practices Priority it includes three important activities: 1) Assist at least 30% of farmers to increase their uptake of sustainable farm and land management practices that deliver improved ecosystem services, 2) Increase the number of farmers who adopt stewardship, covenanting, property management plans or other arrangements to improve the environment both on-farm and off-farm, 3) Improve the knowledge, skills and engagement of at least 30% of land managers and farmers in managing our natural resources and the environment. The program's stated priorities - Community Skills, Knowledge and Engagement - further contribute to enhancing sustainable resource management and environmental protection **Clean Energy Future** Legal establishment of a Land Sector Carbon and Biodiversity Advisory Board to oversee land sector initiatives and advice the Government (Australian Government 2011m).	**Policies before Clean Energy Future** The investment program under consideration covers a broad range of adaption aspects and capacity building for the realization of unknown mitigation potentials. **Policies including Clean Energy Future** No additional policies.	0 1 2 3 4 0 1 2 3 4

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Policies **including** clean energy future: 0 1 2 3 4
Policies **before** clean energy future: 0 1 2 3 4

Policies / measures	Rationale for evaluation	Score
Barriers		
Land use plan/register including a detailed forest inventory and protected areas **National** Registries and planning capacities are available and provide data for Australia's National Communications to the UNFCCC and national policy development. **Clean Energy Future** No additional policies.	**Policies before Clean Energy Future** Land and protected areas are known and registered in inventories. This is no barrier in Australia. **Policies including Clean Energy Future** No additional policies.	-4 -3 -2 -1 **0** -4 -3 -2 -1 **0**
	Total corresponds to	**1.6** **E**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Non-Energy

Table 38
Policies and measures on non-energy related emissions from AFOLU

Policies / measures	Rationale for evaluation	Score
Livestock, CH_4 and N_2O emissions: Measures that lead to improved manure management **National** The Climate Change Research Program includes an A$ 8 million demonstration component to provide information to farmers. The Farming Future Initiative (June 2008-June 2012) is designed to improve productivity and help farmers manage adaptation to climate change. The 'FarmReady' Reimbursement Grants provide support to individual primary producers and Indigenous land managers to attend registered climate change training activities (A$ 34.4 over four years). The Caring for our Country investment program contains elements that have the potential to reduce CH_4 and N_2O emissions. **Clean Energy Future** Agricultural emissions are excluded from the carbon price mechanism. This means there will be no requirement for farmers to pay for emissions from livestock or fertilizer use. The Carbon Farming Initiative allows farmers and land managers to create Kyoto-compliant credits for carbon storage and pollution reduction activities. Credits can be earned by sequestration such as reforestation and emission reductions such as improving manure management. Demand will come from companies with liabilities under the Carbon Pricing Mechanism, which means credits are used as offset and do not create net emissions reductions. Credits generated via the Carbon Farming Initiative non-Kyoto Carbon Fund (A$ 250 million) will result in net reductions, as well as credits that are sold internationally. The Carbon Farming Futures research and development program (A$ 429 million over six years) is designed to help farmers benefit from research, development and on-ground demonstration of innovative ways of reducing emissions and storing carbon on their lands. The Regional Natural Resource Management Planning for Climate Change Fund (A$ 44 million over five years) intends to develop plans for each region to guide where projects should be located and which activities reduce pollution. (Department of Climate Change and Energy Efficiency 2011b; Australian Government 2011k; Australian Government 2011m)	**Policies before Clean Energy Future** There are programs in place that potentially incentivise cropland management both for CO_2 and non-CO_2 emissions. There is a strong focus on voluntary incentives, education and information provision. The effectiveness of these remains uncertain due to the voluntary character. They are also limited in duration and it is unclear if there will be continuation or follow up. We estimate that the incentives will not deliver any substantial reduction in 2030 **Policies including Clean Energy Future** There is quite a range of additional measures starting with substantial funds attached. The main part of the Carbon Farming Initiative is offsetting emissions in other sectors. Only part of the credits will deliver real additional reductions. Treasury estimates range from 1.8 Mt CO_2e to 2.3 Mt CO_2e total reduction potential for livestock in 2030 (Department of Climate Change and Energy Efficiency 2011c). This also compares to other, bottom-up estimates. This translates to 2.9% to 3.6% of BAU in 2030. We assume that a maximum of 50% of generated abatement would be net additional, i.e. 1.45% to 1.8%.	0 1 **2** 3 4 **0** 1 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Agriculture: Measures that lead to improved cropland management (non-CO_2 emissions) **National** Policies to fund research into reducing emissions from various farming practices are in place. The Farming Future initiative (June 2008-June 2012) and the 'FarmReady' Reimbursement Grants as well as the Caring for our Country investment program include measures that potentially affect non-CO_2 emissions from cropland. **Clean Energy Future** The above described carbon credit scheme also includes measures for croplands. Credits can be earned by reducing fertilizer pollution, pollution from burning of stubble and crop residue and rice cultivation, and measures that affect soil carbon content. The Australian Government Biodiversity Fund (A$ 946 over six years) will improve the resilience of Australia's unique species to the impacts of climate change, enhance the environmental outcomes of carbon farming projects, and help landholders to protect biodiversity and carbon values on their land. The Carbon Farming Futures research and development program (A$ 429 million over six years) will support measures in crop management. A$ 44 million are estimated costs (to the government) of a refundable tax offset to encourage the uptake of conservation tillage farming techniques. (Department of Climate Change and Energy Efficiency 2011b; Australian Government 2011k; Australian Government 2011m)	**Policies before Clean Energy Future** There are programs in place that potentially incentivise cropland management both for CO_2 and non-CO_2 emissions. There is a strong focus on voluntary incentives, education and information provision. The effectiveness of these remains uncertain due to the voluntary character. They are also limited in duration and it is unclear if there will be continuation or follow up. We estimate that the incentives will not deliver any substantial reduction in 2030 **Policies including Clean Energy Future** There is quite a range of additional measures starting with substantial funds attached. The main part of the Carbon Farming Initiative is offsetting emissions in other sectors. Only part of the credits will deliver real additional reductions. Treasury estimates range from 0.1 Mt CO_2e to 0.2 Mt CO_2e total reduction potential for cropland in 2030 (DCCEE_Indicative_estimates_of_abatement_from_the_Carbon_Farming_Initiative.pdf). This also compares to other, bottom-up estimates. This translates to 0.4% to 0.8% reduction below BAU and considering that not the full abatement will be net additional does not achieve the minimum threshold to score.	**0** 1 2 3 4 **0** 1 2 3 4
Agriculture: Measures that lead to improved cropland management (CO_2 emissions) The same policies as for non-CO_2 cropland management apply.	**Policies before Clean Energy Future** Rationale for non-CO_2 measures applies. **Policies including Clean Energy Future** Based on the mitigation potential estimates for cropland in total from 0.1 Mt CO_2e to 0.2 Mt CO_2e	0 **1** 2 3 4 **0** 1 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Agriculture: Measures that lead to improved grassland management (non-CO_2 emissions) All instruments described above for crop management also potentially contribute to improved grassland management.	**Policies before Clean Energy Future** There are programs in place that potentially incentivise cropland management both for CO_2 and non-CO_2 emissions. There is a strong focus on voluntary incentives, education and information provision. The effectiveness of these remains uncertain due to the voluntary character. They are also limited in duration and it is unclear if there will be continuation or follow up. We estimate that the incentives will not deliver any substantial reduction in 2030. **Policies including Clean Energy Future** There is quite a range of additional measures starting with substantial funds attached. The main part of the Carbon Farming Initiative is offsetting emissions in other sectors. Only part of the credits will deliver real additional reductions. Treasury estimates range from 0.5 Mt CO_2e to 0.7 Mt CO_2e total reduction potential for savanna fire management in 2030. Savanna fires are the largest source of emissions in grassland managment in Australia. Even assuming that a substantial share of the abatement will not be additional the expected reduction of 7% below BAU is likely to be achieved.	0 1 2 3 **4** **0** 1 2 3 4
Agriculture: Measures that lead to improved grazing management (CO_2 emissions) The same policies as for non-CO_2 cropland management apply.	**Policies before Clean Energy Future** Rationale for non-CO_2 measures applies. **Policies including Clean Energy Future** Based on the mitigation potential estimates for cropland in total from 0.5 Mt CO_2e to 0.7 Mt CO_2e	0 1 2 3 **4** **0** 1 2 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Forestry **National** Regional Forest Agreements (RFAs) are 20-year plans for the conservation and sustainable management of Australia's native forests. The National Climate Change and Commercial Forestry Action Plan 2009–2012 provides a series of actions, classifying areas of work that are fundamental in the context of addressing the impacts of climate change There is a dedicated Forest Industries Climate Change Research Fund (Department of Agriculture 2009) of A$ 5 million starting in 2009-10 and finishing on 30 June 2011 to address major knowledge gaps about the impact of climate change on forestry and forest industries in Australia. The fund was to help industry understand the implications of climate change and build capacity to adapt to predicted scenarios and develop mitigation opportunities. **State / regional** Queensland's Vegetation Management Act (1999) legislated to stop broad-scale land clearing of native vegetation from 1 January 2007. The regulation was updated in 2003, 2004 and 2009 to mitigate flaws that had led to continued clearing. There is some evidence that changes made in 2003/04 contributed significantly to observed reductions in deforestation. Over the period 2005–2009, the deforestation rate in Queensland fell by 64%, from 317,007 ha/yr to 112,608 ha/yr. The NSW Government's native vegetation legislation introduced in 2005 aims to end broad-scale clearing. The decline in deforestation rates after peaks in 2004 and 2006 are difficult to attribute directly to the legislation. Levels were still above 2003 levels in 2009. (NSW Government 2005;NSW Government 2003;Queensland Government 2007) **Clean Energy Future** The above described carbon credit scheme also includes measures for forests. Credits can be earned through native forest protection and improved forest management through the Carbon Farming Initiative (Carbon Credits Bill (2011)). A carbon price will not apply to forestry. The Australian Government Biodiversity Fund also applies to forests where land holders can actively manage and protect remnant native vegetation. The Carbon Farming Futures research and development program supports reforestation and revegetation in areas of high conservation value including wildlife corridors, rivers, streams and wetlands, management and protection of biodiverse ecosystems (including publicly owned native forests and land under conservation covenants or subject to land clearing restrictions). (Department of Climate Change and Energy Efficiency 2011b; Australian Government 2011k; Australian Government 2011m; Productivity Commission 2011; Department of Climate Change 2010)	**Policies before Clean Energy Future** Reporting and incentives to prevent deforestation are in place. Measures target mainly broad scale clearing. NSW (18%) and Queensland (35%) together cover around 54% of total forest area. For Queensland it can be assumed that 75% of forest is covered by the legislation. For NSW we assume a coverage of 60%. Overall this leads to a coverage of 37% of forested area. **Policies including Clean Energy Future** There is quite a range of additional measures starting with substantial funds attached. The main part of the Carbon Farming Initiative is offsetting emissions in other sectors. Only part of the credits will deliver real additional reductions. Treasury estimates range from 5.6 Mt CO_2e to 9.1 Mt CO_2e total reduction potential for avoided deforestation and managed regrowth in 2030. Assuming that a large share of projected abatement will come from reforestation and afforestation projects, the reduction potential for deforestation is estimated between 3% and 6.5% from BAU in 2030. We assume that a maximum of 50% of generated abatement would be net additional, i.e. 1.5% to 3.25% from BAU.	0 1 2 **3** 4 0 1 **2** 3 4

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Policies **including** clean energy future: 0 **1** 2 3 4

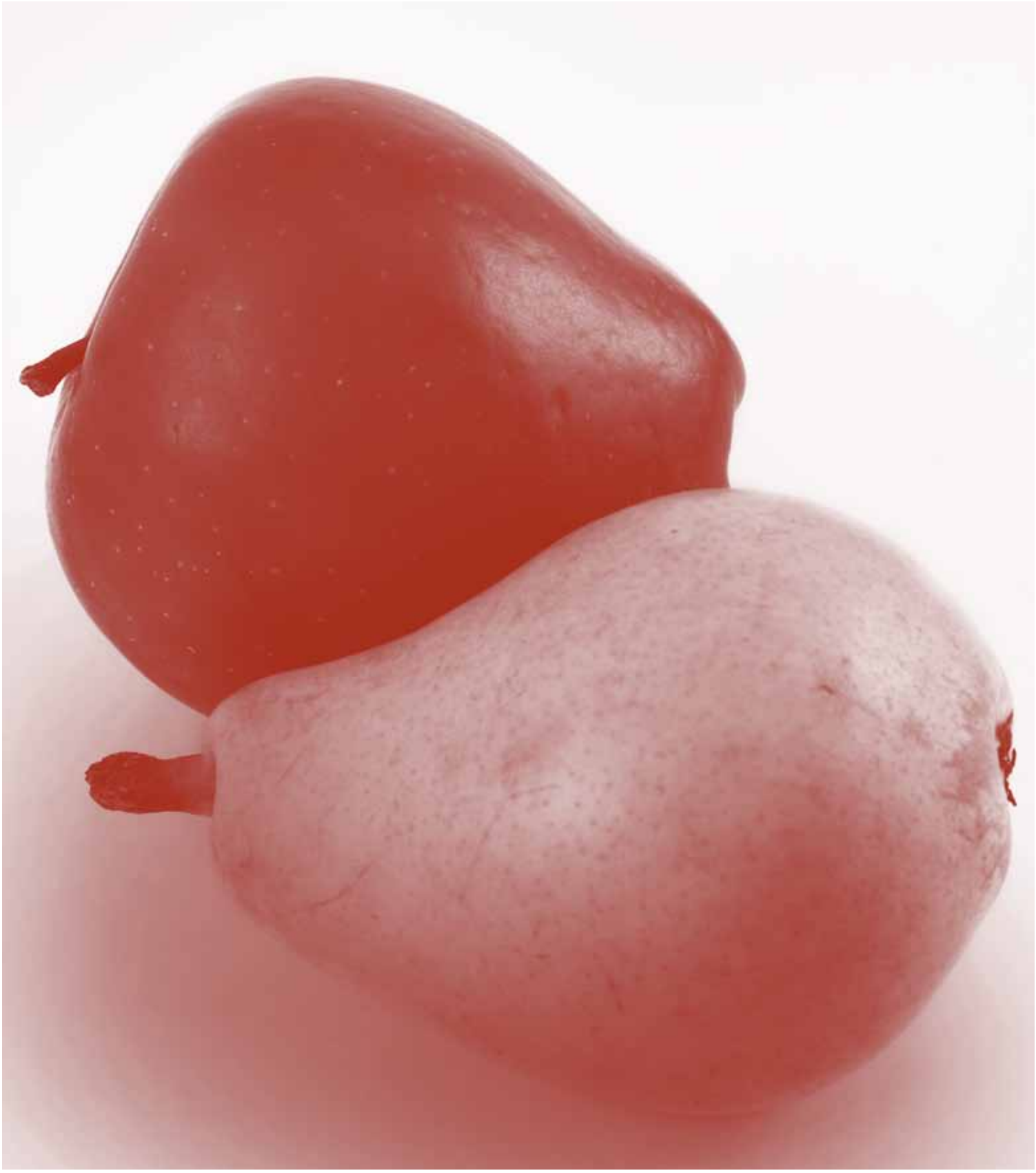
Policies **before** clean energy future: 0 **1** 2 3 4

Policies / measures	Rationale for evaluation	Score
Forestry: The conversion of non-forest land to forests is promoted through afforestation and reforestation (A/R) **National** The Australian Government offers a tax deduction to businesses that plant forests for the purpose of absorbing CO_2 from the atmosphere (Department of Climate Change and Energy Efficiency 2007). **Clean Energy Future** Carbon Farming Initiative non-Kyoto Carbon Fund (A$ 250 million) can generate demand for carbon credits within Australia. This would allow farmers and land managers to create Kyoto-compliant credits for carbon storage and pollution reduction activities. Credits can be earned by sequestration such as reforestation and emission reductions such as improving manure management. National Carbon Offset Standard (NCOS) Carbon Neutral Program allows the Australian operations of organisations or Australian products to be certified as carbon neutral through a number of activities including through reforestation activities (Department of Climate Change and Energy Efficiency 2009)	**Policies before Clean Energy Future** No substantial incentives to trigger deviation from BAU. **Policies including Clean Energy Future** There is quite a range of additional measures starting with substantial funds attached. The main part of the Carbon Farming Initiative is offsetting emissions in other sectors. Only part of the credits will deliver real additional reductions. Treasury estimates range from 5.6 Mt CO_2e to 9.1 Mt CO_2e total reduction potential for avoided deforestation and managed regrowth in 2030. The reduction potential for afforestation, reforestation is assumed to be between 3 Mt CO_2e and 5.5 Mt CO_2e in 2030.	0 **1** 2 3 4 **0** 1 2 3 4
	Total	**1.8**
	corresponds to	**D**

Policies **including** clean energy future: 0 **1** 2 3 4

Policies **before** clean energy future: 0 **1** 2 3 4

ANNEX II | COMPARISON WITH EMISSION SCENARIOS FROM DIFFERENT SOURCES



II Comparison with emission scenarios from different sources

Analysis of emission pathways is always prone to uncertainties due to the amount of assumptions that need to be made. To ensure robustness of the analysis it is therefore useful to compare the results with other similar exercises and available data.

We here compare different data sets for the business as usual case and the policy scenarios.

Figure 34 shows different BAU cases. Up to 2009 the CAT values are slightly lower than the officially reported data. This is due to different assumptions/simplifications we did in our calculations for the primary energy consumption and the conversion to emissions:

1. Different base data: We use IEA data energy data. These are slightly lower compared to Australian national statistics. The national statistics are used for the UNFCCC calculations.
2. Simplifications in emission factors: We use IPCC default emission factors and assume one emission factor for each fuel group (e.g. petroleum, including kerosene, heating oil and naphtha). We distinguish only between crude, petroleum products, coal and gas as input. We do not use country specific emission factors. This can have a noticeable impact for groups with large differences in factors within the group and high shares of specific fuel types in a country.

After 2010 our own projections are almost identical to the baseline scenario retrieved from the Australian Department for Climate Change (DCC), which also forms the basis for the international pledges of Australia. However, it is significantly below the projections used by Australia in their 5th National Communication to the UNFCCC.

Figure 34
Comparison of BAU emission scenarios excluding LULUCF until 2030

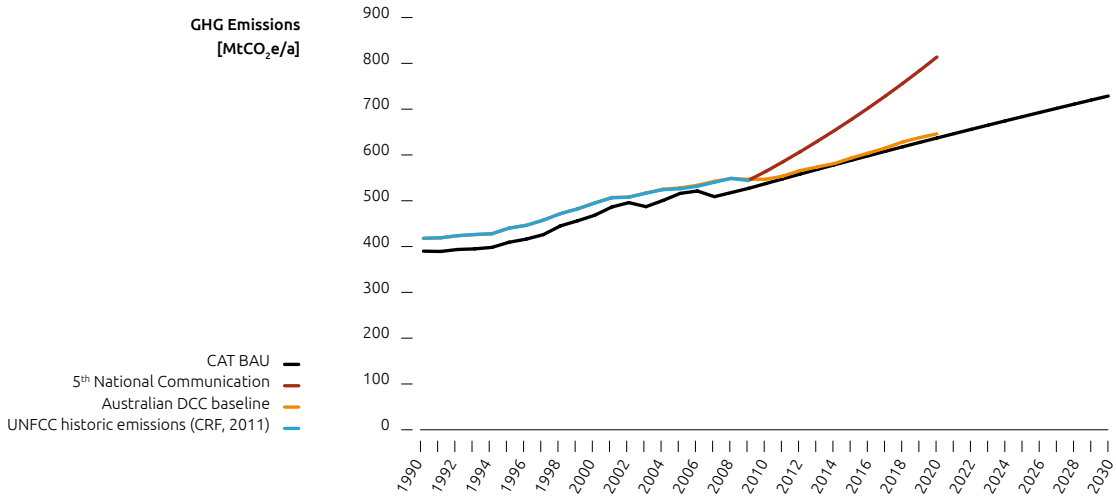
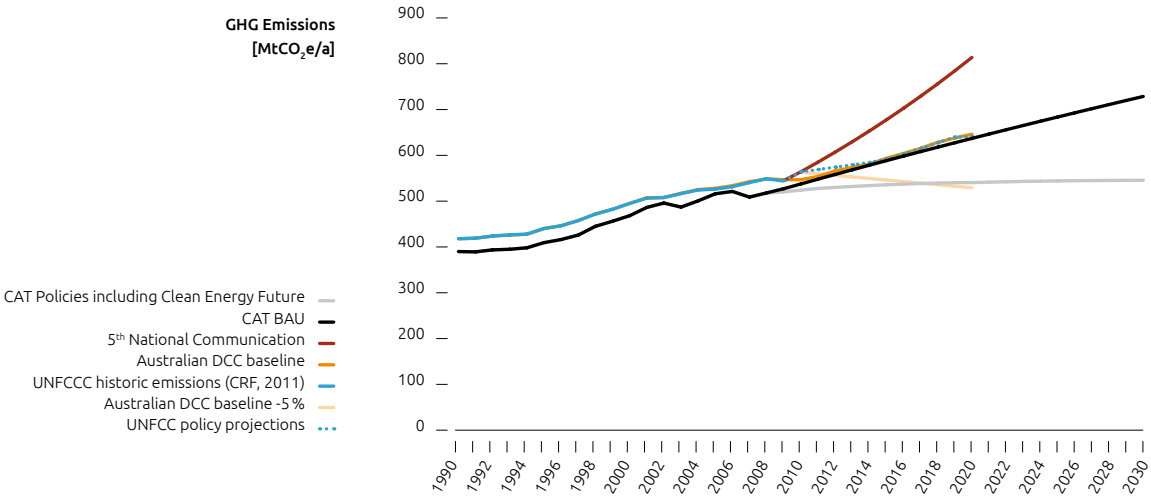


Figure 35 shows different policy scenarios compared with the results from our calculations. The policy projection scenario used in the National Communications is now the baseline for the current calculations by the Australian Department of Climate Change. The CAT Policies including Clean Energy Future scenario already comes close to delivering the desired reductions.

Figure 35
Comparison of policy scenarios



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