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

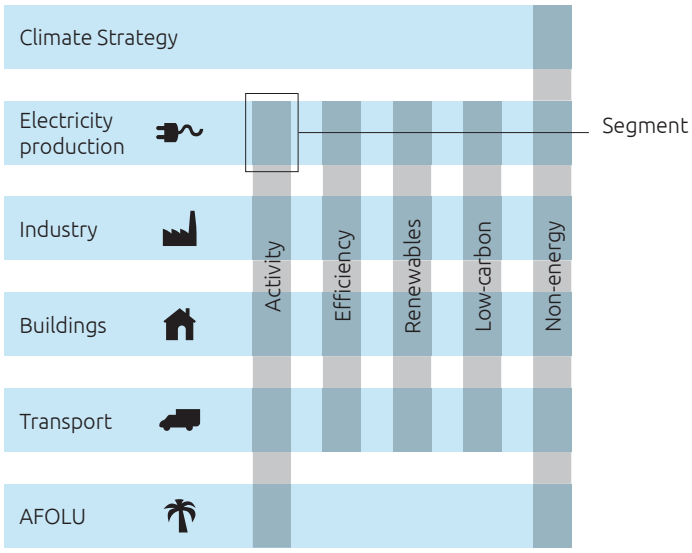
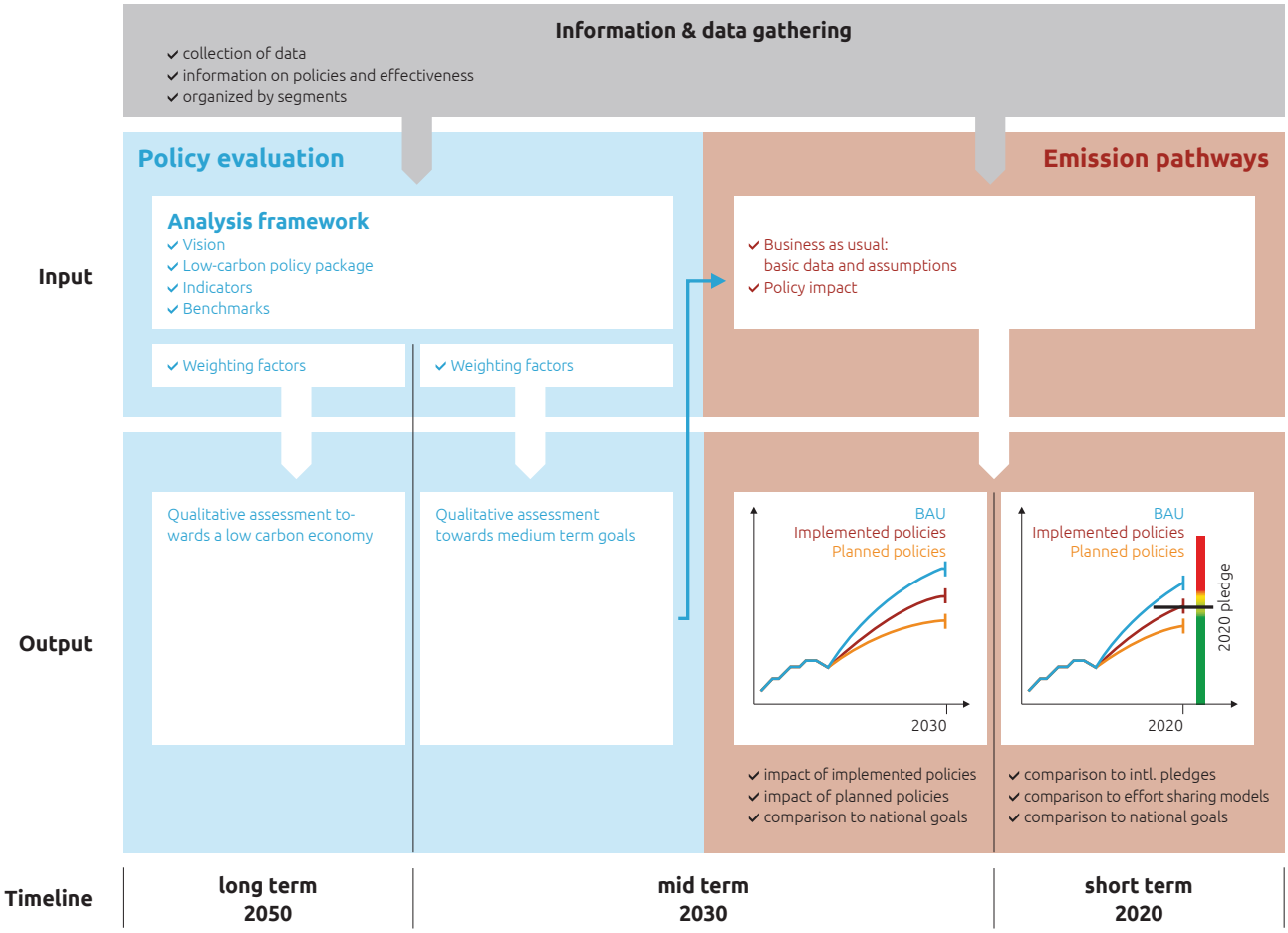


Figure 2
General approach for country analysis



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'.

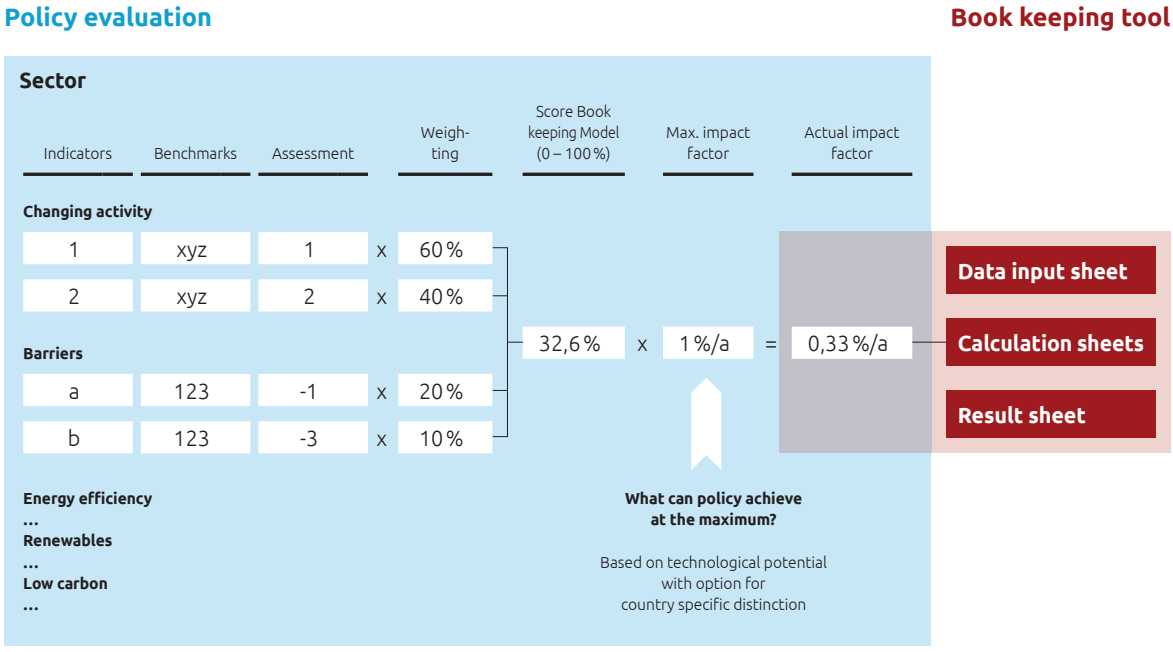
We had to aggregate the indicator scores, including both incentives and barriers. For example, all scores that drive the share of renewables in a sector have to be aggregated.

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