Independent Review of the Climate Change (State Action) Act 2008

Tasmanian Climate Change Office

Final Report of the Independent Review of the *Climate Change (State Action) Act 2008*

18 October 2016

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Executive summary

Independent review of the *Climate Change (State Action) Act 2008*

Jacobs has been commissioned to conduct the second independent review of the *Climate Change (State Action) Act 2008* (the Act). The Act provides Tasmania's legislative framework for action on climate change and includes a requirement for independent review every four years. The first review was carried out in 2012. The terms of reference for this review reflect the legislative requirements and additional matters of interest to the Minister.

Review context

The national and international climate change policy contexts have changed considerably since the first review of the Act. Key changes have been the introduction and then abolition of a national carbon tax in Australia and the landmark COP21 talks in Paris in December 2015. The latter concluded with an in-principle agreement to limit global warming to much less than 2°C above pre-industrial levels, which is set to come into force from November 2016.

Tasmania has long sought to develop its rich renewable energy resources. Based on data from Australia's National Greenhouse Gas Inventory (NGGI), Tasmania's per capita emissions were 4.5 t CO_2-e in 2015, which is just 20% of the national average. Tasmania has a relatively "low carbon" economy. The State's economic output per unit emissions is the greatest of any Australian jurisdiction with significant electricity generation capacity[1]. At almost $11,000 of gross state product per t CO_2-e, Tasmania's economic productivity from emissions is more than double other jurisdictions.

Tasmania was the second jurisdiction in Australia to set a long-term emissions reduction target: for emissions to be reduced to 60% below 1990 levels by 2050. Given the relatively low carbon intensity of its energy system, that is considered to have been a "stretch" target at the time and more ambitious (then) than those of other target-setting Australian jurisdictions.

Changes in accounting rules under the second Kyoto protocol mean that emissions from forest management are now included in Australia's and Tasmania's emissions accounts. These changes greatly increased the State's baseline (1990) emissions. However, reduced forest harvesting since that time has meant that native forests have become a large net sink for atmospheric carbon. As a result, Tasmania's emissions are now well below the legislated 2050 emissions reduction target.

Several Australian jurisdictions (ACT, South Australia, Victoria) have recently reviewed their climate change legislation and have adopted 2050 zero net emissions targets, consistent with the 2015 Paris Agreement. These targets are well in advance of the national 2030 emissions target and are significantly more ambitious than Tasmania's current legislated emissions reduction target.

Review process

This independent review is being conducted according to terms of reference based on Section 18 of the Act and to meet additional requirements for analysis by the Minister. The terms of reference require consideration of:

- The extent to which the objects of the Act are being achieved.
- The extent to which additional legislative measures are considered necessary to achieve the targets set by the Act within the periods contemplated by the Act, including by the introduction of performance standards and other mandatory requirements.
- The suitability of the 2050 emissions reduction target and advice on a new target.
- How improvements could be made to the Act to assist with achieving the Tasmanian Government's commitment on climate change adaptation and mitigation and to drive consideration of climate change in decision making across State Government.

[1] This includes all states and territories except ACT.

The review published a *Discussion Paper* in June 2016 to describe the context for the review and summarise some of its initial analysis. The *Discussion Paper* posed 14 questions and invited public submissions. These submissions and relevant submissions to the recent Draft *Climate Change Action Plan* have been considered in formulating this report to the Minister.

Key messages from consultation

A total of 107 submissions were received in response to the *Discussion Paper* and the Draft *Climate Change Action Plan.* These were prepared by local government; natural resource management organisations; industry organisations; commercial businesses; environmental advocacy groups; and a wide variety of individuals.

Key themes from submissions which are relevant to this review's terms of reference include:

- The State should set a more ambitious emissions reduction target, consistent with international commitments under the Paris Agreement and the need to avoid "dangerous climate change".
- Given the significance of forest carbon stocks to Tasmania's emissions accounts, it is essential to understand and manage the risks they face from climate change, particularly bushfires and drought, and to secure them from losses which would follow any significant expansion in native forest harvesting (if that was to occur).
- Tasmania should not rely on forest management alone to achieve its emissions reduction target, action should be undertaken to reduce fossil fuel use and drive emissions reductions across other sectors of the economy.
- The largely renewable energy base to the Tasmania economy provides the opportunity to encourage widespread uptake of electric vehicles without adversely affecting the State's emissions profile.
- Tasmania's "clean-green" brand would lack credibility if it was not matched by ambitious actions to reduce greenhouse gas emissions.
- The State's comparative advantage in renewable energy generation should be enhanced through diversification of the renewable energy mix and reduced reliance on imported, carbon-intensive energy via Basslink. Many submissions advocated for a 100% renewable energy target.
- The potential impacts of climate change on vulnerable communities and ecosystems need to be understood and managed effectively.
- State government has an important leadership role in relation to climate change. This includes: providing information to support local governments, businesses and communities who are seeking to build resilience to climate change; clarifying and supporting the respective roles of State and local government; and establishing principles and standards which enable robust and consistent decision-making.

Resetting the 2050 target

In 2014, Tasmania's reported emissions were reported by the NGGI to be 87% below those of the baseline year, 1990. This change is primarily due to reductions in emissions from the land use, land use change and forestry (LULUCF) sector, specifically: native forest management; deforestation; and grazing land management. Emissions in other key sectors – energy, agriculture, industrial processes – either grew or declined slightly. Uncertainty about future LULUCF emissions means that Tasmania's current below-target level of emissions is insecure.

Tasmania's low level of emissions means that the 2050 target in its current form does not provide a continuing driver for action on emissions abatement. Further, it is no longer leading practice among comparable jurisdictions and is not aligned to international commitments made under the Paris Agreement to avoid "dangerous" climate change. Into the future, the current legislated target could be perceived as being inconsistent with the State's clean-green branding.

Analysis undertaken as part of this review suggests that a 2050 zero net emissions target is achievable for Tasmania using current or emerging technologies. Such a target could be achieved while maintaining moderate levels of native forest harvesting through reductions in emissions from (for example): livestock; nitrogen

management in agriculture; energy use (particularly in transportation); and deforestation. Sequestration by forests would continue to offset emissions which could not be cost-effectively abated in other sectors of the economy.

This review does not favour the setting of either sectoral or interim targets. It favours an adaptive management process for emissions abatement. This process would involve monitoring and transparent reporting of emissions and the prioritisation of responses towards activities or sectors with high potential for cost-effective abatement or whose emissions have resisted change despite the availability of cost-effective technologies. Given the current low level of Tasmania's emissions, there is no compelling argument that interim targets would enhance efforts to contain or reduce emissions.

A future direction for the *Climate Change (State Action) Act 2008*

The Act is the State's framework climate change legislation and provides a narrative for how it responds to climate change. Like similar legislation in other jurisdictions, it sets a target for overall emissions for the State and advocates for action on emissions abatement and climate change adaptation. While the Act provides a narrative for action by government, business and the community in Tasmania, it has minimal capacity to drive such actions.

The review considers that the Act should be modified in several key areas to strengthen and clarify the narrative it provides for action on climate change and to drive the consideration of climate change in government decision-making. Areas for modification identified by this review include the following.

Objects of the Act

Other than the target, the objects are the key expression of the State's position on climate change. The ten objects overlap and do not provide clear guidance on how climate change should be considered in decision-making. There is scope to reword and consolidate the objects to clarify the purpose of the Act and provide a robust framework for evaluating its effectiveness.

Statutory requirement to have regard to climate change

Whilst climate change is just one of many policy areas for Government, the state's performance on this issue is linked to many other areas of decision-making. There is scope for improved linkages between climate change and key policy areas to ensure that its decision-making transparently considers the implications for emissions, achievement of the legislated target and the climate resilience of communities, infrastructure and the environment.

Principles to guide decision-making

It is suggested that a set of principles be inserted into the Act to guide prioritisation of investment and action on climate change.

Adaptive management framework for climate change

The review considers that government action on climate change should be based on an adaptive management framework. This is consistent with the uncertain nature of: the rate at which climate change will progress; the future trajectory for emissions; and the availability and effectiveness of abatement measures. Adaptive management, supported by monitoring, evaluation and transparent reporting, is considered to offer a better approach for taking forward the Act's legislated target and objects than reliance on regulation and target-setting.

Key features of such an approach include:

- Drawing on best available science;
- Being informed by monitoring and evaluation;
- Assessing and responding to key risks and opportunities;
- Integrating action to contain or reduce emissions and build climate resilience;
- Complementing relevant national and international action;

- Engagement across State and local government and with the community and organisations representing business, industry, community and environmental interests.

The review considers that that the adaptive planning process for climate change could follow parliamentary cycles so that plans and actions are “owned” by the implementing government. The adaptive management framework should be implemented through a *Climate Change Action Plan* which would be a legislative requirement under the Act.

Recommendations

Recommendation	Rationale and discussion
Long-term emissions reduction target	
1. That Tasmania set a new aspirational long-term emissions reduction target which is achievable and consistent with international ambitions to avoid dangerous climate change. Based on best available science, this target should be to achieve net zero greenhouse gas emissions by 2050.	Such a target would be consistent with Tasmania's ambitions to be a leader on climate change, and is comparable to those made by leading sub-national jurisdictions. Any lesser target would most likely be perceived as being at odds with the State's clean-green branding. Tasmania should advocate for the Commonwealth to adopt a similarly ambitious long-term target for emissions, as part of global efforts to avoid dangerous climate change. The review notes the potential distortions that could arise from differing sub-national targets, and that the Australian Government is ultimately accountable for the nation's emissions and response to climate change. The Commonwealth review of existing climate change policies in 2017 is an opportunity for Tasmania and other jurisdictions to inform this process.
Mainstreaming climate change into government decision making	
2. That the objects of the Act are consolidated around four themes, to provide clarity on the purpose for having the legislation and a robust framework for evaluating its effectiveness, namely: · Targets and reporting; · Actions to reduce greenhouse gas emissions; · Adaptation to projected climate change; · Complementarity with national and international climate change initiatives.	The objects are overlapping and individually worded such that they cover multiple themes. Certain themes are also addressed in several objects. Restructuring and simplifying the objects to focus on the key themes has potential to more clearly articulate the rationale and narrative for action on climate change.
3. That the Act is amended to require State agencies and Departments to consider the target, objects and proposed principles of the Act in relation to relevant decisions. Specifically, decisions should consider: · Risks from climate change; and · Implications for the State's emissions and potential to achieve Tasmania's legislated emissions target.	Climate change is an issue which cuts across sectors and therefore Government portfolios. Integrating climate change as a consideration into decision-making will help to ensure that the State: does not unwittingly: · Act contrary to its intent to reduce emissions; or · Expose infrastructure, environments or communities to increased risk from climate change or extreme weather. Government policies to grow Tasmania's population and reinvigorate the forest industry provide recent examples where there is potential for conflict between policy and the target and objects of the Act.
4. That the Act is amended to include a set of principles to give greater effect to the target and objects of the Act and provide a set of expectations for decision-making on climate change. These principles should give priority to: · Abatement in sectors and through initiatives where the greatest emission reductions can be cost-effectively achieved; · Opportunities that deliver social and economic benefits from Tasmania's position as a low carbon economy; · Adaptation in areas and with communities at greatest risk from the projected impacts of climate change.	The objects do not provide meaningful guidance for decision-makers on what to consider when making decisions allocating scarce resources. Action by government, businesses and individuals should occur where it is cost-effective and delivers co-benefits.

Recommendation	Rationale and discussion
Adaptive management framework for climate change	
5. That the Government continue to prepare a plan for mitigating and adapting to climate change, and that Act is amended to make the Climate Change Action Plan (CCAP) a statutory requirement. The CCAP should include a clear timeframe for preparation, implementation and evaluation that, wherever possible, follows the four-yearly parliamentary terms and legislative review cycle under the Act. In developing the CCAP, the State should take account of the: · Long-term greenhouse gas emissions target under the Act; · Revised objects of the Act, and Principles proposed for the Act; · Latest greenhouse gas accounts for the State, and best-available science on projected impacts of climate change on Tasmania; · Evidence on the effectiveness of existing initiatives to mitigate and adapt to climate change.	A statutory requirement to prepare a CCAP sends a signal of the importance of climate change to Government and improves visibility of actions to address the issue. It should provide improved confidence to business, local government and the community in developing their responses to climate change. As has been the case with the Draft CCAP, the Plan should be developed in consultation with the community and involve collaboration with key stakeholders, including local government, business and non-government organisations.

Glossary

ABS	Australian Bureau of Statistics
ACE CRC	Antarctic Climate and Ecosystems Cooperative Research Centre
CCAP	Climate Change Action Plan
CFT	Climate Futures Tasmania
COP21	21st Conference of Parties to the United Nations Framework Convention on Climate Change
DPIPWE	Department of Primary Industries, Parks, Water and Environment
FPP	Forest Practices Plans
FPA	Forest Practices Authority
GSP	Gross State Product
IPCC	Intergovernmental Panel on Climate Change
kt CO_2-e	Kilotonnes of carbon dioxide equivalent: a standard unit of greenhouse gas emissions
LGAT	Local Government Association of Tasmania
LULUCF	Land use, land use change, forestry
MER	Monitoring, evaluation and reporting
NEM	National Electricity Market
NGGI	National Greenhouse Gas Inventory
RFA	Regional Forest Agreement
TCAC	Tasmanian Climate Action Council
TCAP	Tasmanian Coastal Adaptation Pathways project
TCCO	Tasmanian Climate Change Office
TPNFEP	Tasmanian Permanent Native Forest Estate Policy
TWWHA	Tasmanian Wilderness World Heritage Area
UNFCCC	United Nations Framework Convention on Climate Change

1. Introduction

Jacobs has been commissioned to conduct the second review of the *Climate Change (State Action) Act 2008* (the Act). The Act provides Tasmania's legislative framework for action on climate change and includes a requirement for independent review every four years. The first review of the Act was carried out in 2012.

The terms of reference for this independent review are based on the legislative requirements and additional matters of interest to the Minister (below).

Terms of Reference for the 2016 Independent Review of the *Climate Change (State Actions) Act 2008.*

Under Section 18 of the Act, the review must address:

- The extent to which the objects of the Act are being achieved.
- The extent to which additional legislative measures, if any, are considered necessary to achieve the targets set by the Act within the periods contemplated by the Act, including by the introduction of performance standards and other mandatory requirements.

Section 18 of the Act also provides that the review may consider other matters of interest to the Minister. The review team has also been instructed to consider:

- The suitability of the 2050 emissions reduction target and advice on a new target given Tasmania has met its legislated target in 2012-13.
- How improvements could be made to the Act to assist with achieving the Tasmanian Government's commitment on climate change adaptation and mitigation and to drive consideration of climate change in decision making across State Government. This will include consideration of specific examples of how this might be achieved, such as:
  - A statutory requirement for the Tasmanian Government to prepare a regular climate change action plan.
  - Consideration of the appropriateness of the Objects of the Act, particularly in the context of current national and international developments in climate change policy.
  - Advice on how the Act could assist Tasmanian Government agencies to incorporate consideration of climate change into strategic decision making.

The review is being undertaken concurrently with the preparation of the State's *Climate Change Action Plan* (CCAP).

The review team prepared a *Discussion Paper* which was released by the Tasmanian Climate Change Office (TCCO) in June 2016. The *Discussion Paper* addressed the review's terms of reference, posed a set of questions (Appendix B) and invited submissions from interested organisations and members of the public. Twenty submissions were received (Appendix C). These and relevant responses to the Draft CCAP (released in December 2015) have been considered in preparing this report.

2. About the Climate Change (State Action) Act 2008

The Act has three main components: a set of 10 objects (Appendix A); a state-wide 2050 greenhouse gas emissions (hereafter expressed only as *emissions*) reduction target; and regulation-making powers.

2.1 Tasmania's emissions reduction target

The Act has a target to *reduce, by 31 December 2050, Tasmania's greenhouse gas emissions to at least 60% below 1990 levels*. After South Australia, Tasmania was the second Australian jurisdiction to introduce a legislated emissions reduction target.

The target is a statement of Tasmania's aspiration for emissions abatement and matches that set by the South Australian *Climate Change and Greenhouse Emissions Reduction Act 2007*. Given the State's predominantly renewable energy supply and accounting rules at the time, the target was considerably more ambitious than the similarly worded South Australian target.

Although it is a legislated target, the Act does not impose any sanctions if the target is not achieved.

What are the climate change challenges to which Government should respond?

The Act is intended to help the State address the challenges of climate change, although these challenges are not explicitly stated. Respondents to the review's Discussion Paper were asked to comment on the key challenges Tasmania faces from climate change. Submissions to the Draft CCAP provided similar comments.

Many submissions were concerned at the influence climate change may have on extreme weather. They referenced the challenging conditions experienced by the State during the 2015-16 summer, in particular drought and large bushfires in its Wilderness World Heritage Area. This was associated with a perceived need for improved risk assessment, monitoring, management and response processes, and incorporating considerations of climate change risks into land use planning and development process.

Submissions strongly supported continued provision of information on potential effects of climate changes on weather patterns and environmental conditions. The latter included research into whether and how the State's unique flora and fauna could adapt to these changes, and what the flow on effects of climate changes would be to resource-dependent sectors such as hydropower, agriculture and fisheries.

Some submissions were concerned with how the cost of building resilience would be distributed and recommended more targeted support to assist the most vulnerable members of the community.

Submissions also considered the challenge of retaining the State's performance on greenhouse gas abatement through carbon sequestration. Respondents were concerned with how to ensure that forest carbon was retained in the landscape as a long-term contribution towards mitigating the majority of the State's emissions and potentially earning revenue in national or international carbon markets.

2.2 Regulations

The Act provides for the making of regulations. To date, only one set of regulations has been made under the Act, the *Climate Change (Greenhouse Gas Emissions) Regulations 2012*. These establish Tasmania's emissions baseline and provide a method for measuring changes in the State's emissions, based on data from the Australian National Greenhouse Gas Inventory (NGGI).

The Act also allows for regulations to be made to facilitate or promote emission offset programs, and for general activities, including: the collection, provision and release of information, establishing notifying activities, setting of emission reduction targets for government agencies and the power to set penalties for failure to comply with the regulations.

2.3 Objects of the Act

The objects of the Act provide a narrative for how the State addresses climate change. The 10 objects follow four main themes:

- *Targets and reporting:* the objects provide for the setting of a state-wide 2050 target for emissions reductions and allow for interim targets and targets for specific sectors. The objects also provide for progress towards the State's emissions reductions targets being reported to parliament.
- *Actions to reduce greenhouse gas emissions:* the objects specifically refer to the promotion of energy efficiency and conservation and the development of low emissions and carbon sequestration technologies. They also advocated for "early" action by Tasmanian businesses and communities on climate change.

- *Adaptation to projected climate change:* the Act recognises that projected changes in climate may create risks and opportunities for Tasmania and supports adaption to the risks and encourages action (including research) to take advantage of any opportunities climate change may present.
- *Complementarity with national and international climate change initiatives:* the Act recognises the requirement for national and international action to reduce greenhouse gas emissions and the value in Tasmania actively participating in those endeavours.

Australia's national climate change targets:

Commonwealth emissions abatement targets set in the lead up to COP21 and the Paris Agreement are:

- A 26-28% reduction in greenhouse gas emissions by 2030 (with respect to a 2005 baseline).
- A 40% increase in energy productivity by 2030, through better informed decision-making tools, new efficiency measures and technologies and energy market reforms.
- A revised Renewable Energy Target (RET) of 33,000 GWh by 2020 from large and small scale schemes.

National incentives for climate change mitigation have evolved with the repeal of the *Clean Energy Act 2011* and carbon tax. Current national drivers for abatement are the Emissions Reduction Fund (ERF) as the centrepiece of the Direct Action plan and targets set by the Commonwealth in the lead-up to the Paris Conference.

2.4 What is the role for sub-national climate change legislation?

The Commonwealth is accountable in international forums for making Australia's greenhouse gas emission reduction commitments and reporting against them. While the Act (Object i) supports Tasmania in contributing to national action on climate change, with the State's emissions comprising just 0.4% of the national total (in 2014), its capacity to directly influence Australia's overall emissions performance is limited.

Governments in the Australian Capital Territory, South Australia and Victoria have also enacted specific climate change legislation. Like the Act, these jurisdictions' climate change legislation provides a framework for local action as well as alignment with relevant Commonwealth laws and activity.

Sub-national jurisdictions in Australia are responsible for many areas where action on climate change mitigation and adaptation can occur. Climate change legislation is one mechanism available to them to support such actions. It is also a means by which they can frame a narrative for action on abatement, climate resilience and transitioning to low carbon economies. That narrative may be for both internal and external audiences: in Tasmania's case it has potential to reinforce the clean-green brand the State presents nationally and internationally.

The lead up to COP21 highlighted the increased ambition and sophistication of sub-national jurisdictions' individual targets, instruments and initiatives, as well as their willingness to collaborate in areas of common interest. Two main vehicles for that collaboration have emerged, via the: Global Compact of States and Regions; and the Under2MOU. Parties to the latter commit to emissions reduction of 80-95% below 1990 levels or annual per capita emissions of 2 t CO_2e or less [2].

How can the Act project Tasmania's clean-green brand?

Submissions considered the Act was a symbolic statement of the Government's position on climate change, and could help to position Tasmania to influence future Commonwealth emissions reduction policies.

Specific suggestions of how the image Tasmania's projects could be enhanced by the Act include:

- Setting a course of more decisive action than other States and Territories;
- Establishing a goal of 100% renewable energy to attract businesses aligned with its brand;
- Promote the State as a leader in electrification of public and private transport systems, without increasing emissions.
- Highlighting the LULUCF sector as key to Tasmania's contribution to global greenhouse gas abatement would provide a platform for careful management in this sector.

One submission cautioned that while the State's natural advantages (i.e. hydropower resources, forests for carbon sequestration) could be leveraged to support further opportunities in transitioning to a lower-carbon economy, these assets and values were also themselves at risk from the projected impacts of climate change.

[2] www.under2mou.org

2.5 A role for local government?

Local government is the second domain of sub-national governance in Australia and is the level of government which is most closely connected with the community. The important opportunities local government has to influence emissions abatement and build climate resilience within local communities were emphasised in submissions by the sector to this review and the Draft CCAP. The sector also advocated for their role in climate change responses to be clarified and more explicitly supported.

The Act does not explicitly recognise local government or refer to its role in addressing the challenges Tasmania faces from climate change. However, several of the Act's objects potentially lead the State Government to engage with local government and other sectors of the community in action on emissions and climate adaptation.

3. Climate change opportunities and challenges

3.1 What are the key findings from climate change science?

Scientific evidence of the need to act on climate change and reduce greenhouse gas emissions associated with human activities has been building for decades. In their *Fifth Assessment Report* (AR5), the Intergovernmental Panel on Climate Change (IPCC[3]) asserted that there is "unequivocal" evidence of increased concentrations of greenhouse gases in the atmosphere and consequent warming of the climate system. Most observed changes in the global climate system since the mid-20th century are attributable to human influences.

The IPCC found that continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Global warming of more than 2°C above 1850-1900 levels is considered to indicate "dangerous" climate change. The IPCC projected that without concerted global action to reduce emissions, global warming of 4° above 1986-2005 levels was plausible. To keep temperatures below the threshold for dangerous climate change, global emissions would need to fall by 40-70% of their 2010 levels by 2050 and net emissions would need to fall to near zero by 2100[4].

Including 2015, global mean temperature has increased at an average rate of 0.17°C/decade[5] since 1970. The global temperature anomaly for 2015 was the highest ever recorded, at 0.9°C above the 20th century average.

3.2 What are the potential implications of climate change for Tasmania?

Tasmania's latitude, topography and location in the Southern Ocean mean that its climate is different to that of the Australian mainland. It is also likely to experience the effects of projected climate change in a somewhat different way to other Australian regions. Climate change projections for Tasmania and descriptions of potential impacts are available from CSIRO's *Climate Change in Australia* website[6] and the *Climate Futures for Tasmania* project website[7]. A summary of the key projected changes in climate and their potential implications are given in Table 3.1.

Table 3.1 Climate change projections and their potential implications for Tasmania.

Source: Climate Futures Tasmania project (http://acecrc.org.au/climate-futures-for-tasmania/): General climate impacts, Impacts on agriculture, Water and catchments, Extreme events, Extreme tides and sea level rise events reports.

Projected effects of climate change	Potential implications of climate change
Annual and seasonal rainfall: Annual rainfall is projected to remain within the historical range, but significant changes are projected in rainfall seasonality: · Autumn: lower rainfall in the west, increased rainfall in the east; · Winter: increased rainfall through most of the state; · Spring: reduced rainfall in central and eastern Tasmania; · Summer: reduced rainfall in the west and increased rainfall along the east coast.	Catchment water yields will continue to be subject to natural climatic variability and will vary between years and decades, with climate change effects varying between regions within Tasmania. Average run-off is projected to increase slightly across the state to 2100. Large reductions in run-off are projected for the Central Highlands – the location for some of the State's largest hydropower storages - with increases projected for parts of the state's east. West coast run-off is projected to increase in winter and decrease in summer, but remain largely unchanged overall. Changes in run-off may diminish irrigation water supply from storages deriving run-off from the Central Highlands and may increase irrigation supply in the Macquarie and Coal River catchments. This may lead to changes in production from irrigated agriculture, although that will depend on how farmers and water resource managers

[3] IPCC 2014. Synthesis Report Summary for Policymakers. http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf
[4] IPCC (2014) *Climate Change 2014: Synthesis Report Summary for Policymakers.* Page 20
[5] NOAA National Centers for Environmental Information, State of the Climate: Global Analysis for Annual 2015, published online January 2016, retrieved on July 31, 2016 from http://www.ncdc.noaa.gov/sotc/global/201513.
[6] www.climatechangeinaustralia.gov.au. Climate change projections and potential impacts are described in the overall Technical Report and the report for the "Southern Slopes Cluster", which includes Tasmania, Southern Victoria and the coastal south-east of NSW.
[7] http://acecrc.org.au/climate-futures-for-tasmania/ Climate change projections from Climate Change in Australia are based on modelling for the IPCC's *Fifth Assessment Report. Climate Futures for Tasmania* is based on climate modelling for the IPCC's *Fourth Assessment Report which has been downscaled for Tasmania.*

Projected effects of climate change	Potential implications of climate change
Drought: The incidence of drought will most likely be similar to that experienced historically. Time spent in drought may increase in the central highlands and north-east and decline along the east and south-west coasts.	adapt to longer-term and seasonal changes in water availability. Inflows to hydro-electric storages are projected to continue their historical decline[8]. This may reduce the amount and reliability of supply of the main source of renewable energy for Tasmania.
Extreme rainfall events: The number of very wet days is projected to increase, with higher 1 day rainfall totals and much larger sub-daily rainfall rates (particularly in eastern Tasmania).	More severe extreme rainfall events will most likely increase the incidence and impact of flooding. In the west and north-east coastal regions, the risk is likely to increase in winter and diminish in summer. Flooding from more extreme rainfall events may affect communities and infrastructure in flood-exposed areas and disrupt agricultural production.
Temperature: Average temperatures will continue to increase in all seasons, with a higher frequency of hot days and warm spells, higher temperatures on hot days and fewer frost-risk days.	Much of Tasmania's agriculture is limited by low temperatures during winter and spring. Increases in temperature are likely to extend pasture growing seasons and yield. Crop yields may increase provided spring rainfall is adequate and/or irrigation is available. Warmer temperatures may also favour Tasmania's wine-growing industry, with improved conditions for growth and ripening of grapes. Reduced frost incidence with the projected warming climate may reduce (although not eliminate) frost risk to sensitive grain and horticultural crops. Many deciduous fruit and nut trees require periods of cold temperature for successful fruit set and production. While "chill hours" will most likely decline at sites below 500 m, the change is only likely to adversely affect species with high chill requirements (e.g. blackcurrants). Projected warmer temperatures will increase the incidence of warm spells and heatwaves and reduce the incidence of cold waves. This may result in changes in the use of residential heating and cooling as well as perceptions climatic liveability by residents and visitors. Projected warmer temperatures and lower spring-summer rainfall in some areas may increase the incidence of algal blooms, particularly in lowland streams and other water bodies. This may temporarily affect recreational values and disrupt their use in water supply.
Fire weather: Increased temperatures and changes in spring-summer rainfall may increase the incidence of fire weather conditions which provide for dangerous behaviour in established bushfires.	The projected increased incidence of severe fire weather conditions may lead to greater risk to communities and environments from bushfires and increased expenditure on hazard management and fire responses. Increased fire incidence in some ecosystems and fire ingress into those which rely on the absence of fire may lead to irreversible loss of heritage values and diminish ecotourism opportunities. Fire also releases carbon stored in forests. While bushfires are treated as natural phenomena and do not register in the State's greenhouse gas accounts, large scale loss of carbon stocks during major bushfire events (particularly in tall, wet eucalypt forests) will significantly diminish the capacity of the state's LULUCF sector to offset emissions from other sectors.

[8] HydroTasmania (2009) *Electricity in Tasmania: A Hydro Tasmania Perspective*

Projected effects of climate change	Potential implications of climate change
Sea level rise: Mean sea level is projected to rise due to thermal expansion of ocean waters and in response to the melting of Greenland and Antarctic ice caps.	The effects of sea level rise are experienced most acutely during storm tide events, when coinciding storm surges and high tides erode beaches and inundate low-lying coastal land. While wind speeds are projected to strengthen with climate change, this is unlikely to exacerbate flooding during storm surges. Low-lying coastal areas are anticipated to experience flooding at much higher frequency than has historically been the case and new areas will be exposed to extreme coastal flooding events. This will greatly increase damage to beaches and property in coastal settlements and may lead to increased expenditure on coastal protection.
Marine environmental change: Tasmania's coastal and ocean waters are warming as air temperatures rise. Much of the CO_2 from human emissions is taken up by ocean waters, which increases their acidity.	Changing water temperatures and strengthening of the Australian east coast current may support the ingress of new marine species into Tasmanian waters and contribute to the displacement of endemic species. Warmer temperatures may increase disease risk in wild fisheries and aquaculture operations. Ocean acidification has potential to disrupt the life cycle of marine crustaceans and dependent food webs and fisheries.
Wind: Wind speeds are projected to strengthen in the Southern Ocean and increase wind hazard in elevated regions, northern coastal areas and Bass Strait Islands.	Increased wind hazard, coupled with new development in some areas is projected to increase wind risk to buildings in north-west and east coastal areas. The projected change in wind speed with climate change remains within the design wind speeds for roofing and cladding. Average winter wind speeds are projected to increase in western and eastern Tasmania by the end of the century under a high emissions scenario. This may lead to increased wind energy generation at this time of year. However, this may be offset by small reductions in average wind speed in summer and autumn.

3.3 May opportunities arise from climate change?

While the potential effects of projected climate change within Tasmania and elsewhere are largely negative, there are several opportunities upon which Tasmania is well placed to capitalise. The types of opportunity include:

- *Opportunities created by a warming climate:* Tasmania's projected warming climate may extend some agricultural growing seasons, reduce frost and cold weather risks and lead to increased production of food and fibre from the State's perceived "clean-green" agriculture[9]. Warmer conditions may also expand the range of high-value horticultural and viticultural crops which can be produced. They may also reduce heating demand in winter and excess mortality that typically occurs among vulnerable (typically elderly) people during cold, winter conditions.
- *Opportunities created by changing climate elsewhere:* climate change will be expressed differently in Tasmania to other areas of Australia and alter perceptions of liveability and climatic comparative advantage (e.g. for food or fibre production). This may particularly be the case by comparison with inland and northern Australian regions. Increasingly unfavourable conditions in parts of Australia may lead to Tasmania attracting new residents, tourist visitation and commercial activity.
- *Low carbon economy opportunities:* implementation of the Paris Agreement should lead to increased investment in low carbon economic activity. With its well-developed renewable energy resources and low per capita emissions, Tasmania is currently Australia's only low carbon economy. As other states seek to transition their economy over coming decades, Tasmania may be able to able to attract businesses wishing to advance their low carbon economy credentials and new residents who wish to reduce their carbon footprint.

[9] This opportunity needs to be considered in the context of increased livestock production potentially leading to increased livestock methane emissions.

- *Timber as a substitute for emissions intensive building products:* timber sourced from sustainably-managed plantations and native forests provides an alternative to emissions-intensive building materials such as steel and concrete. Increased focus on the energy and emissions embedded in new buildings and renovations may create opportunities to increase Tasmania's forest estate, build forest carbon stocks and strengthen its forest products industry.
- *Valuing forest carbon:* the Paris Agreement anticipates a role for carbon sequestration in lowering atmospheric greenhouse gas concentrations as emissions peak and decline. Carbon pricing (for greenhouse gas emitters[10]) in some form may be required in Australia to drive progress towards the national emissions reduction target. These elements potentially lead to an environment in which forest carbon stocks, of which Tasmania is well-endowed, can be monetised and generate returns to their managers and/or owners. Building on existing opportunities through the Commonwealth Government's ERF, this opportunity may help to secure LULUCF emissions abatement in some sectors and generate revenue to offset the opportunity cost of not harvesting native forest areas and actively manage the carbon stocks.

In developing these and other potential opportunities arising from climate change and the low carbon economy, the government needs to consider how they will affect the State's emissions trajectory and capacity to achieve the overall emissions reduction target. Without appropriate mitigations in place, increased livestock production, a strongly growing population and increased economic activity all have potential to increase emissions, conflict with the objects of the Act and detract from the State's low carbon, clean-green branding.

[10] The Commonwealth Emissions Reduction Fund (ERF) establishes a price for carbon in the economy, but this is paid to reduce or prevent emissions and not by those responsible for them. It is generally agreed (e.g. Garnaut Climate Change Review, 2008) that exposing (at least) large emitters of greenhouse gases to explicit pricing is an effective and economically efficient measure of driving emissions reduction in key economic and emissions sectors.

4. Review of the Act

4.1 Findings of the first independent review

The first independent review of the Act found that there was a high likelihood of the 2050 emissions reduction target being achieved under the policy settings provided by the then (Commonwealth) *Clean Energy Act 2011* and Renewable Energy Target (RET). The review also concluded that there was no need for interim or sectoral State targets.

Better integration of climate change considerations across government decision-making, particularly in planning, was identified as an opportunity to spread ownership and minimise the risk of locking in undesirable levels of greenhouse gas emissions. The review also found that the Act's objects were sufficiently broad to allow for flexibility in Government responses to climate change.

How successful has the Act been in influencing action on climate change?

Many submissions considered that the Act had not been effective in driving emission reductions. This was reflected in the contribution of LULUCF emissions changes relative to other sectors. The limited abatement in these other sectors and Tasmania's continued reliance on electricity imports were considered to be evidence of the Act's lack of influence.

The Act was also acknowledged as an important milestone and a symbol of the Government's position on climate change.

Several submissions reported actions by local government and business to: reduce emissions; improve energy efficiency; and adapt to climate change. While these were primarily influenced by other drivers (e.g. cost-savings, cost-efficiencies, risk avoidance) they were consistent with the objects of the Act.

4.2 Legislative and regulatory changes since the first independent review

Interim and sectoral targets were considered by the then government in 2013, following the first independent review. An interim policy target for a 35% reduction in emissions by 2020 (relative to 1990) was included in its climate change strategy in 2013. This target was informed by advice from the Tasmanian Climate Action Council (TCAC).

The *Climate Change (Greenhouse Gas Emissions) Regulations 2012* were made under the Act to prescribe methods for measuring Tasmania's emissions baseline and reductions in greenhouse gas emissions. These follow published IPCC guidance. Changes to national greenhouse gas inventory methods under the second Kyoto Agreement reporting period (from 2013) meant that emissions from forest management, grazing land management and cropland management were mandatorily included within the LULUCF sector. Baseline (1990) emissions and those in all subsequent years have been recalculated for all sectors as a consequence of these changes.

Following their election in 2014, the Tasmanian government disbanded the TCAC and repealed sections of the Act relating to it.

4.3 Greenhouse gas emissions reporting

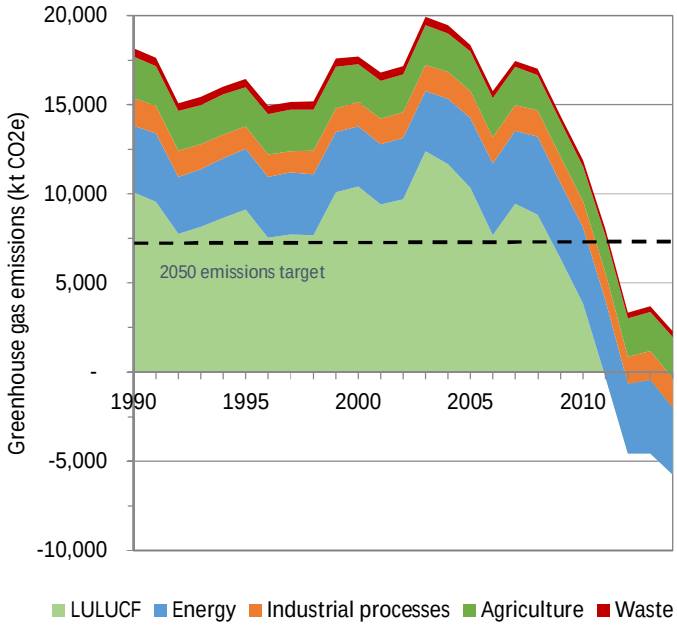
Reporting on Tasmania's greenhouse gas emissions

The Minister reports periodically on the State's greenhouse gas emissions, as required under the *Climate Change (Greenhouse Gas Emissions) Regulations 2012*. This report is based on analysis by the TCCO and uses data from Australia's National Greenhouse Gas Inventory (NGGI)[11].

[11] National Greenhouse Gas Inventory data is available from www.aegis.gov.au. The NGGI is compiled from calculations using methods developed by the Australian Government and which conform to the guidelines prepared by the IPCC and rules developed under the UN Framework Convention on Climate Change (UNFCCC). TCCO's latest report (*Tasmanian Greenhouse Gas Accounts. State Greenhouse Gas Inventory 2013-2014*) is based on the Department of the Environment's *State and Territory Greenhouse Gas Inventories* 2014. Following release of the Tasmanian report, LULUCF emissions calculations in the NGGI were revised and hence the emissions reported here differ to those published in the TCCO's report.

Tasmania's greenhouse gas accounts show that in 2014 emissions had been reduced 87% below baseline levels in 1990 and were well below the State's legislated 2050 target[12]. Under the recalculated Tasmanian emissions accounts, the LULUCF sector was the dominant source of emissions in 1990 (Figure 4.1). Reduced harvesting in public and private native forests has meant that these areas have changed from being a net source of emissions to becoming a large sink for carbon. As a result of this and other changes, the LULUCF sector offset emissions from other sectors by about 6,500 kt CO_2-e in 2014.

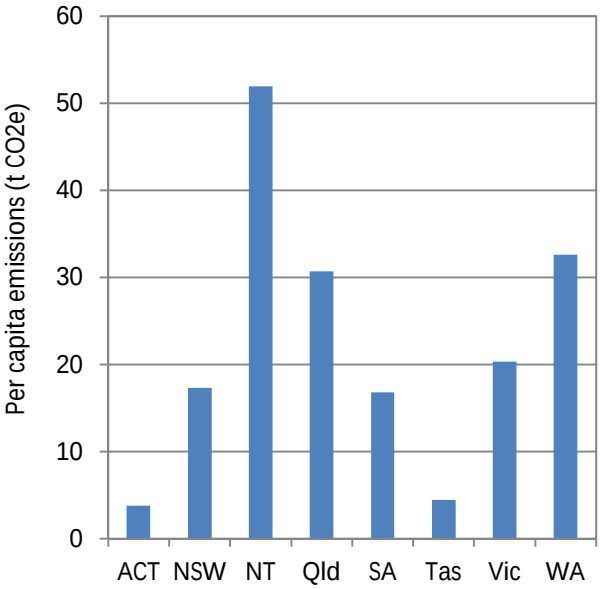
Emissions reductions result in part from implementation of the Tasmanian Regional Forest Agreement, forest policies of the previous State government and reduced demand (and price) for low grade logs from native forests. Changes in emissions in this sector have largely been incidental to the State's planned abatement measures.

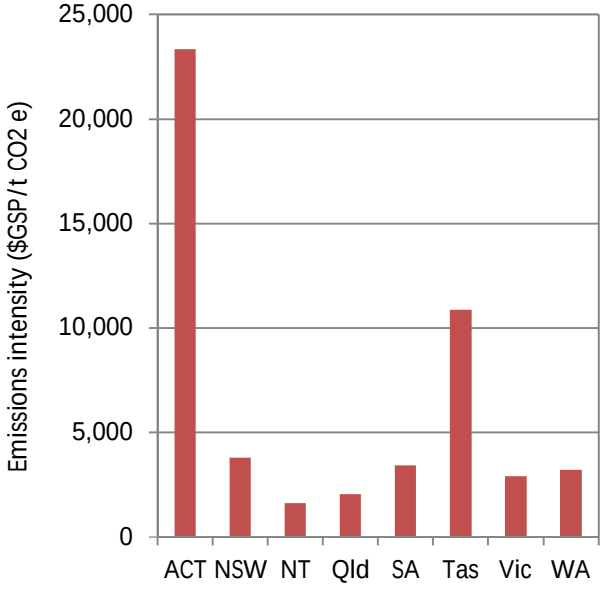


Source: Department of the Environment and Energy, National Greenhouse Gas Inventory; www.aegis.gov.au.

Figure 4.1 Tasmania's greenhouse gas emissions, 1990-2014: by emissions sector.

Relative to most other Australian jurisdictions, Tasmania has a low carbon economy. Tasmania had the second lowest per capita emissions of any Australian jurisdiction in 2014 (20% of the national average). The value of Gross State Product (GSP) per unit of emissions was 3.6 times the national average in 2014and second only to the ACT (Figure 4.2, Figure 4.3)[13].





Sources: National Greenhouse Gas Inventory (www.aegis.gov.au), Australian Bureau of Statistics (ABS).

Figure 4.2 Emissions intensity per capita for Australia: 2014.

Figure 4.3 Value of gross state product per unit of greenhouse gas emissions: 2014.

[12] Recent revisions to the Tasmania's emissions accounts have resulted in downward revisions to the 1990 emissions total and upwards revisions to the 2014 emissions total. This has meant that Tasmania's 2014 emissions are 87% lower than in 1990, rather than 92% lower as reported in this review's *Discussion Paper*. Differences are due to changes in estimated emissions in the LULUCF sector.

[13] Results for ACT are not directly comparable, as it has minimal electricity generation capacity and emissions from fuel combustion in the energy sector are recorded as part of the NSW emissions account.

The NGGI reports on emissions at their source jurisdiction. As a result, emissions associated with the generation of electricity imported into Tasmania via Basslink are not accounted for in Tasmania's accounts. Emissions associated with the import of electricity by other jurisdictions within the National Electricity Market (NEM) are treated in the same way.

Review and evaluation of Tasmania's emissions profile and trajectory

The requirement for an independent four-yearly review of the Act provides a process for assessing progress towards the legislated target and, potentially, for revising the level of ambition for emission reductions and/or the focus for abatement activities. The 2012 independent review[14] updated the 2009 analysis[15] of the state's emissions profile and trajectory. It found that under the policy settings and emissions accounts at the time, Tasmania was likely to achieve its legislated emissions reduction target. An analysis of Tasmania's greenhouse gas accounts and its capacity to sustain or build on the current low level of emissions is given in Section 5.

Until its disbanding in 2014, the TCAC reported biennially on Tasmania's emissions and abatement opportunities.

4.4 How has the Act driven or supported action on emissions abatement?

The Act provides no specific powers to drive abatement actions by government, community or industry within Tasmania. The legislated target sets the State's level of ambition for greenhouse gas abatement and the Act's objects provide the themes for how this might be achieved[16]. Collectively, these provide or are intended to provide a narrative for abatement actions across the portfolio of State government activities and complementary action by communities and industry. The objects also link Tasmania to national actions (e.g. introduction of an emissions trading scheme) which may also help locally to drive emissions abatement.

Tasmanian government agencies have developed plans to reduce their own emissions and review progress in their annual reports. Climate change considerations are written into the Government's purchasing framework, although their application is not mandatory. As applicable to an individual procurement, consideration may be given to the implications for emissions, energy use, waste generation and climate change impacts. Where relevant, decision-making is to be based on appropriate evidence and independent science-based measurement tools (e.g. energy ratings)[17].

Abatement initiatives supported by the Tasmanian Government since the last review (Table 4.1) have focussed on energy efficiency in transport and the built environment; agricultural emissions; and land use management. Most initiatives potentially provide benefits beyond emissions reductions. In some cases (e.g. Wilderness area bushfire research) emissions abatement is incidental to the primary objective of the initiative. Given the high proportion of renewable energy generation within Tasmania and the widespread use of electricity for heating, most built environment energy efficiency measures have only a modest direct impact on the state's emissions account.

Several large industrial energy users and greenhouse gas emitters made submissions in response to the Draft CCAP and/or this review's discussion paper. Their submissions indicated that these organisations are undertaking actions which follow the narrative established by the Act. They report that they continue to seek energy efficiency improvements and, for applicable operators, minimise avoidable industrial process emissions. Energy efficiency improvements are largely driven by financial considerations. Where these industrial operations directly burn fuel for energy, energy efficiency improvements may contribute materially to improvements in Tasmania's emissions accounts.

[14] SKM (2012) Review of the Climate Change (State Action) Act 2008 – Part Two. October 2012
[15] MMA (2009) Tasmanian Greenhouse Gas Emission Reduction Project - Understanding the Potential for Reducing Tasmania's Greenhouse Gas Emissions.
[16] Specifically, these are: the promotion of energy efficiency and conservation (Object e); and research and development into applicable technologies (Object f).
[17] Department of Treasury and Finance (2016) Labour Force (ABS Cat No 6202.0)

Table 4.1 Initiatives which have been supported by the Tasmanian government and have potential emissions abatement benefits, 2014-2016.

Emissions sector	Key initiatives	Summary
Agriculture	*Making Cent$ of Carbon and Emissions on-farm*, 2014 (adapted from Victoria)	TCCO supported RMCG and DPIPWE Practical guidance booklet for farm businesses on improving emissions through trees, soils, nitrogen fertilisers, livestock, energy use and supply chains. *Note: this is also applicable to the LULUCF sector (grazing land management and crop land management emissions sub-sectors).*
	Fert$mart program, 2014-16[18]	TCCO supported DairyTas in implementing this Dairy Australia program in southern Tasmania. The program aims to improve the effectiveness of fertiliser application and reduce nutrient losses and nitrous oxide emissions.
Energy: built environment	*Stay Warm Save Money Housewarming* program	A program to deliver home energy audits, low-cost energy efficiency upgrades and education on changing behaviours to reduce energy usage among low income households.
	Energy Efficiency for the Aged Care Sector	TCCO delivery of a series of energy audits in residential aged care facilities to identify current energy usage, efficiency opportunities and recommended measures to realise energy and cost savings.
	Government energy use and emissions[19].	The Tasmanian Government has purchased third party software and conducted a full agency audit of energy use and emissions from Government assets, facilities and vehicles.
	Tasmanian Energy Efficiency Loan Scheme[20]	Commitment with Aurora Energy of up to $10M to deliver no interest loans to households and businesses to install energy efficient appliances.
Energy: transport	*Smarter Fleets* pilot program	Support and provision of resources to industry fleets to understand energy use, identify practical efficiency improvement strategies and implement improvement plans for their organisation.
	Electric vehicle demonstration concept report, 2014[21]	Independent report commissioned by TCCO to investigate the feasibility of plug-in electric vehicle demonstration project in Tasmania.
LULUCF	*Tasmanian Wilderness World Heritage Area (TWWHA) Bushfire Research Project*, 2016	Funding to support a research project investigating the impact of climate change on future bushfire risk in Tasmania's wilderness areas and determining appropriate firefighting responses. While the project is concerned with climate change adaptation, bushfires in the TWWHA have potential to significantly disrupt the emissions account for the LULUCF sector.
	Soil Carbon Stories case studies, 2014	DPIPWE support to Tasmanian Institute of Agriculture (TIA) project to monitor the effect of pasture management change to soil carbon storage under dryland grazing. *Note: while this is an agricultural abatement activity, any benefits would be reported in the LULUCF grazing land management sub-sector.*

Changes in the LULUCF sector have largely been responsible for Tasmania's emissions falling well below its 2050 emissions reduction target. Annual emissions from three LULUCF sub-sectors (forest management, grazing land management and deforestation) have collectively declined by almost 15,000 kt CO_2e between 1990 and 2014 (Table 4.2). This has partly been in response to government forest policy initiatives, although these measures were not specifically directed towards reducing emissions.

[18] DairyTas (2016) Fert$mart Snapshot at March 2016
[19] Department of Premier and Cabinet (2015b) DPAC Annual Report 2014-15
[20] Department of Premier and Cabinet (2016a) Reducing emissions
[21] Joule Logic (2014) *Tasmanian electric vehicle demonstration concept investigation report*. Prepared by Joule Logic for Tasmanian Climate Change Office.

Table 4.2 Changes in greenhouse gas emissions 1990-2014 by sector and the sub-sectors with the greatest reported changes.

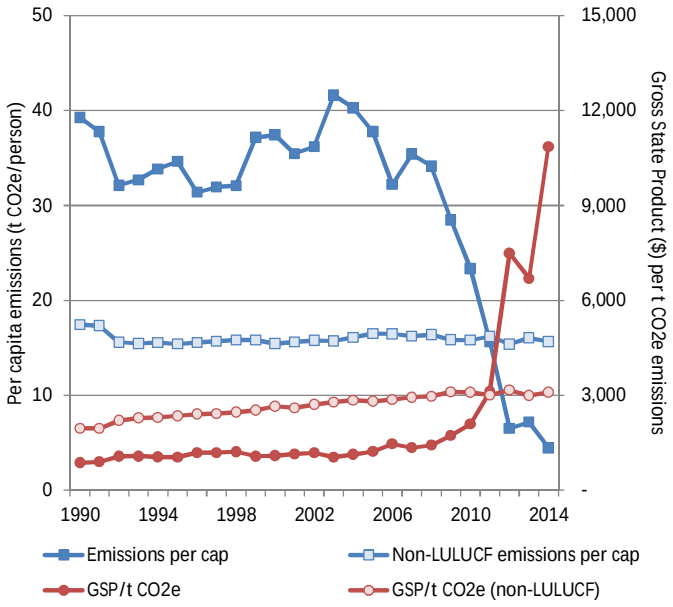
Source: National Greenhouse Gas Inventory (www.aegis.gov.au).

Emissions sector or subsector	Change in emissions 1990-2014 kt CO_2e (as % 1990 value)	Emissions sector or subsector	Change in emissions 1990-2014 kt CO_2e (as % 1990 value)
Energy	57 (+1.5%)	LULUCF	-15,865 (-157%)
· Energy industries	-149 (-26%)	· Deforestation	-1,388 (-47%)
· Transport	+125 (+8%)	· Forest management	-11,358 (-222%)
Industrial processes	127 (+8.2%)	· Grazing land management	-2,015 (-117%)
Agriculture	-48 (-2.1%)		
Waste	-126 (-27%)		

Small reductions in emissions from waste and agriculture sectors were recorded between 1990 and 2014. Emissions from the energy and industrial process sectors increased. The former were due to increased fuel consumption in transport, manufacturing and construction. Emissions from electricity generation declined.

While it does not appear that this has specifically been driven by the Act, Tasmania has partly decoupled population and economic growth from its overall emissions. Per capita emissions declined from 39.3 t CO_2-e/person in 1990 to 4.5 t CO_2-e/ person in 2014. The value of GSP per t CO_2-e emitted has increased from $870 in 1990 to almost $10,500 in 2014 (Figure 4.4; adjusted for inflation).

Even if LULUCF emissions are excluded, the economic value generated in Tasmania from each unit of emissions has increased by approximately 60% between 1990 and 2014 (Figure 4.4; accounting for inflation). Non-LULUCF emissions have risen in line with population growth since the early 1990s and hence per capita emissions have remained relative stable over that period (Figure 4.4). This is consistent with the trend in the overall national average in non-LULUCF emissions during this period.



Sources: National Greenhouse Gas Inventory (www.aegis.gov.au), Australian Bureau of Statistics (ABS). GSP is adjusted for inflation.

Figure 4.4 Tasmania's emissions relative to population and gross state product: 1990-2014.

4.5 Adaptation to the projected impacts of climate change

While several of the Act's objects (f, g, h) support actions to build climate resilience, the Act has no specific powers to drive this. However, as with abatement, the Act provides a rationale for government interest and investment.

In 2012, the Council of Australian Governments (COAG) Standing Council on Climate Change agreed on seven priority sectors for adaptation and the roles and responsibilities for each level of government and the private sector. Each adaptation sector (water; emergency management; agriculture; coasts, vulnerable communities; and infrastructure) has relevance to Tasmania (as do other sectors, such as natural ecosystems).

Tasmania has a well-established scientific foundation for adaptation planning through technical papers prepared as part of the *Climate Futures for Tasmania* (CFT) initial project and subsequent extensions[22] (see Table 3.1). This work has recently been complemented by updated climate modelling and analysis published by CSIRO as part of their update to the national *Climate Change in Australia* website and technical report series[23].

Other adaptation initiatives which have been led by or have involved the State government are summarised in Table 4.3. Activities are classified according to the COAG priority sectors which they address. The government's role typically combines the provision of information to support adaptation and supporting some sectoral initiatives, which have mostly been in agriculture and coastal management.

Table 4.3 Current and recent Tasmanian climate change adaptation initiatives.

Adaptation initiative	Adaptation priority area	Summary
Tasmanian Wilderness World Heritage Area (TWWHA) Bushfire Research Project, 2016	Emergency management	Funding to support ACE CRC research project on the impact of climate change on future bushfire risk in Tasmania's wilderness areas and appropriate firefighting responses.
Tasmanian Coastal Adaptation Pathways project	Vulnerable communities Coasts Infrastructure	The Tasmanian Coastal Adaptation Pathways (TCAP) project, managed by TCCO, is designed to progress flexible community adaptation planning pathways and toolkits to be applied to vulnerable coastal areas. TCAP has been delivered across 12 communities since its inception in 2011.
Regional Climate Change Adaptation Project	Emergency management Infrastructure	TCCO and LGAT support to local government and community preparedness, building on research commissioned by Kingborough and Huon Valley Councils. Outputs include a corporate *Climate Change Adaptation Plan* for each council, a *Regional Climate Change Adaptation Strategy* covering themes common to all councils and *Climate Adaptation Toolkit* to assist in review of Council Adaptation Plans. A toolkit for use by councils to promote awareness of potential increase in bushfire risk from climate change was also developed.
Accounting for coastal hazards through land use planning	Coasts Infrastructure	Coastal hazard mapping based on LIDAR data for vulnerable coastal areas, sea level rise planning allowances based on analysis from CSIRO, and coastal hazard policy and guidance integrated into the Southern Interim Planning Scheme and the Tasmanian Planning Scheme (currently under development).
Enterprise Suitability Mapping, 2015	Agriculture	DPIPWE/TCCO partnership to integrate CFT climate projections with enterprise suitability modelling to spatially model where five crops – poppies, wheat, potatoes, wine grapes and barley – could be grown productively in the future.
Tasmanian Energy Taskforce, 2016	Infrastructure	Independent feasibility study of a second electricity interconnector to analyse the extent to which it would address long-term energy security and facilitate large-scale renewable energy.
Disaster Planning and Recovery – Resources for Tasmanian Businesses, 2016	Emergency management Infrastructure	TCCO worked with a broad range of stakeholders to develop tools, including a Business Continuity Plan template, factsheet and checklists to help businesses plan for and recover from disasters.

With the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC) and a major CSIRO climate science laboratory located in Hobart, Tasmania also has access to world-leading scientific expertise to support climate change adaptation.

[22] Technical papers focus on impacts on agriculture; water and catchments; extreme events; extreme tide and sea level events and severe wind hazard and risk. For instance the Sharples Report on vulnerability of the Tasmanian coastline to impacts of climate change and TCCO convened climate change workshops (2008) with experts in natural systems and climate change.

[23] Climate Change in Australia climate modelling outputs and technical reports are available at www.climatechangeinaustralia.gov.au

4.6 Consistency with national and international action on climate change

The Act's objects (i, j) seek to link Tasmania into national and international responses to climate change and include specific references to national emissions trading and reporting schemes. Reflecting the national policy framework which existed at the time, the first independent review found that national-scale influences, particularly carbon pricing leading to an emissions trading scheme, would most likely drive Tasmania's emissions towards its legislated target.

The policy settings which were considered likely to drive emissions towards the target were changed following the 2013 Commonwealth elections. Legislation supporting carbon pricing was repealed and the national emissions trading scheme concept was replaced by the ERF. Several other Australian jurisdictions also altered their climate change policies at about the same time.

During this period, Tasmania retained its 2050 emissions target and its modest direct program of action on climate change. The State Government also continued to engage in a range of national climate change forums[24]. Although this has not been a direct and intended consequence of government action, Tasmania has also reduced its emissions to well below its legislated target. No other Australian jurisdiction has achieved this.

The framework for national and international action on climate is now based on the Paris Agreement to reduce emissions so that average global warming is kept well below 2°C. This is to be achieved through emissions reductions and sequestration of carbon from the atmosphere. Australia's interim contribution is to reduce national emissions by 26-28% below 2005 levels by 2030. In 2014, Tasmania's emissions were 13% of 2005 levels. Australia has not yet set its 2050 emissions reduction target, however to be consistent with the aspirations of the Paris Agreement it will likely need to be near net zero emissions.

Several Australian jurisdictions have recently set or have proposed to set emissions targets which reflect the aspirations of the Paris Agreement and are significantly more ambitious than Tasmania's legislated target. The ACT government has legislated a target of zero net emissions and both the South Australian and Victorian governments have flagged their intention to set and legislate a similar target. The Queensland government has recently signalled its intention to transition towards a low carbon economy[25], but has not yet publicly canvassed an emissions reduction target.

South Australia and the ACT are signatories to the Compact of States and Regions and Compact of Mayors, which are symbolic commitments to global efforts to tackle climate change. The South Australian government is also a signatory to the sub-national government *Under2MOU* agreement, under which jurisdictions commit to reducing emissions to 80-95% below 1990 levels by 2050 or to achieving annual per capita emissions of less than 2 t CO_2e by 2050. Tasmania has not yet pursued direct participation in these kinds of international initiative.

Tasmania's environmental credentials are a key part of its national and international "brand", particularly for tourism and agriculture. While the State's achievements *across its emissions accounts* are consistent with this image, its legislated emissions target is no longer at the leading edge of aspiration (nationally or internationally), nor is it consistent with the implications of the best available climate change science.

4.7 Strengths and weaknesses of the Act

The Act provides a robust framework and narrative for the State's action on climate change. It establishes a specific and measurable target for emissions reductions and, through regulation, provides for progress on that target to be reported.

Until recently, Tasmania's emissions reduction target could be considered as ambitious relative to other Australian jurisdictions. This reflects both the target which was set and the limited additional opportunities Tasmania has, relative to other jurisdictions, to reduce emissions from its electricity generation sector by transitioning to renewable sources.

[24] These forums include: National Greenhouse Gas Inventory Committee and a National Climate Change Adaptation Research Facility coastal risk project steering committee.
[25] Queensland Department of Environment and Heritage Protection (2016)

Given the rapidly changing policy, knowledge and technological environment in which climate change risks and responses exist, the Act appropriately provides for independent review and adaptive management. Formal legislative mechanisms for independent advice on climate change being provided to government have been removed following repeal of sections of the Act dealing with the TCAC (and the abolition of that body). However, as amended, there is nothing to preclude the Government from seeking independent (or other) advice, should it require it.

What amendments to the Act could further drive action on climate change?

Submissions on this discussion question that suggested targets are considered in Section 5.

Several submissions emphasised that any changes to the Act should complement national climate change policy, and not impose additional regulatory burdens on businesses. Other respondents suggested that the Act should be strengthened to enforce action on emissions.

Other suggestions for modifications to the Act included:

- Embedding consideration of climate change across government;
- Improved provisions for monitoring and reporting of climate change action;
- Revision to the objects to better inform and drive action.

The independent review team consider that there are several key deficiencies with the Act:

- *The objects:* the Act's objects deal with four main themes: targets and reporting; actions to reduce greenhouse gas emissions; adaptation to projected climate change; and complementarity with national and international climate change initiatives. Individual objects are worded such that they cover multiple themes and some themes are addressed in multiple objects. Restructuring and simplifying the objects to focus on the key themes has potential to more clearly articulate the rationale and narrative for action on climate change.

  The Act has historically and most likely will continue to play a largely symbolic role with respect to climate change action. Improved communication of why and how (broadly) the State engages in action on climate change through the objects should enhance its effectiveness in fulfilling this symbolic function.

- *Influence over government planning and decision making:* the review team appreciate that in setting the narrative about the State's action on and aspirations for climate change, the Act has influence over planning and decision-making by State and local governments, industry and the community. However we consider that the level of influence is undesirably low.

  One reason for the Act's low level of influence is that it has no mechanism to require government to consider and address the implications of its actions on climate change. Thus it is possible for the State to develop policy which could produce outcomes which are inconsistent with the legislated target and/or certain of the Act's objects. Policies to grow the State's population and to reinvigorate the forest industry, for example, address important issues of strengthening the Tasmanian economy. However, they also have potential to significantly increase emissions[26].

  It is not considered to be an appropriate role for legislation to specify which "balance" government strikes with competing priorities. However it is considered that the Act should be strengthened so that there is an explicit and transparent process to consider the implications of key government actions on the state's emissions and climate resilience.

- *Defining a "medium" for positive government action:* the Tasmanian government is in the process of developing the State's Climate Change Action Plan. This plan will be the medium by which the government will articulate its concerns about climate change and its objectives and strategies for action. In a sense it will be an implementation plan for the Act, although the Act does not require such a plan.

  The lack of a legislative requirement to develop a State CCAP (or similar) is self-evidently not an impediment to its development. However not having a legislative requirement provides greater opportunity for governments to avoid scrutiny for not taking action on climate change in a manner which is consistent with the emissions target and objects of the Act. For this reason, the review team consider that the Act should provide for a regular adaptive planning process to guide government action.

[26] While consideration of this risk is not apparent in the policy documentation, TCCO has advised the independent review team that it was consulted about policy documents regarding population growth.

5. Target reset

One of this review's terms of reference is to *review the suitability of the 2050 emissions reduction target and advise on a new target given Tasmania has met its legislated target in 2012-13.* This section provides an analysis of the 2050 target and its "achievement" in 2012-13. It offers reflections on whether this target should be reset and the capacity to achieve any new and possibly more ambitious target. The appropriateness of supplementing an overall emissions target with interim, sectoral and/or renewable energy targets is also considered. Climate change targets of (broadly) comparable jurisdictions are described in Appendix D.

5.1 Rationale for legislating a state emissions reduction target

The *Climate Change (State Action) Act 2008* legislates for a target to reduce, by 2050, the state's greenhouse gas emissions by 60% below 1990 levels. This target has and continues to provide the central narrative for the Act and a rationale for government action in response to climate change. It sends a signal of the government's intent to the community, business and industry and is a measure by which the government can be held to account for progress. The recent independent review of Victoria's *Climate Change Act 2010* supported a state legislated target for similar reasons to those described above.

Tasmania's national and international branding seeks to capitalise on perceptions of its "clean-green" image, reflecting its clean air, extensive conservation reserves and predominantly renewable electricity generation mix. However, "clean-green" claims face increasing scrutiny and must be backed by effective action. Progress towards legislated and ambitious targets for greenhouse gas emissions may ultimately be critical in sustaining Tasmania's brand and supporting one of its key economic and social advantages. Most submissions to the review supported the State having an ambitious emissions target and argued that it was essential that Tasmania played its part in national and international efforts to mitigate climate change.

How important is it that the Act supports national and international targets for climate change?

Submissions were virtually unanimously in favour of close alignment with international target-setting, and the State being seen to punch above its weight in its response to climate change.

There was a strong feeling that the integrity of Tasmania's clean-green brand would be tarnished if the State did not continue to make efforts to drive its emissions down.

Re-setting the target was also perceived to be a symbolic means of communicating to business and the community that climate change is a continuing concern of Government. It was also suggested that action by Tasmania could encourage other States and Territories to take similar steps and strengthen the basis for sub-national input to the Commonwealth climate change policy review in 2017.

Under the Paris Agreement, Australia committed to its *Intended Nationally Determined Contribution* (INDC). This is to implement an economy-wide target to reduce greenhouse gas emissions by 26-28% below 2005 levels by 2030. There is no legislated target beyond 2030. Some submissions to the review argued that emissions targets should be set only at the national level, where there is international accountability for action on climate change. It was also argued that varying state targets could distort markets and disadvantage businesses and the economy in "early mover" jurisdictions if more aggressive targets imposed additional costs.

5.2 How secure is the achievement of Tasmania's 2050 emissions reduction target?

Tasmania's net greenhouse gas emissions in 2014 were 87% below 1990 levels and significantly below the 2050 target legislated in the Act. This reflects small reductions in agricultural and waste emissions and the transformation of the LULUCF sector from being a large source of net emissions to being a large source of net sequestration.

The reduction in LULUCF emissions primarily result from changes in emissions from forest management (Table 4.2). They are driven by large reductions in the area of native forests being harvested from the late 2000s. Future emissions in the LULUCF sector are uncertain due to the potential for changes in (for example): forest policy; forest product market conditions; and wood utilisation technology. Harvesting in native forests and plantations appears to have increased in recent years (Figure 5.1b) and activity in the native forest and plantations sector could increase in response to Tasmanian Government policy to grow the industry and

emerging opportunities for the commercial use of lower grade timbers in engineered wood products and forest residues in renewable energy generation[27].

Forest governance in Tasmania

Tasmania's forests are managed under the Forest Practices Act, the Regional Forest Agreement, and the Permanent Native Forest Estate Policy (PNFEP). Key aspects relevant to emissions:

- Broad scale clearing and conversion of native forest on public land has been banned since 2010.
- Forestry Tasmania is responsible for Permanent Timber Production Zone land, and has a Forest Carbon Policy in place.
- Clearance and conversion of native forest on private land is currently subject to forest community retention level restrictions and property conversion limits under the latest (June 2016) PNFEP.

The extent to which native forest harvesting may change is not specified in policy and will inevitably depend on whether there is a sustained improvement in demand and price for residual (i.e. non-sawlog) wood from these forests. If the economics of the industry improves and harvesting returns to the level recorded in the early 2000s, forest management emissions could increase significantly. It is likely that forest management can remain a net source of emissions abatement at somewhat greater native forest harvesting rates than have recently been recorded.

5.3 What is the potential role of the LULUCF sector in achieving Tasmania's 2050 emissions reduction target?

Article 4 of the Paris Agreement refers to achieving *a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century.* The text clearly anticipates a role for the LULUCF sector in driving down the atmospheric concentration of carbon dioxide - in conjunction with aggressive action to mitigate greenhouse gas emissions from other sources.

Emissions from the LULUCF sector aggregate those from five main sub-sectors: afforestation and reforestation; deforestation; forest management; cropland management; and grazing land management (Figure 5.1a). In 1990, each sub-sector was a net source of greenhouse gas emissions, the largest of which was forest management[28]. By 2014, only deforestation remained a net source of emissions.

Emissions trajectories in the forestry sector are partly explained by forest harvesting and clearing statistics (from the Forest Practices Authority [FPA]; Figure 5.1b). Reductions in emissions from forest management largely follow the decline in area of native forest harvested since the mid-2000s[29]. Forest management transitioned from being a net source of emissions to a net sink for carbon once the estimated harvest area declined below 20,000-25,000 ha/y and native forest harvesting declined below 15,000-20,000 ha/y.

Expansion of forestry plantations to the mid-2000s contributed to reforestation (with afforestation) becoming a net sink for carbon. However since the collapse of Gunns and other managed investment scheme operators, there has been almost no plantation expansion[30]. Unless a new investment vehicle is developed to support forestry plantations, the level of net sequestration is likely to peak as the plantations mature and then decline as they enter second and subsequent rotations.

Emissions from deforestation declined slowly through most of the 2000s. This was not clearly matched by the area of forest practice plans for clearing without regeneration, suggesting that not all plans were activated and/or that some unplanned clearing took place.

The area of deforestation increased to historically high levels in 2014 and 2015, largely as the result of harvesting and non-replanting of plantations. This most likely reflects period of adjustment in the plantation

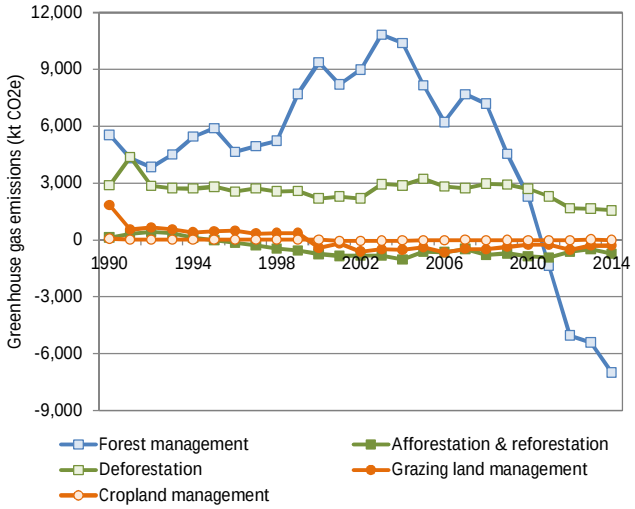
[27] Department of State Growth (2014) Forestry and related products. Sector summary 2014.

[28] Forest management emissions are from harvesting of native forests and plantations established prior to 1990. Under Australian methodologies for emissions accounting in the LULUCF sector, harvested wood products are considered to be a pool of sequestered carbon over their expected service life. However, this only accounts for wood products in service within Australia. Carbon in exported wood products is treated as an emission in the jurisdiction from which they were sourced. Thus forest management emissions are sensitive to the overall level of harvest, the mix of products and the extent to which those products are exported or used domestically.

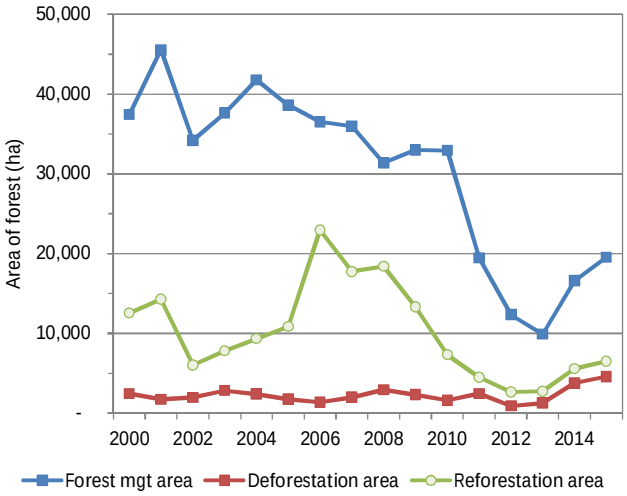
[29] Native forest harvesting is the sum of the area of partial logging and clear-felling followed by regeneration for private and public native forests.

[30] Less than 40 ha/y of new plantations have been established in the 3 years from 2012-13. The area of reforestation activity in Figure 5.1 includes new plantings and the harvest and replanting of plantations established since 1990.

industry and the concentration of management effort on the more economic parts of the plantation estate. Deforestation emissions are therefore likely to rebound temporarily and then most likely decline.



a) LULUCF emissions: 1990-2014.



b) Area of forest or plantation harvested, cleared or established, linked to emissions sector.

Sources: National Greenhouse Gas Inventory (www.aegis.gov.au), Forest Practices Authority annual reports (www.fpa.tas.gov.au).

Statistics in Figure 5.1b are based on the area of Forest Practices Plans (FPP) for various types of activity. While these values may not exactly match the area of forest or plantation harvested, cleared or established in any one year, it is assumed that over time they provide a reliable representation.

Forest mgt area: FPP for partial logging of native forests, clearfell and stand replacement in native forests and plantations on public and private land. *Deforestation area:* FPP for clearfell of native forest and plantation on public and private land followed by non-forest land use. *Reforestation area:* area of new plantations on public and private land.

Figure 5.1 Quantity and drivers of LULUCF emissions for Tasmania: 1990-2014.

Emissions from grazing land management declined by over 2,000 kt CO_2-e between 1990 and 2014. This presumably reflects increased soil carbon stocks resulting from fertiliser use and the retention, restoration and management of native vegetation. While emissions vary annually, this sector has accumulated carbon stocks at about 400 kt CO_2-e annually since 2000. Unless new, large-scale revegetation programs are initiated on grazing lands, emissions from this sector are unlikely to change substantively.

The future trajectory in LULUCF emissions is expected to be strongly influenced by forest management emissions and the area of native forest and (to a much lesser extent) pre-1990 plantations harvested and regenerated each year. Given the historical influence of forest management emissions on Tasmania's emissions accounts, the level of native forest harvesting activity will be a key determinant of whether Tasmania is able to maintain its emissions below the legislated target and whether more ambitious targets can be achieved.

In addition to being influenced by the level of harvesting activity, LULUCF emissions are also

To what extent should Tasmania rely on the LULUCF sector to achieve its target?

Most submissions recognised the importance of LULUCF operating as a carbon sink to assist in reducing the State's emissions, but expressed strongly this it should not preclude actions to reduce emissions from other sectors.

One of the prime reasons given to support this view was the uncertainties associated with impacts of changing climate and extreme weather events on carbon storage potential. Some respondents also considered there was a moral duty to alter behaviour and activities reliant on unsustainable fossil fuel use, rather than offset this via natural sinks.

Driving down emissions in other sectors was also considered to be an opportunity to further build Tasmania's capacity as a low-carbon economy, create jobs and attract investment.

Submissions which perceived LULUCF as a legitimate mechanism in Tasmania's abatement responsibilities also emphasised the importance of minimising emissions from other sectors and close monitoring and reporting of carbon stocks to inform management decisions.

subject to bushfire events. Bushfires are considered to be a natural process and the carbon stores which are lost during these events are not normally directly accounted. However in subsequent years, sequestration from affected forest areas is adjusted to account for the fire's effects.

If climate change leads to increased bushfire incidence, particularly in carbon-dense tall, wet eucalypt forests, then this could also affect the achievement of the state's emissions target.

5.4 Opportunities to reduce emissions in other sectors

Energy

Energy emissions accounted for almost 50% of Tasmania's non-LULUCF emissions in 2014 and are largely unchanged since 1990. These were derived from three main sources: energy generation; fuel combustion in manufacturing and construction; and transport (Figure 5.2).

Transport is the largest individual sub-sector (48% of total energy emissions in 2014). About half of all transport emissions are from cars. Emissions from cars have declined since 1990, but those from light and heavy commercial vehicles have increased. Continued fuel efficiency improvements in all classes have potential to reduce emissions intensity, although increasing vehicle numbers and usage may offset any gains. With Tasmania's largely renewable power supply system, widespread adoption of electric vehicles (EV) could significantly reduce emissions from cars and (subject to cost and technology) some light and heavy commercial vehicles.

Emissions from fuel combustion during manufacturing and construction have remained relatively stable. Most emissions are from the burning of coal and liquid fuels. Gas usage and emissions have increased significantly since the mid-2000s. Continued emissions intensity improvements are likely in all sub-sectors due to price pressures. Depending on the level of production, this may or may not lead to changes in overall emissions. Emissions reductions could also be achieved by fuel substitution (e.g. coal for gas or biomass). It is not clear that there are readily applicable, low capital opportunities for large emissions reductions in this sector.

The third main source of emissions is energy production. Under typical conditions, most of Tasmania's energy is derived from non-greenhouse gas emitting sources such as wind and hydro-power. If hydroelectric output is impaired, then (mostly non-renewable) energy is imported from Victoria (which is not reported in Tasmania's accounts) or generated locally. Emissions associated with the recent low hydroelectric generation capacity and Basslink outage do not yet appear in Tasmania's emissions accounts.

Improvements in energy use efficiency can help to reduce emissions associated with energy sources other than electricity (e.g. gas, wood) and electricity use and (across NEM) emissions during those periods in which the Tasmanian grid is supplied partly with non-renewable energy.

The main abatement opportunity for energy appears to be in the transport sector. Adoption of more fuel efficient vehicles and EV could significantly reduce transport emissions. However, even a reduction of 50% in transport emissions would lead only to a less than 25% reduction in energy emissions and 11% reduction in Tasmania's non-LULUCF emissions.

Agriculture

Agriculture is currently Tasmania's second largest source of emissions and contributed about 28% of non-LULUCF emissions in 2014. There are three main sources of emissions: methane emitted by cattle and sheep; and nitrous oxide emitted from agricultural soils (Figure 5.3). Methane emissions from cattle have increased since 1990 and those from sheep have declined, with emissions presumably reflecting changes in livestock numbers and the relative profitability of the dairy, beef, sheep meat and wool industries. Emissions from agricultural soils have been relatively stable since 1990.

Methane emissions from livestock and nitrous oxide emissions from agricultural soils also represent lost productive opportunities for farming systems. As abating either source of emissions has potential to increase production and profitability, they are the subject of considerable research interest. The use of feed supplements

(e.g. wheat for dairy cattle, red macro algae[31]) can reduce methane emissions by up to 60%, although some are currently prohibitively expensive. The adoption of recommended practices to improve the efficiency of nitrogen fertiliser use has potential to reduce nitrous oxide emissions by up to 80%[32].

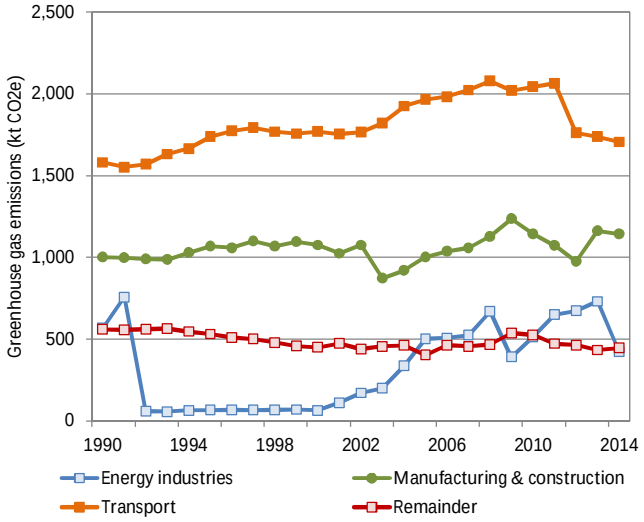


Figure 5.2 Key sources of Tasmanian energy emissions: 1990-2014.

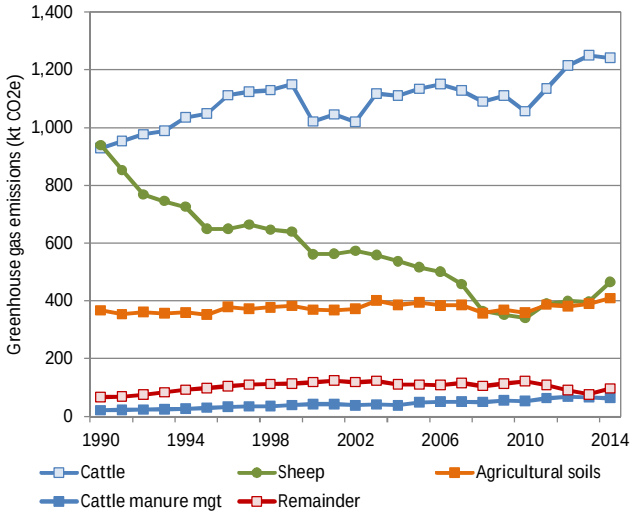


Figure 5.3 Key sources of Tasmanian agricultural emissions: 1990-2014.

Source: National Greenhouse Gas Inventory (www.aegis.gov.au).

Based on current research (and livestock numbers), there is potential to reduce agricultural emissions by up to about 1300 kt CO_2-e/y, which is approximately 17% of non-LULUCF emissions in 2014. With other reductions in emissions from the agricultural sector since 1990, this could help agriculture to achieve about a 60% reduction in overall emissions from the baseline year.

Industrial processes

Industrial process emissions are those which are a by-product of the manufacturing process and do not include energy generation in manufacturing. There are three main sources of industrial process emissions in Tasmania, these are from the production of: cement; aluminium; and manganese alloy. These account for about 21% of the state's non-LULUCF emissions and have increased overall since 1990.

In submissions to the Draft CCAP and this review, some of the key industrial process emitters stated that they have implemented available, cost-effective measures to reduce the emissions intensity of their operations. While there may be potential for further emissions reductions, they are only likely to be incremental changes and could be offset if plant output increased over time.

Waste

Waste is the remaining emissions sector. This accounted for just 4% of non-LULUCF emissions in 2014 and declined consistently between 1990 and 2014. Waste reduction and methane management measures at landfills are likely to continue to drive emissions reductions from this sector. However, this sector is so small in relation to the others it has little material effect on Tasmania's overall emissions accounts.

5.5 Setting a new 2050 emissions reduction target?

This review was asked to consider the suitability of the 2050 emissions reduction target and advise on a new target. The premise for this request was that Tasmania had already reduced its emissions to well below the legislated target. While this is the case, the overall emissions level is sensitive to changes in annual harvest

[31] Meat and Livestock Australia (2015) *More meat, milk and wool: less methane. Latest outcomes of research into lowering methane emissions and raising productivity in Australia's livestock industries.*
[32] Eckhard, R. (2010) Greenhouse gas emissions from agriculture - reduction options. Department of Primary Industries, Victoria

rates in native forest and large bushfire incidents in sensitive forest types. The current low level of emissions has not been secured and could increase significantly in future.

Tasmania's legislated target should be considered in the context of the state having a low carbon economy, particularly by comparison with other Australian jurisdictions (Figure 4.2, Figure 4.3). At the time it was set, that target represented a greater level of ambition than other jurisdictions with emissions reductions targets because of the high level of renewable energy generation.

Since the target was set in 2008, climate science has advanced and a clearer picture has emerged of the global need to reduce greenhouse gas emissions to avoid dangerous climate change. This was expressed in the Paris Agreement, in which nations agreed on the need to quickly peak and reduce greenhouse gas emissions and remove CO_2 from the atmosphere. This has been interpreted[33] as suggesting a 2050 zero net emissions target; which has been adopted by the ACT, South Australian and Victorian governments. Under the current accounting rules, such a target would allow less tractable emissions from some sections of the economy to be offset by sequestration in the LULUCF sector.

What 2050 target is consistent with Tasmania seeking to be an international leader on climate change?

The most-favoured target, consistent with the outcomes of COP21 and recent reviews in the ACT, South Australia and Victoria, was for the State to set a target of net zero emissions. Alternative suggestions were for a target which was consistent with the COP21 Paris Agreement to limit climate change to 1.5°C of warming.

Several submissions suggested a more ambitious goal of reaching zero net emissions by 2035 or 2030. The goal of the State becoming a net sink for greenhouse gas emissions (i.e. sequestering more carbon that it generates) was also proposed.

There was little support for retaining the existing target unless this was qualified and supported by sector-based targets to drive further emission reductions outside of the LULUCF sector, and accompanied by more stringent monitoring and reporting arrangements.

This review's analysis of Tasmania's emissions profile indicates that a zero net emissions target is achievable. Further reductions to the currently low level of emissions could be achieved through a combination of measures, including:

- Limiting increases in the area of native forest harvested and actively managing forest carbon stocks to avoid their impairment by fire.
- Limiting the extent of private native forest clearing and the associated emissions from deforestation.
- Adoption of recommended practices for nitrogen fertiliser management and reduction in nitrous oxide emissions from soils.
- Adoption of livestock emission reduction technologies as they become cost-effective.
- Continued adoption of cost-effective energy efficiency measures to reduce emissions from: vehicles; fuel use in manufacturing and construction; residential and commercial heating; and periods with low hydroelectric generation capacity.
- Development of infrastructure to support widespread uptake of electric vehicles.

These measures would also be most effectively implemented if this target and complementary actions were adopted by the Commonwealth Government.

Setting a 2050 zero net emissions target would also be consistent with Tasmania's positioning as a clean-green food producer and tourism destination. Lesser ambition on emissions abatement could undermine Tasmania's credentials in sensitive markets. Such a target was widely supported in submissions to the Draft CCAP and this review.

Recommendation 1:

That Tasmania set a new aspirational long-term emissions reduction target which is achievable and consistent with international ambitions to avoid dangerous climate change. Based on best available science, this target should be to achieve net zero greenhouse gas emissions by 2050.

[33] Climate Council (2015) Paris COP21: Key issues for the new climate agreement. Climate Council Discussion Paper.

5.6 A role for other types of targets?

Sector-based targets

Sector-based targets potentially serve to complement an overall emissions reduction target, and concentrate attention and resourcing to drive abatement and measure performance in that area. The Act (Object b) provides for specific targets to be set for sectors of the economy.

Several other jurisdictions' climate change legislation provides for sectoral targets, although these are typically not enshrined in legislation or regulations. Sector-based targets can be developed collaboratively (as in South Australia) or mandated by an independent body (such as UK's Committee on Climate Change).

Several opportunities exist to develop sectoral targets for Tasmania, as follows:

- *Targets for emissions sectors:* targets could be developed for the main emissions sectors and/or the sub-sectors where achievable and cost-effective abatement or sequestration opportunities exist. If such targets were to be developed, they could be considered for sectors such as agricultural soils, livestock emissions, transport, forest management, deforestation and fuel consumption in manufacturing and construction.
- *Targets for energy efficiency:* energy efficiency improvements may be associated with cost savings for energy users and, where this is the case, sectoral targets are considered by this review to be unnecessary. However, efficiency targets could apply across sectors including residential and commercial energy use.

  The Australian Government's *National Energy Productivity Plan* sets a non-binding target for energy productivity improvements of up to 40% by 2030. Progress towards the targets is to be achieved through collaboration with state and territories.

  The high level of renewable energy generation in Tasmania and reliance on electricity for residential and commercial heating will limit the impact of energy efficiency targets on emissions from electricity use.
- *Renewable energy generation:* renewable energy targets were strongly advocated for in many of the submissions received by this review and in response to the Draft CCAP, with many respondents advocating for a 100% renewable energy target.

What other types of emissions reduction target should be considered?

A wide range of targets were put forward in submissions to this review and the Draft CCAP. The approach taken was to either recommend a firm target that applied to all sectors and interim targets for each or to suggest principles on which a target could be based.

Few specified whether the targets that they proposed should be policy-based or legislated.

Generally there was strong support for target-setting which would complement the long-term emissions reduction target. Sector-based targets, in particular, were seen to be an important means of achieving this. The most common target recommendations were for renewable energy generation and/or use and energy efficiency.

Renewable energy targets included: 100% renewable electricity supply; targets for non-hydroelectricity energy supply; and a target for the State to become a net renewable energy exporter. Targets for annual incremental improvements in energy savings were proposed, as were targets for energy efficiency assessments, targets to address 'standby' energy use, targets to bring older housing stock up to newer 6 star energy rating standards.

The other key sector for which targets were proposed was energy used in transport (non-stationary energy). This was linked to efforts to increase the uptake of low emissions vehicles. Associated targets were on a maximum timeframe for the rollout of supporting infrastructure and reducing imports and use of liquid fuels.

There were few suggestions for targets on other sectors. Several submissions suggested targets on reducing waste to landfill, and reducing emissions intensity in agriculture (livestock emissions, irrigation efficiency, nitrogen fertiliser use etc.).

Suggestions of principles on which to base targets included: achieving bipartisan agreement on targets; developing a system for voluntary targets and associated reporting and review frameworks. A specific framework for larger emitters was also suggested. It included the setting of achievable targets and the development of clear plans and performance measures to assess progress.

Economic efficiency was a key principle for some submissions advocating for no further state-based targets, believing these could distort the operation of the NEM and increase costs to consumers.

Some submissions proposed that further independent advice (referencing the prior role of TCAC) was warranted to update Wedges type analysis to better understand pathways to carbon neutrality across different sectors.

Tasmania currently has more installed renewable energy generation capacity than is required to meet domestic demand[34]. During periods of high inflows and/or high dam storage levels, the state is able to export energy to the NEM via Basslink.

Despite its renewable energy generation capacity, Tasmania periodically needs to draw on (largely non-renewably generated) electricity from the NEM (e.g. when winds are light and/or hydroelectric dam levels are low). Flat domestic demand for electricity and the absence of a second mainland interconnector[35] are anticipated to constrain new commercial scale renewable energy development over the next decade and would make it difficult to achieve a 100% renewable energy target within that timeframe.

The review team consider that the Tasmanian government should routinely monitor, evaluate and report on emissions and energy efficiency at a sectoral and sub-sectoral level. This analysis should be used as part of an adaptive management framework (see Section 7) to guide sectoral policy and/or programs to drive attainment of the State's overall emissions target. While additional targets may have some value as part of this process, the review team does not consider that they are essential. Nor do we consider that there is currently sufficient analysis by which informed and achievable targets can be formulated for most key sub-sectors.

Should targets account for abatement and emissions from the import and export of electricity?

There was some divergence in views on whether Tasmania should factor in emissions generated from importing electricity from the mainland in its emissions accounts. Arguments made against accounting for imports were that:

- It would increase energy costs for vulnerable households and businesses: by requiring more renewable energy generation in Tasmania, which would likely be at higher cost than non-renewable energy from the NEM.
- Emissions would be double counting: in Tasmania and the state of origin.

Those in favour of Tasmania accounting for important emissions associated with electricity use considered there was a principle at stake around taking responsibility for indirect emissions.

Some submissions suggested specific targets around Tasmania's imports and exports of electricity including:

- Aiming to be net exporter of renewable energy to the mainland,
- Earmarking associated profits to further mitigation and adaptation, and so support the State's clean-green branding;
- Setting a target to limit the non-emergency import of electricity.

The variability of inflows to hydropower and generation capacity was a concern raised by Hydro Tasmania, and any target on generation, consumption or export should be as a rolling average, rather than a strict annual requirement.

Interim targets

Recent reviews of ACT and Victorian climate change legislation advocated for interim targets to drive Government accountability for action towards the overall jurisdictional target. The concept follows the ratchet mechanism incorporated into the Paris Agreement, whereby Parties review and strengthen the ambition of their targets at five year intervals. The Victorian government proposes to adopt a complementary process[36].

While interim targets are potentially a useful measure as part of the adaptive management process referred to above and described in Section 7, they are problematic given the current low level of Tasmania's emissions. If the current legislated target is maintained, interim targets would most likely be higher than the current level of emissions. If a 2050 zero net emissions target was set, the interim target would, at best, be only marginally lower than the current emissions level. Regardless of the challenge in achieving them, such targets would be unlikely to be considered as aspirational or ambitious and may be counterproductive to support for government action on climate change.

[34] Total installed renewable energy generation capacity is not necessary available at any particular time. This reflects low dam storage levels, reduced wind power output, outages in parts of the system and normal processes of risk and asset management by Hydro Tasmania and other renewable energy operators.
[35] Smith, W. (2016) Feasibility of a second Tasmanian interconnector. Preliminary report.
[36] ABC (2016) Victoria sets ambitious target for zero greenhouse gas emissions by 2050. 09 June 2016

6. Mainstreaming climate change

The review was requested to advise on how improvements to the Act could assist in driving consideration of climate change in decision-making across State government.

Three opportunities have been identified, as follows:

- Develop a clearer, consolidated set of objects within the Act to clarify its purpose and facilitate independent reviews;
- Introduce a statutory requirement for relevant State Government agencies and departments to have regard to climate change;
- Develop principles to promote more targeted and consistent decision-making.

Each opportunity is considered, in turn, in the following sections.

How can the Act facilitate action by the State, local government, businesses and the community?

Many suggestions related to the theme of promoting action on emissions, but by their nature are more appropriately considered by Government in finalising the CCAP.

Revising targets and associated timeframes for their achievement was one suggested means of signalling the need to plan and resource for associated mitigation and adaptation activities.

To further embed climate change upfront in decisions, a requirement in the Act for Departments and agencies to consider the climate change mitigation and adaptation implications of their decisions was suggested. One mechanism by which this could be done is through climate impact assessments for particularly significant state projects. The establishment of a dedicated Climate Change Minister and requiring climate change impact statements for relevant Cabinet papers was also proposed as a means of demonstrating whole-of-government commitment.

A suggested means by which the Act might help support action by non-state entities was to provide annual reporting of key climate indicators and annual emissions and energy improvements. A related suggestion was that the Act could be supported by a set of guidelines providing local government greater legal certainty over land use and development decisions. Submissions also raised the concept of developing, under the Act, a framework for voluntary transition plans, through which businesses and the community could access technical expertise and support, and provide for public reporting of their climate change performance.

6.1 Clarifying the objects of the Act

No changes have been made to the objects since the commencement of the Act. The 2012 review found the objects remained appropriate, however some submissions considered that they should be reworded to better guide decision-making, and give greater emphasis to adaptation. Submissions to this review expressed similar sentiments; that the objects were unmeasurable and of little consequence to driving changes in behaviour or linking to other spheres of decision-making.

Our assessment is that the objects of the Act provide a broad set of aspirations for action on climate change, however as outlined in Section 4, the themes overlap and several objects relate to the same theme. This obfuscates their intentions, creates uncertainty about the proper role of the Act and of climate change policy. The framework developed and used by this Review to consolidate the objects garnered support among submissions, and clearly articulates what the Act is driving at.

Recommendation 2:

That the objects of the Act are consolidated around four themes, to provide clarity on the purpose for having the legislation and a robust framework for evaluating its effectiveness, namely:

- Targets and reporting;
- Actions to reduce greenhouse gas emissions;
- Adaptation to projected climate change;
- Complementarity with national and international climate change initiatives.

6.2 Statutory requirement to have regard to climate change

Whilst climate change is just one of many policy areas for Government, the state's performance on this issue is linked to many other areas of decision-making. Current Government policies to grow Tasmania's population and the forestry industry, for instance, could diminish the emissions reductions realised in recent years (see Section

5). The projected impacts of climate change may have important implications for major developments which either create effectively permanent expectations of land use or build infrastructure which has a long design life.

Statutory regard to climate change, in Victoria

As noted by several submissions, Victoria's framework climate change legislation - the *Climate Change Act 2010* – requires decisions or actions taken under certain legislation to have regard to climate change.

The specified Acts (or instruments under those Acts) are listed in a schedule to the *Climate Change Act*; and have recently been extended.

Victoria's Act also sets out the considerations that must be taken into account by decision-makers[1].

There is scope for improved linkages between climate change and key policy areas. For example, policies in support of population growth have potential to lead to increased emissions[37] and could expose more people and/or infrastructure to the projected effects of climate change. Energy policy, similarly, has potential to influence the State's emissions accounts. Policies in these and many other areas represent opportunities for climate change to be considered explicitly through formulation and implementation.

Several submissions to the 2012 review, and to the current review, advocated for better linkages between the Act and decision-making under other, existing legislation. Suggestions included explicitly integrating climate change considerations into the land use planning process to ensure the resilience of communities and infrastructure are considered upfront. This would also facilitate measures that reduce the emissions embedded in these activities. The Government is currently developing a single, state-wide Planning Scheme[38]. This is designed to improve consistency in planning controls, while retaining flexibility in responding to some local issues. A draft set of planning provisions have been released and were open for public comment, with public hearings due to take place through the second half of 2016.

It is not within the scope of the current review to assess in detail and determine which legislation should be linked to the Act. Nor can it describe the mechanisms by which this may be achieved. However, some examples adopted by other jurisdictions are highlighted. Victoria's *Climate Change Act 2010* is one prominent example referenced by a number of submissions. The US has recently issued guidance for Federal Departments and agencies to consider emissions and climate change as part of National Environmental Policy Act Reviews[39].

Climate change can also be considered upfront in developing policy or passing legislation, through climate impact or triple bottom line assessments and reporting, as in the ACT. This process is similar to the Impact Disclosure Statements that have been proposed in New Zealand[40].

Recommendation 3:

That the Act is amended to require State agencies and Departments to consider the target, objects and proposed principles of the Act in relation to relevant decisions. Specifically, decisions should consider:

- Risks from climate change; and
- Implications for the State's emissions and potential to achieve Tasmania's legislated emissions target.

6.3 Establishing principles to guide decision-making

The recent review of Victoria's Climate Change Act proposed that revisions be made to the existing guiding principles, and that a new set of (legislated) objectives was developed. The Victorian review considered that the guiding principles would provide a framework for decision-makers to appropriately and consistently consider climate change, make decisions given uncertainty, and would be flexible to support a range of decisions[41].

[37] Noting that per capita emissions in Tasmania have remained virtually unchanged since the early 1990s.
[38] Department of Justice (nd)
[39] Council on Environmental Quality (2016) Memorandum for Heads of Federal Departments and Agencies: Final guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews
[40] Parliament of New Zealand (2016) Legislation (Climate Impact Disclosure Statement) Amendment Bill. 6th April 2016
[41] Wilder *et al.* (2015) Independent Review of the Climate Change Act 2010. Authorised and published by the Victorian Government. December 2015

The discussion paper for this review socialised the concept of guiding principles. The divergence in approach among submissions has informed our conclusions of how principles would best serve the Act and action on climate change. The conceptual principles advocated in some submissions (see adjacent text box) could apply to any area of government decision-making and are likely to already be embedded in government policy and planning. The outcome-focused set are prescriptive, and cannot hope to cover all possible pathways by which Government could pursue action on climate change, and potentially open to dispute or result in missed opportunities.

The review team consider that a set of principles is required that neatly summarises "*what really matters most*" in decisions on allocation of scarce resources to abatement and adaptation and evaluating decisions which potentially conflict these two imperatives.

What principles might help guide government decision-making on climate risks and emissions?

Two types of principles could be distinguished in submissions: conceptual and outcome-focused principles (or objectives).

Conceptual principles included the precautionary principle, a principal around inclusive and integrated decision-making, transparency, selecting solutions that are cost-neutral or positive, intergenerational equity. Some alignment with the Commonwealth Government's principles for climate resilience and adaptation was also suggested to drive for consistency across jurisdictions.

Outcome-focused suggestions included protecting carbon stocks and increasing sequestration; transitioning to 100% renewable energy; diversifying and decentralising Tasmania's renewable energy mix; monitoring and sharing of best practice with other jurisdictions and prohibiting activities (specifically "fracking") that are at odds with Tasmania's clean-green brand.

This review's suggested approach to principles (below) is considered to provide a holistic means of assessing initiatives and making decisions in light of climate change issues.

Recommendation 4:

That the Act is amended to include a set of principles to give greater effect to the target and objects of the Act and provide set of expectations for decision-making on climate change. These principles should give priority to:

- Abatement in sectors and through initiatives where the greatest emission reductions can be cost-effectively achieved,
- Opportunities that deliver social and economic benefits from Tasmania's position as a low carbon economy,
- Adaptation in areas and with communities at greatest risk from the projected impacts of climate change.

7. Adaptive management framework for climate change

To deliver an integrated and reflective response to climate change issues, the review team consider there is scope for a framework within the Act which provides a process for acting on climate change of which the State Government has ownership. This could address several of the challenges and shortcomings identified in by this review and some of the submissions made to it:

- Challenging social and economic conditions influencing other areas of Government policy, that could adversely affect the State's emissions or could be exacerbated by climate change impacts.
- The significant influence of the LULUCF sector on Tasmania's emissions and uncertainty over future forest carbon stocks in the context forest and forest industry policy, industry opportunities and the effects of bushfires and other climate-related hazards.
- Tasmania's starting point as a relatively low carbon economy, with relatively few easy 'wins' to be made in emissions reductions in 'traditional' areas of investment such as renewable energy and energy efficiency.
- A desire by the community for ambitious, government-led, collaborative action to reduce emissions and build resilience into Tasmanian communities, infrastructure and environments.

7.1 An adaptive management framework

Adaptive management is a method that was developed in natural resource management to manage systems where linear approaches have failed[42]. It is an iterative, evidence-based approach to decision-making. It explicitly acknowledges the dynamic interplay between managers, stakeholders, interventions, and system responses[43], and is based on ongoing learning and stakeholder input. Adaptive management could be used as a framework for taking-forward the Act's legislated target and objects in a way that accommodates uncertainty but does not allow this to be a barrier for action.

The Act is seen as a symbolic statement of commitment to acting on climate change and provides the framework for other instruments to operationalise its target and objects. However, there is currently nothing in the Act that sets out what other instruments are in existence to communicate how the target and objects link to actions by government, business and communities. Amending the Act to require Government to prepare and maintain a CCAP will help to clarify the proper relationship between the ends sought by legislation and intended Government action.

What should the Act include to help Tasmania build resilience to climate change?

Key themes which emerged in submissions were:

- Recognition of locked-in warming as a catalyst for Government to provide best available science to inform decision-making.
- Explicit recognition of shared responsibility for adaptation and possible frameworks to support collaboration e.g. partnerships between businesses and emergency management organisations, or knowledge-sharing among industry and communities.
- Valuation tools to factor in avoided costs associated with adaptation.
- Principles to guide investment, managing resources and prioritising adaptation (e.g. diversifying the State's renewable energy sources and supply).
- Clarifying and supporting the differing roles of State and local government in building climate resilience.
- Links between the Act and other legislation to support action on adaptation.

7.2 A legislated Climate Change Action Plan

It is beyond the scope of this review to provide a detailed description of the preferred contents of a CCAP or of the process by which it would be formulated. Similarly, it is not the role of legislation to provide detailed prescriptions of the contents. However the review team considers the process and document should include these key features:

- *Draws on best available science:* the CCAP should be informed by the best available science on climate change projections for Tasmania and what this means for communities, infrastructure and the environment. The level of ambition for action on emissions abatement should be informed what is required internationally

[42] Holling, C. S. (1978) Adaptive Environmental Assessment and Management. Chichester, UK: John Wiley and Sons.
[43] Hess *et al (2012)* 'Climate change and public health: the role of adaptive management'. Commonwealth Health Partnerships.

to avoid dangerous climate change, as well as analyses of sectoral emissions trajectories and abatement technologies and their potential application.

- *Informed by monitoring and evaluation:* the CCAP should be informed by monitoring of government and community action on emissions abatement and climate change adaptation, as well as evaluation of the appropriateness, impact and efficiency of those actions. Evaluation and planning should also be informed by assessments of the extent to which the objectives of the CCAP and objects of the Act are being achieved. The CCAP should be supported by a monitoring, evaluation and reporting program.

Strategic response to climate change

A set of Purposes in Victoria's *Climate Change Act 2010* set out the nature and scope of the Act for Parliament and decision-makers.

Purpose (d) of the Act is *"to provide for a strategic response by the Government of Victoria to climate change through a Climate Change Adaptation Plan and to set out guidance for the preparation of the plan".*

- *Responds to key risks and opportunities:* actions proposed by the CCAP should respond to assessments of risks and opportunities associated with the physical impacts of climate change and emissions abatement. The level of action or response proposed in the CCAP should be proportional to the severity of risk and scale of opportunity.
- *Includes action to contain or reduce emissions and build climate resilience:* actions to build climate resilience, contain or reduce emissions and develop opportunities from the low carbon economy are required and should be appropriately ambitious and complement each other.
- *Complement relevant national and international action:* the CCAP should be informed by and, where possible, take advantage of relevant national and international responses to climate change. It should advocate for national action on climate change which is at least as ambitious as that proposed in Tasmania.
- *Engagement:* development and implementation of the CCAP should engage across State and local government and with the community and organisations representing business, industry, community and environmental interests.
- *Follows parliamentary cycles:* the CCAP will only be implemented effectively if it is "owned" by the incumbent government. The process for preparing and implementing the Plan should be structured so that it captures the objectives and ambition of the incoming government and is largely implemented during their term in office. A potential CCAP planning cycle which may achieve this level of ownership is described in Appendix E. However this model is most suited to the fixed four year parliamentary terms which apply in some other jurisdictions.

Recommendation 5:

That the Government continue to prepare a plan for mitigating and adapting to climate change, and that Act is amended to make the Climate Change Action Plan (CCAP) a statutory requirement.

The CCAP should include a clear timeframe for preparation, implementation and evaluation that, wherever possible, follows the four-yearly parliamentary terms and legislative review cycle under the Act.

In developing the CCAP, the State should take account of the:

- Long-term greenhouse gas emissions target under the Act;
- Revised objects of the Act, and Principles proposed for the Act;
- Latest greenhouse gas accounts for the State, and best-available science on projected impacts of climate change on Tasmania;
- Evidence on the effectiveness of existing initiatives to mitigate and adapt to climate change.

7.3 Monitoring, evaluation and reporting

Adaptive management processes are typically informed by monitoring, evaluation and reporting (MER). The Act embeds MER processes with its requirement for monitoring and reporting of emissions and periodic independent review.

Development of a CCAP, which consolidates the government's program of action on climate change, would provide an improved basis for a more rigorous MER program. It would also enable learnings from implementation of the Plan to be captured and shared, achievements to be recognised and underperformance addressed.

As part of this process, the Government could consider complementary mechanisms to operationalise reporting of community actions on climate change. An online forum could be established where support and initiatives available from the State are gathered in one location, and businesses, local governments, communities and individuals could make, record and report on voluntary "pledges" for action to reduce emissions or build climate resilience.

Government agencies which are required to consider climate change in their decision making (as proposed by this review) should also report into the Plan's MER process on how they have met this requirement and what the outcome of their consideration of climate has been.

Would businesses, community groups, local government or regions voluntarily commit to reducing emissions?

Several councils and businesses as well as a handful of individuals responded to this question.

Some of Tasmania's large industrial producers outlined they had voluntarily been pursuing efforts to reduce emissions intensity of their operations, and additional abatement opportunities were at this stage limited. Members of the public outlined they had taken proactive steps to manage, and in some cases, measure their carbon footprint through small scale renewables and travel mode choices in particular.

Several Councils expressed interest in the concept of pledges and some indicated they had already set or were considering setting targets. A perceived need was development of community-focused emissions accounting tools. A similar gap was identified around emissions inventories for individual farm enterprises to capitalise on the Commonwealth ERF.

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Appendix A. Objects of the Act

Section 4 of the *Climate Change (State Action) Act 2008* states the Act's objects. These are:

a) to help Tasmania respond to the challenges of climate change by addressing issues associated with that phenomenon and, in particular, by providing for the setting of a target for the reduction of greenhouse gas emissions in the State as part of the national and international response to climate change; and

b) to promote a commitment to action on climate change issues in Tasmania by providing for the development of –

   i. interim State targets for the reduction of greenhouse gas emissions in the State; and

   ii. suitable targets and interim targets, having the same aim, for specific sectors of the State's economy; and

c) to help Tasmania take advantage of the new social, economic and environmental opportunities that climate change will present; and

d) to provide for reporting and Parliamentary oversight of progress being made towards achieving the State's 2050 target and other targets; and

e) to promote energy efficiency and conservation; and

f) to promote research and development in the development and use of technology for reducing or limiting greenhouse gas emissions or for dealing with and adapting to the expected consequences of climate change, including technology for removing greenhouse gases from the atmosphere; and

g) to promote and facilitate business and community consultation and early action on climate change issues; and

h) to identify, promote and support measures to help Tasmania deal with and adapt to the expected consequences of climate change; and

i) to promote a Tasmanian response to climate change issues that is as far as practicable consistent with national and international schemes addressing those issues, including any schemes for emissions trading and emissions reporting; and

j) To enhance Tasmania's willingness and capacity to contribute and respond, constructively and expeditiously, to national and international developments in climate change issues.

Appendix B. Discussion questions to inform the review

B.1 Questions in the Discussion Paper to the Review

The Discussion paper to inform the review of the Act included 14 questions to guide persons and organisations wishing to make submissions. Submissions were invited on any or all of these questions and/or to other matters which are relevant to the review's terms of reference.

1. The Act aims to help Tasmania respond to the challenges posed by climate change. What do you consider are the critical challenges to which this legislation and Government action should respond?
2. How successful do you think the Act has been in influencing action on climate change within Tasmania?
3. What amendments may the Act require to further drive action on climate change?
4. The Act creates a narrative on how the state regards the challenges posed by climate change. How do you think the Act can provide a narrative which helps to project Tasmania's clean-green-liveable brand?
5. With Tasmania providing just 0.3% of national emissions, how important is it that the Act supports the achievement of national and international targets for climate change?
6. Should the Act recognise the possibility of 2°C of warming as a means of driving action on climate resilience?
7. What should the Act include to help Tasmania build resilience to climate change?
8. How can the Act facilitate action on climate change at state and local levels and among businesses and the broader Tasmanian community?
9. To what extent should Tasmania rely on the Land Use-Land Use Change Forestry emissions sector to achieve its emissions reduction target?
10. What 2050 emissions reduction target would you consider is consistent with Tasmania seeking to be an international leader on climate change?
11. Should Tasmania's targets account for emissions and abatement associated with its importation and export of electricity?
12. What other types of emissions reduction target should be considered (e.g. interim, sectoral, energy efficiency, mandatory/voluntary)?
13. How willing would your business, community group, local government or region be to commit to pledges to reduce emissions?
14. What do you consider might be appropriate principles to guide government decision-making which influences climate risks and greenhouse gas emissions?

B.2 Consultation questions in the Draft Climate Change Action Plan

1. What practical actions should we prioritise over the next five years in our response to the issue of climate change?
2. What targets, both legislated and policy driven, should Tasmania adopt in pursuing our greenhouse gas abatement effort?
3. How can our natural advantages best be used to maximise Tasmania's contribution in the effort to combat climate change?
4. What amendments or enhancements would you propose to the *Climate Change (State Action) Act 2008* to ensure that Tasmania is responding effectively to the issue of climate change?

Appendix C. Register of submissions received

A total of 20 submissions were received on the Discussion Paper and 87 non-confidential submissions received on the Draft Climate Change Action Plan, all of which were considered in preparing this report. Submissions made in response to this review's *Discussion Paper* were received from:

- Australian Industry Greenhouse Network
- Bell Bay Aluminium
- Break O'Day Council
- City of Hobart
- Climate Action Hobart Working Group
- Dr Nicholas Cummings
- Environment Defenders Office Tasmania (EDO Tasmania)
- Hamilton Energy Consulting (Mr David Hamilton)
- Hydro Tasmania
- Kingborough Council
- Local Government Association Tasmania
- Mr Phil Parsons
- Mr R.B. Jackson
- Mr Robert Cassidy
- NRM South
- Tamar Natural Resource Management
- Tasman Council
- Tasmanian Council of Social Service (TasCOSS)
- Tasmanian Farmers and Graziers Association (TFGA)
- Tasmanian Greens

Appendix D. Climate change targets of comparable jurisdictions

Jurisdiction	Key commonalities and differences	Notable features of climate change policy	Targets
Australian Capital Territory	· Small population (393,000 in December 2015)[44] · No electricity generated within the territory · High proportion of energy from renewables (although started from a low base)	· Legislated targets for reduction of emissions through energy efficiency and increasing renewable energy generation. · Reverse auctions (solar, wind and next generation renewables) as key procurement mechanism for competitive large-scale renewable energy. · Adaptation approach through territory-wide risk assessment, Ministerial Statement and assessment of impacts on ecological systems	At time of the first review: 80% reduction in emissions by 2050 (1990 baseline) Currently: · *Net zero emissions by 2050* · *Interim target: 40% reduction in emissions by 2020 (1990 baseline).* · *100% renewable energy supply by 2020*
New Zealand	· Agriculture sector is the largest contributor to GHG emissions · Significant role for LULUCF to meet emission reduction targets · High vulnerability to coastal hazards, as in Tasmania.	· NZ ETS (Emissions trading scheme) requires certain sector to acquit or surrender emissions and account for direct and indirect emissions. Main tool to encourage afforestation and reduce deforestation. · Integrated approach to climate change and hazard management – all people exercising duties and functions under the *Resource Management Act 1991* are required to have particular regard to the effects of climate change. Guidance documents for local councils to assist in planning for climate change[45] · Electric vehicles exempt from road user charges for the period 2008-2020.	· *5% reduction in emissions (1990 baseline) by 2020* – unconditional – *or 10-20% reduction* if there is a comprehensive global agreement · *30% reduction in emissions (2005 baseline) by 2030* · *50% reduction in emissions (1990 baseline) by 2050* · Target for economy-wide energy intensity improvement of 1.3% per year.
Northern Territory	· Small population and industrial sector · Important contribution from savanna burning on emissions (from a third to a half of emissions)[46] · No specific climate change legislation	· Climate change risk assessment and adaptation plans for councils, via Local Government Association of the Northern Territory · Actions otherwise focused on land management practices, renewable energy, waste, green infrastructure initiatives[47].	· 60% reduction in emissions (2007 baseline).
Norway	· High proportion of energy from renewables (hydroelectricity)	· Purchasing of emission units to meet domestic target[48] · Carbon capture and storage a priority area of focus · Active forest policy to increase carbon sequestration – with initiatives in	At the time of the first review: 30–40% below 1990 levels by 2030 with the 40% reduction target conditional on global action. Currently: · *Net zero emissions by 2030*

[44] ABS (2016) 3101.0 - Australian Demographic Statistics, Dec 2015
[45] Examples on the Ministry for Environment's website include: *Tools for Estimating the Effects of Climate Change on Flood Flow (2010)*; P*reparing for future flooding (2010)* and *Preparing for coastal change (2009)* – correct as at 01.08.2016
[46] City of Darwin (2011) Climate Change Action Plan 2011-2020
[47] Ibid.
[48] Approximately half of Norway's emissions are covered by the EU ETS. EU targets are for 43% reduction in emissions by 2030 (2005 levels) for sectors covered by the ETS and a 30% reduction for non-ETS sectors. Contributions from each member state vary from 0-40% and are determined on the basis of GDP per capita and adjusted for level of cost. (Norwegian Mission to the EU, 2015)

Jurisdiction	Key commonalities and differences	Notable features of climate change policy	Targets
		· increasing plant density, fertilisation and breeding[49] · Lower vehicle taxes for low and zero emission vehicles and mandatory biofuel sales for road transport purposes	
South Australia	· Strong similarities in the Objects of the Act to Tasmania's Act · Seeking to position itself as a leader on renewable energy.	· 5 year climate change strategy released in 2015 with focus on reducing emissions through energy efficiency, renewable energy and transport (low emission vehicle strategy) in particular · Strong focus on reducing emissions from transport: low-emission vehicles, fuel efficiency and public transport investment · Appointed Low Carbon Economy Experts Panel in 2015 to advise on deep decarbonisation and targets to 2050 · Signatory to Compact of States and Regions and founding member of Climate Group's States and Regions Alliance	At time of the first review: 60 % reduction in emissions by 2050 (1990 levels) Currently: · *Net zero emissions by 2050* · *50% renewable energy by 2025.* · *$10B in low-carbon energy generation investment by 2025.* · *30% improvement in energy efficiency of Government buildings by 2020.* · *Adelaide to be the world's first carbon neutral city.*
Victoria	· Developing a Climate Change Framework for action to be released in 2016 – setting out key priorities in action on abatement and adaptation. · Positioning itself to take advantage of opportunities associated with transition to low carbon economy – particularly through investment in renewable energy (brown coal currently accounts for approximately 50% of the State's emissions)[50] · Climate Change MOU exists between state and local government	· Implementing a sub-national level approach to INDCs, through departmental TAKE2 'pledge and review' process with strong focus on consultation via Leadership Forum, one-on-one meetings between stakeholders and Government and online forum for dialogue over climate change. · Rights based framework (property rights clearly defined) for carbon sequestered on private land – with carbon rights being an interest that remain attached to the land, providing investor confidence and enabling landowners to be in a position to take advantage of future national carbon markets	At time of the first review: Aspirational 80 % reduction in emissions by 2050. 2020 target had been repealed. Currently: · *Net zero emissions by 2050* · *5 yearly interim targets*
Iceland	· Comparable population (c.332,000 in 2016[51]) · High renewable energy generation capacity (close to 100%) achieved early (pre-1990s)	· Mitigation largely through domestic efforts focused on afforestation and reforestation (c.90% land cleared) · Piloting new techniques for carbon capture and storage[52] · Changes in levies and taxes to reduce emissions via excise duty, biannual fees	· *50-75% reduction in net GHG emissions by 2050 (1990 levels)* · *Contribute to collective EU target of 40% reduction by 2030 (1990 levels)*

[49] Norwegian Ministry of Climate and Environment (2015) Norway's second Biennial Report Under the Framework Convention on Climate Change.
[50] Victorian Department of Environment, Land, Water and Planning (2016) Long-term greenhouse gas emissions reduction target to 2050
[51] Statistics Iceland (2016) Population and elections: Population key figures 1703-2016
[52]

Jurisdiction	Key commonalities and differences	Notable features of climate change policy	Targets
	· Small economy so size and the proportional impact of relatively large single projects is significant to its emissions – industrial processes account for over 40% total emissions · Party to the EU-ETS and over 40% of Iceland's emissions fall under the trading scheme.	and VAT[53]	
Bhutan*[54]	· Forests cover ~70% of the land area, act as total carbon sink – i.e. it is carbon neutral · Highly vulnerable to impacts of climate change.	· Hydropower from run-of-the-river schemes account for ~100% of electricity generation · Net exporter of electricity, 75% to India[55] · Current policies focused on sustainable land management, livestock management, organic agriculture and low emission vehicles. · Pursuit of ecologically sustainable development – balancing economic development with pursuing low emissions development pathways across sectors[56].	· Goal to become world leader in use of electric vehicles[57] · Maintenance of a minimum of 60 % of total land under forest cover. · Maintain carbon neutrality

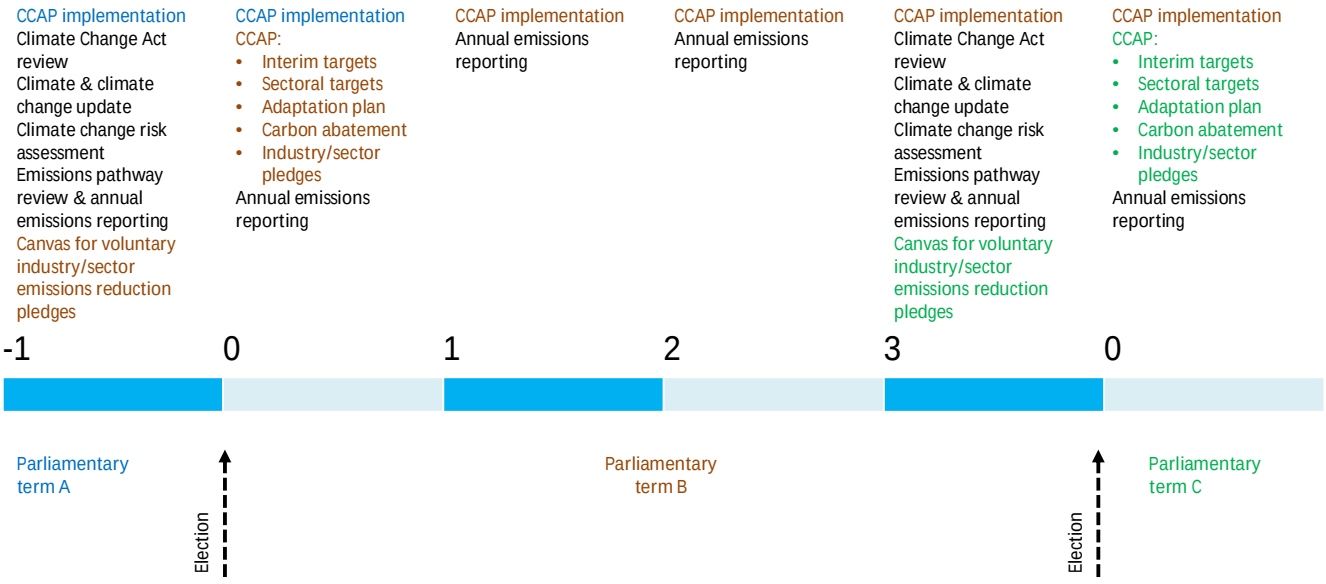
[53] UNFCCC (2016) Iceland's Second Biennial Report to the UNFCCC
[54] Royal Government of Bhutan (2015) Communication of INDC of the Kingdom of Bhutan.
[55] Dorji *et al* (2012). "Options for off-grid electrification in the Royal Government of Bhutan". Renewable Energy Volume 45, September 2012, Pages 51–58.
[56] Royal Government of Bhutan (2015) Communication of INDC of the Kingdom of Bhutan.
[57] Reuters (2015) On the road to zero emissions, Bhutan hits a few electric car bumps. 9 June 2015

Appendix E. A potential climate change review and action planning cycle

This appendix provides a brief description of a potential climate change review and action planning cycle which is consistent with the adaptive management framework described in Section 7, particularly Section 7.2. The review and action planning cycle is illustrated in Figure E.1.

The cycle seeks ensure that the CCAP is developed, owned and largely implemented by the incumbent government. It provides a mechanism by which political parties' ambitions for action on climate change can be put to the electorate, with implementation commencing late in the first year of the governing party's term in office. The cycle is most applicable to a fixed, four year parliamentary cycle. It could be adapted to non-fixed terms (such as apply in Tasmania), but only if the parliamentary term extended beyond three years. With shorter planning cycles, too much effort would be invested in planning and review, rather than implementation.

Other jurisdictions with adaptive climate change action planning processes (e.g. Victoria) operate or plan to operate on fixed review cycles. While this provides for an orderly process, it has resulted in momentum being lost following changes in government. The model depicted in Figure E.1 could be adapted to fixed four or five year planning and review cycles if this was considered to be more workable.



Climate change review and action planning cycle

The climate change review and action planning cycle is shown from the transition of parliamentary term A (blue) to term B (Brown) and then term C (green). Core actions are in black.

Figure E.1 Conceptual process for a climate change review and action planning cycle for Tasmania.

Key features of this process are as follows:

- *CCAP with a four year implementation period:* implementation would extend from (approximately) the end of the first year of one parliamentary cycle to that point in the subsequent cycle. The overlap provides for continuity of action in case of a change of government, but also allows an incoming government to refresh the plan and give expression to its own electoral commitments.
- *Four yearly independent review:* as currently specified by the Act. The review would be undertaken during the final year of the four year cycle and inform development of the CCAP.
- *Climate and climate change update:* this would provide an update on how Tasmania's climate has tracked against projections, the experience of climatic extremes and any new information on climate change projections. Major updates of climate change projection information would follow successive IPCC

Assessment Reports and any subsequent revision of the Climate Change in Australia reports and website. This review would be undertaken to inform priorities for climate change adaptation.

- *Climate change risk assessment:* a risk assessment would be undertaken to inform priorities and actions for the CCAP. The risk assessment would consider risks to achieving the State's 2050 emissions target and those arising from the projected impacts of climate change.
- *Emissions pathway review:* this would provide a thorough review of Tasmania's emissions account and assess likely futures emissions trajectories and opportunities for emissions abatement. It would provide a similar assessment to the 2009 "Greenhouse Wedges" report (MMA 2009) and would identify the key opportunities and impediments for achieving the State's emissions reduction target.
- *Voluntary emissions reduction pledges:* these provide an opportunity for communities, businesses and the public sector to propose and subsequently report on actions to reduce emissions. Pledges would be called for in the year prior to CCAP renewal, so that the level of ambition for action could be integrated into that document.
- *Annual emissions reporting:* TCCO would continue to report annually on the State's emissions, with those reports continuing to be based on data from the NGGI[58]. As part of the annual reporting process, TCCO could also report on progress against voluntary actions and emissions reductions pledges. The reporting process could also be expanded to capture key actions by government, businesses and the community to build climate resilience.

[58] Which may be over 12 months old when published.