Report on the operation of the *Climate Change and Greenhouse Emissions Reduction Act 2007*

December 2015

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Report prepared by

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Report on the operation of the *Climate Change and Greenhouse Emissions Reduction Act 2007* – December 2015, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide

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Foreword

South Australia has a strong record in leading climate change action. Our State was the first jurisdiction in Australia to introduce climate change-specific legislation – the *Climate Change and Greenhouse Emissions Reduction Act 2007* (the Act) – which sets greenhouse gas emissions reduction and renewable energy targets. The Act promotes climate change mitigation and adaptation action within South Australia that provides consistency with national and international schemes.

In 2007, South Australia released its first climate change strategy. In November 2015, to ensure that our State remains at the forefront of climate change action and is positioned to continue taking advantage of opportunities the low carbon economy presents, the Government released *South Australia's Climate Change Strategy 2015 – 2050: Towards a low carbon economy*. This new strategy outlines the Government's aspirations for the future and provides a framework for renewed action. It also responds to the Premier's Climate Change Council's advice for South Australia to become a low carbon, resilient economy by 2050 in *South Australia's climate change vision: Pathways to 2050*. Importantly, it sets a bold new greenhouse gas emissions target to achieve net zero emissions by 2050. This target will provide a new focus for action by all sectors and send a strong signal that further and more ambitious action to reduce our emissions is required.

The establishment of this target is consistent with advice from the South Australian Low Carbon Economy Expert Panel indicating that achieving net zero emissions is critical to limit global warming to two degrees, and that adopting this target will ensure South Australia is well positioned to take advantage of opportunities in a low carbon world.

South Australia is already seeing the results of its early climate change action. The latest data indicates that the State's net emissions in 2012/13 were nine per cent below 1990 levels. During this time, our Gross State Product (GSP) increased by more than 60 per cent, demonstrating that economic growth can be decoupled from growth in greenhouse gas emissions. The share of renewable energy generation has grown from virtually zero in 2003 to over 41 per cent today, achieving the 2020 target of 33 per cent six years early.

In 2014, the Government established a new target of 50 per cent of renewable electricity generation by 2025 and a target of attracting a $10 billion investment in low carbon energy generation by 2025. By 2014/15, approximately $6.6 billion had been invested in renewables, with around 40 per cent of this investment occurring in regional areas. In December 2015, the Government released its *Low Carbon Investment Plan*, which sets out strategies and initiatives to achieve the $10 billion target.

The State's *Low Carbon Investment Plan* is a major step towards establishing the City of Adelaide as the world's first carbon neutral city – a bold ambition announced by the Government in February 2015. The Carbon Neutral Adelaide initiative provides a platform to attract investment to the city and the State and create opportunities for local business. The world is moving towards a low carbon economy. Leading this transition will position South Australia at the forefront of research and innovation, attracting investment and creating jobs for the future. In November 2015, the Government entered into a sector agreement with the key partner for this initiative – the Adelaide City Council – and formalised the State-local government partnership to achieve this bold ambition.

South Australia is an active participant in the international climate change dialogue. Our State is a founding member and the longest standing co-chair of The Climate Group's States and Regions Alliance, which brings together sub-national government leaders from around the world. In early 2015, South Australia became a signatory to the *Compact of States and Regions*, which provides a global account of greenhouse gas emissions reduction targets and progress towards those targets made by state and regional governments. Complementing this commitment, the Adelaide City Council has become a signatory to the *Compact of Mayors*, which is a global coalition of city leaders addressing climate change by pledging to reduce their greenhouse gas emissions, tracking their progress and preparing for the impacts of climate change. This makes South Australia the first Australian jurisdiction where a State government and a capital city council have both signed these key international agreements on climate change.

In December 2015, along with the Premier, I attended the 21st session of the Conference of the Parties (COP 21) under the United Nations Framework Convention on Climate Change held in Paris. At COP21, the South Australian Government signed the *Subnational Global Climate Leadership Memorandum of Understanding* or "Under2MOU" and the *RegionsAdapt* initiative, both of which complement existing work being undertaken in South Australia.

Climate change continues to be one of the biggest challenges that we as a society are facing. The Government of South Australia will continue to work with the community, industry, local government and other partners to capture opportunities and to transition to a resilient and prosperous low carbon economy.

I am pleased to present the fourth progress report pursuant to Section 7 of the Act.

IAN HUNTER MLC
Minister for Climate Change

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Introduction

The *Climate Change and Greenhouse Emissions Reduction Act 2007* (the Act) sets out a number of reporting obligations for the Government of South Australia. Section 7(1) of the Act requires the preparation of a report on the operation of the Act every two years. This report fulfils the reporting requirements of Section 7 of the Act, including the provision of information regarding:

- the assessment of the effectiveness of climate change initiatives, targets and determinations
- progress on renewable energy targets
- sector agreements
- the State's greenhouse gas emissions
- climate change mitigation technologies
- intergovernmental agreements
- national and international commitments, and
- climate change impacts related information.

This is the fourth report on the operation of the Act. It provides information pertaining to the reporting period for calendar years 2014 and 2015.

Every alternate report requires an assessment by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) on the extent to which the targets under the Act are being achieved. A CSIRO report is not required for the 2015 Section 7 report.

The first three progress reports were completed in 2009, 2011 and 2013. They are available from the Government's website at: http://www.environment.sa.gov.au/about-us/our-reports.

Section 1 – South Australia's climate change initiatives

South Australia's net greenhouse gas emissions are in decline. The latest estimate indicates that net greenhouse gas emissions in 2012/13 of 29.25 million tonnes of carbon dioxide equivalent (CO_2e) were nine per cent below the 1990 baseline (32.31 million tonnes CO_2e). South Australia's Gross State Product has grown by more than 60 per cent, demonstrating that economic growth can be decoupled from growth in greenhouse gas emissions. South Australia's increase in renewable energy generation continues to contribute to the reduction of emissions from the energy sector. Modern agricultural practices and increased recycling, including hard waste and wastewater recycling, have also contributed to this decline.

The Act includes targets for 20 per cent renewable energy generation and consumption by 2014. These targets have been met. In addition, South Australia met its 2020 target of 33 per cent renewable energy generation six years early. In 2014, a new target of 50 per cent of renewable electricity generation by 2025 was set. These targets are yet to be adopted under the Act. The portion of renewable energy generated continues to rise, with more than 41 per cent electricity generation in 2014/15 being from renewable sources. Further detail is provided in sections 3, 6, 11 and Appendix A of this report.

South Australia has implemented a number of notable programmes and policy initiatives developed to reduce greenhouse gas emissions and assist the State to better manage and adapt to the impacts of climate change. The main outcomes are reported annually in the Annual Report of the Department of Environment, Water and Natural Resources (DEWNR). In addition, Appendix A provides more detail on the effectiveness of South Australia's climate change programmes and initiatives undertaken in the 2014 and 2015 calendar years, fulfilling the requirement of Section 7(2)(a) of the Act.

South Australia's Climate Change Strategy 2015 - 2050: Towards a Low Carbon Economy

In 2015, the Government established a new target of net zero emissions by 2050. *South Australia's Climate Change Strategy 2015 - 2050: Towards a Low Carbon Economy* outlines the Government's aspirations for the future and provides a framework for renewed effort and action. The Climate Change Strategy sets out new initiatives that will put South Australia on the path towards achieving the new emissions reduction target and building resilience to the climate change we are starting to see. The Strategy builds on achievements of the 2007 Climate Change Strategy, the leadership being demonstrated by industry, the community and the Government to date, and the success of South Australia's award winning adaptation framework.

The development of South Australia's new Climate Change Strategy was guided by the establishment of the Climate Change and Carbon Neutral Adelaide Cabinet Task Force and informed by the findings of South Australia's Low Carbon Economy Experts Panel, which provide independent advice about climate change targets and objectives for South Australia to 2050. The Strategy was further shaped by a comprehensive public consultation process undertaken in September and October 2015. The Strategy also responds to advice from the Premier's Climate Change Council in *South Australia's Climate Change Vision: Pathways to 2050,* which sets out a vision for South Australia to become a low carbon, resilient economy by 2050.

Carbon Neutral Adelaide

In February 2015, the Government announced its ambition for the City of Adelaide to be the world's first carbon neutral city. The Government has entered into partnership with the Adelaide City Council to achieve this bold shared vision, underpinned by a sector agreement under the Act. This partnership between a local government and regional/state government to achieve economic growth while decreasing emissions is unique globally and was recognised as such at the United Nations Framework Convention on Climate Change 21st Conference of Parties in Paris, December 2015. The partners have released a framework, *Carbon Neutral Adelaide - A shared vision for the world's first carbon neutral city*, and a detailed action plan will be developed in 2016.

The Carbon Neutral Adelaide initiative will be an important step towards the State's transition to a low carbon economy. The aim is for the entire Adelaide City Council area, including the Adelaide Park Lands, Central Business District (CBD) and North Adelaide, to become carbon neutral. This will deliver a number of benefits, including: development and growth of the State's green industries; financial savings; and a platform for the roll out of successful, innovative technologies across the State. A balanced and practical approach will be required to achieve this vision and to deliver employment, economic and innovation opportunities.

Low Carbon Investment Plan for South Australia

The Government's Low Carbon Investment Plan for South Australia outlines current and new initiatives to underpin the achievement of the Government's target for $10 billion investment in low carbon energy generation by 2025. The plan is framed around four strategies: clear policy and efficient regulatory environment; information to inform investment; sponsoring uptake and wider market deployment; and facilitating projects to leverage funding and support.

Premier's Climate Change Council

The Premier's Climate Change Council (the Council) was established under the Act and its primary function is to provide independent advice to the Minister for Climate Change on reducing emissions and adapting to climate change. The Council is also responsible for consulting with business, the community and the environment and conservation sectors and for disseminating information to encourage climate change action.

In February 2014, the Council provided the Government with comprehensive advice in *South Australia's climate change vision: Pathways to 2050*, proposing eight high-level recommendations and 29 actions to support South Australia's transition to a low carbon, resilient economy. In the formal response to this advice, the Government made a commitment to develop a new strategy for climate change action, in consultation with the community.

During 2015 the Council focussed on providing strategic input to the development of the new Climate Change Strategy. Council members also had an integral role in the design, delivery and promotion of the consultation process to inform the new strategy. The Chair represented the Council at meetings of a newly-formed Climate Change and Carbon Neutral Adelaide Cabinet Task Force and its Senior Officials Group.

Low Carbon Economy Expert Panel

In September 2015, the Government established South Australia's Low Carbon Economy Experts Panel (the Panel) to provide independent advice about climate change targets and objectives for the State to 2050. The Panel members – Dr John Hewson AM, Ms Anna Skarbek and Dr Frank Jotzo – were asked to provide advice about the key strategies and actions that should be pursued in order to meet these objectives, maximise economic opportunities, and ensure that the South Australian economy is best placed to adjust to a carbon constrained future.

The Panel's final report was released in November 2015. It found that it is feasible for South Australia to achieve a target of net zero emissions by 2050 and that a commitment to this target will position South Australia well in a low carbon world. The Panel also made recommendations for the Government to support the community and industry to transition to a net zero emissions economy, including comprehensive engagement. It also recommended a number of actions for the immediate pursuit of the State's low carbon transition.

National and International leadership and engagement

The South Australian Government has continued to undertake engagement activities and demonstrate leadership at a national and international level. Internationally, South Australia continues as the longest standing co-chair and a founding member of The Climate Group's States and Regions Alliance. This Alliance comprises over 30 sub-national governments from across the world, bringing leaders together in a network to influence international dialogue on climate change, share expertise and show the impact of sub-national government actions to address climate change. Through this role, the Premier has actively advocated for Victoria, New South Wales, the Australian Capital Territory and Queensland to join the Alliance. South Australia also leads the States and Regions Alliance's Adaptation Peer Forum. Topics discussed through this forum have included approaches to

adaptation planning, natural disaster risk management, private sector engagement and economic incentives, and private sector approaches to risk and resilience.

In April 2015, the Government signed the *Compact of States and Regions* and the Adelaide City Council signed the *Compact of Mayors*. This is the first time in Australia that a State government and the capital city council have both signed key international agreements on climate change.

In May 2015, the Premier and the Minister for Climate Change hosted the Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC), Ms Christiana Figueres, who briefed climate change Ministers and senior officials from local government, States, Territories and the Australian Government about the work to develop the new global agreement on climate change. This meeting gave rise to the ongoing Climate Change and Energy Working Group, which is convened by South Australia, Victoria, Queensland and the Australian Capital Territory, with the Commonwealth, New South Wales and Tasmania participating as observers. This group will continue to work on key areas, including opportunities to drive uptake in renewable energy, harmonise energy efficiency schemes, improve information sharing and best practice delivery in adaptation, and share information on emission reduction targets.

South Australia is also an active participant in the Climate Change Adaptation Working Group (chaired by Victoria) established in February 2015 through the Council of Australian Governments (COAG) Meeting of Environment Ministers. This group will share knowledge and progress policy on issues such as adaptation planning and strategies, coastal adaptation and legal liability, climate change and insurance, and private sector engagement.

During 2014 and 2015, the Government participated in a number of key international conferences, including the United Nations Climate Summit in New York in September 2014, and the 20th Session of the Conference of the Parties (COP20) under the UNFCCC in Lima, Peru in December 2014. In June 2015, the Minister for Climate Change spoke at an event organised by the Bavarian Government entitled *Adaptation to Climate Change in the Focus of Companies - Opportunities and Risks for the Economy* and participated, along with the Premier, in the World Summit of Climate and Territories held in Lyon, Paris.

The Premier, the Minister, the Chair of the Premier's Climate Change Council and the Lord Mayor of Adelaide attended COP21 under the UNFCCC, held from 30 November to 11 December 2015 in Paris. The Premier played a key role as the chair of a session with the UN Secretary-General, Ban Ki-moon, attended by State and Regional Government leaders. The Premier also co-chaired the General Assembly for members of The Climate Group's States and Regions Alliance. At the commencement of the conference, the States and Regions Alliance released a COP21 position paper, originally proposed by the Premier, which outlined the achievements of the Alliance members and their critical role, and called on national governments to take similar strong action through the international agreement in Paris.

At COP21, South Australia became a signatory to key international agreements for sub-national governments, including the *Subnational Global Climate Leadership Memorandum of Understanding* (known as the "Under2MOU") and the *RegionsAdapt* initiative. The Government also joined with non-state actors from cities, regions, business, investment, trade unions and civil society in signing the *Paris Pledge for Action*.

Emissions reduction and innovation

Government programmes provided support and information for key industries such as primary producers, tourism and the cleantech sector to actively improve business resource efficiency and reduce emissions. The *New Horizons* programme, led by Primary Industries and Regions South Australia (PIRSA), is designed to make dryland farming more productive by introducing farming practices to improve soils structure and therefore improve yield. Extensive trials undertaken in 2014 demonstrated the success of the technique. The waste industry also demonstrated advances with a survey of members of the *Zero Waste SA Industry Programme* in October 2015, identifying that 2,178 tonnes of CO_2e were saved through these programmes. Since 2013/14, the Premier's

Research and Industry Fund, a Government investment programme for scientific research in South Australia, has awarded $3.2 million to six renewable energy projects and four climate change related projects.

On 1 December 2014, the Premier convened a Clean Energy Summit with clean energy industry and community leaders to discuss the need for continued investment in renewable energy in Australia. The Premier and Minister for Climate Change also hosted a "Green Jobs" forum in June 2015 to gather feedback from industry and researchers regarding the opportunities to grow the cleantech sector in South Australia, and the role that the Government can play to assist businesses to create jobs by linking local and global action on climate change with industry development. A follow up forum in November 2015 provided an update on key State Government procurement and policy initiatives which seek to reaffirm the strong commitment to action on climate change and support local industry.

Legislative changes made to support the transition to a low carbon economy include the *Pastoral Land Management and Conservation (Renewable Energy) Amendment Act 2015* and the *Local Government (Building Upgrade Agreements) Amendment Bill 2015*. The *Planning, Development and Infrastructure Bill 2015* has been developed to provide a guiding framework for South Australia's planning reforms. The Bill sets out statutory objects which are then further elaborated in "principles of good planning". These include a focus on: ecologically sound policy frameworks responsive to emerging challenges and seeking to promote equity between present and future generations; and sustainability principles with a specific focus on energy efficient urban environments, sustainable resource use and renewal. At the time of writing this report, the Bill was before Parliament.

The transport and planning area has the potential to make a significant contribution to climate change mitigation and adaptation. In terms of state-wide planning, in 2015 the Government released its *Integrated Transport and Land Use Plan* to integrate longer term planning for land development, transport and infrastructure. Since 2007, $2.6 billion has been invested to extend the tram network through the city and upgrade and electrify the Adelaide Metro rail system. The Adelaide metropolitan bus fleet is powered by lower emission alternative fuels, including gas and bio-diesel. Adelaide's network of bicycle lanes and paths was extended from approximately 480 kilometres in 2002 to 1,227 kilometres in 2015. In Adelaide, and regional South Australia, an increase in cycling participation was observed between 2013 and 2015. In 2015, on average 16.7 per cent of residents rode a bicycle in a typical week and about a third (33.2 per cent) had done so in the past year.

South Australia is planning for a more compact urban form through the objectives and policies contained within volumes of the South Australian Planning Strategy, in particular the *30 Year Plan for Greater Adelaide*. Regional volumes of the Planning Strategy similarly seek to contain the footprint of urban or town centres in order to minimise the environmental impacts of development while preserving high value environmental and primary production land. South Australia's building sector continues to pursue improvements in building research, innovation and practice. These opportunities are supported with a regulatory and policy regime that continues to increase performance standards. One of the policy initiatives developed to support these directions is the *Design Review Programme*. Independent experts provide advice on major development proposals, which helps to improve the design quality and delivers environmental and social benefits.

Renewal SA has sought Green Star Communities certification for developments at Bowden and Tonsley Park to demonstrate that they have reached a high level of performance for environmental, social and economic sustainability outcomes. Tonsley has achieved a 6 Star Green Star – Communities certification and is Australia's first mixed-use urban redevelopment to achieve world leading status. Eight buildings in the Bowden precinct have achieved 5 Star Green star *as designed* ratings for residential development with a further five developments registered for ratings.

The Retailer Energy Efficiency Scheme was continued through regulation on 6 November 2014. The scheme will continue to 31 December 2020. Between 2009 and 2014 the scheme assisted 245,087 households to become more energy efficient.

With a focus on innovation for climate change mitigation, there is a range of measures where the Government is investing in its own operations. These include:

- continued installation of solar panels on government owned and operated buildings, totalling 170 kilowatts installed in the two years to December 2015
- an expression of interest process to investigate opportunities to convert the government fleet to low or zero emissions
- an expression of interest process to deliver reliable and affordable low-carbon electricity to meet up to 100 per cent of government's electricity needs, and
- an expression of interest process for the installation of battery energy storage as demonstration sites with high profile city building with existing solar photovoltaic (PV) installations.

Climate change adaptation

South Australia's climate change adaptation framework, *Prospering in a Changing Climate,* was launched in 2012. Central to the framework is a regional approach that empowers communities to collaborate in assessing vulnerability to climate change and articulating responses at the regional scale. By December 2015, five regions – Yorke and Mid North, Eyre Peninsula, Southern Adelaide, Murray-Darling Basin and Barossa – had completed climate change adaptation plans. The remaining regions are on track to deliver their plans in 2016.

During the reporting period, the *Prospering in a Changing Climate Grants Scheme* provided grants for regional adaptation planning projects, innovative adaptation actions, research projects, and innovative community engagement tools. In support of the adaptation framework, the Government also partnered with the Local Government Association (LGA) to provide advice to councils, Natural Resources Management (NRM) boards and Regional Development Australia (RDA) committees on adaptation, including developing the *Climate Adaptation Planning Guidelines* and supporting *Science to Solutions*, a significant project looking at overcoming barriers to adaptation within these organisations. In 2014 the Government and the Local Government Association (LGA) co-hosted the South Australian Climate Change Adaptation Showcase, attracting approximately 200 delegates.

The Government has entered into voluntary sector agreements under the Act to support adaptation planning, including with the LGA and regional groups.

During 2014, the Government collaborated with the Coast Protection Board and the LGA to investigate the management of sea level rise risks faced in coastal areas and including commissioning the report *Defining the Sea Level Rise Problem in South Australia: Issues Paper*.

The Government has worked with the National Climate Change Adaptation Research Facility (NCCARF) on a number of projects to deliver strategic research and tools to support climate change adaptation action in South Australia. In 2016, Adelaide will host the next national NCCARF and CSIRO Climate Adaptation Conference and the State Government will be a platinum sponsor.

In 2015, South Australia's Goyder Institute for Water Research developed, for the first time, regional climate change projections to 2100 for each individual rainfall station across the State's NRM regions as part of the *SA Climate Ready* project. These projections complement the national scale projections produced by the CSIRO and the Australian Bureau of Meteorology in 2015 as part of the *Climate Change in Australia* project.

In the new Climate Change Strategy, the State Government has committed to develop a state-wide, whole-of-government adaptation action plan to guide future work and provide a framework for priority adaptation actions by government. Areas of focus will include key issues highlighted in regional adaptation planning processes, such as engagement with industry and support for vulnerable communities.

Community Engagement and Initiatives

The Government has continued to deliver a range of awareness and behaviour change projects relating to climate change. These activities were in addition to the consultation process undertaken in September and October 2015 to inform the development of the new Climate Change Strategy, and other engagement activities outlined in this section.

Climate change was a key theme of the DEWNR stand at the Royal Adelaide Show in 2015 that attracted approximately 16,000 visitors.

In 2015, DEWNR assisted the Conservation Council of South Australia to engage the South Australian community on climate change. A range of activities are being progressed, including exploring community owned energy schemes, a public art project in the CBD, developing a *Roadmap for Energy Transition* with unions and industry, and organising a series of expert speaker seminars.

The *Climate Change 101 – things you can do to help tackle climate change* publication was distributed at community events.

In 2014, a grant was provided to the Australian Red Cross to develop a community engagement strategy for climate change adaptation in the Yorke and Mid North and Eyre Peninsula regions. A consultation process was undertaken in 2014/15 to develop the content of the strategy, which is expected to be finalised in 2016.

The *Energy Partners Programme* is working with over 90 organisations across the social, environmental, local and State government sectors to help South Australian households manage their energy use and costs and improve their energy efficiency. Established in 2011, the programme provides access to energy expertise and advice, creates online and printed resources, shares information, promotes relevant government services, offers home energy audit toolkits and facilitates energy training for staff and volunteers.

The Government's Solar Feed-in Scheme, which closed to new entrants on 30 September 2013, was successful in promoting the uptake and community acceptance of rooftop solar PV installations. Demand for these systems remains strong, with approximately 900 applicants per month wishing to install a solar PV system. South Australia leads the nation in the uptake of roof top solar PV, with installations in one in four households.

In 2014, the Government made an election commitment to pilot a scheme in public housing to reduce electricity bills for tenants. The commitment outlined that up to 200 homes would be selected for the trial and, if successful, the scheme would be introduced more broadly to include up to 5,000 homes over five years. Consistent with this commitment, in November 2015 the Government announced that Renewal SA would pilot a solar panel scheme on 200 new suburban Housing Trust homes and that a further 200 solar systems will be installed on existing Housing Trust homes in the Adelaide CBD.

The Adelaide City Council's *Sustainable City Incentives Scheme* is providing reimbursements for the installation of water and energy savings systems, such as solar PV panels, solar hot water systems, apartment building energy efficiency upgrades and rainwater tanks. It includes Australia's first consumer rebate for energy storage. The scheme is available to all building owners and tenants, including schools, community and sporting organisations, within the City of Adelaide. The Government, through DEWNR, has supported the scheme by doubling the total funding available in 2015/16 up to $300,000.

In the area of waste, South Australia's recycling efforts in 2013/14 saved approximately 1.12 million tonnes of CO_2e.

Programmes to encourage safer, greener and more active travel have also been initiated to reduce car use and encourage the use of public transport and bicycles. This is being achieved through implementation of workplace specific initiatives and small scale projects.

Section 2 – Targets and determinations

This section fulfils the requirement of Section 7(2)(b) of the Act.

No new targets were formally established under Section 5 of the Act within the reporting period. However, the Government has set a zero net emissions by 2050 target and aims to have 50 per cent of electricity generated in the State sourced from renewable sources by 2025.

Section 3 – Report on the progress to achieve renewable electricity targets

This section fulfils the requirement of Section 7(2)(c) of the Act and provides a report on the progress made to achieve renewable electricity targets, which are as follows:

- to increase the proportion of renewable electricity generated so that it comprises at least 20 per cent of electricity generated in the State by 31 December 2014; and
- to increase the proportion of renewable electricity consumed so that it comprises at least 20 per cent of electricity consumed in the State by 31 December 2014.

In 2009, the Government announced a target of 33 per cent of South Australia's electricity generation to come from renewable energy by 2020, pursuant to Section 5(7) of the Act. This target has been incorporated into South Australia's Strategic Plan (SASP) as Target 64.

On 23 September 2014, the Premier announced an updated renewable energy target that seeks to support the development of renewable energy so that it comprises 50 per cent of the State's electricity production by 2025. The new target has not yet been adopted under the Act.

For the purposes of reporting against the SASP Target, the Government uses a State-based approach that takes into account in-house energy use and maintains a consistent methodology across the timeframe. CSIRO uses an alternate approach in calculating the proportion of renewable energy. While this approach results in a slight variation in figures, the renewable energy targets in the Act have been achieved under either approach.

South Australia's 20 per cent generation and consumption targets in the Act were both achieved during 2010/11, approximately three years ahead of schedule. Given the achievement of the renewable energy consumption target in 2010/11, the Government now only measures progress towards its updated renewable energy generation target.

South Australia's 33 per cent generation target was exceeded during 2013/14. The Government reported that South Australia's renewable energy contribution to the State's total electricity generation amounted to 39.3 per cent in 2013/14.

The proportion of renewable energy production in the State continues to rise, with more than 41 per cent of total electricity generation from renewable energy in 2014/15.

The tables and the chart below illustrate the yearly progress towards the targets.

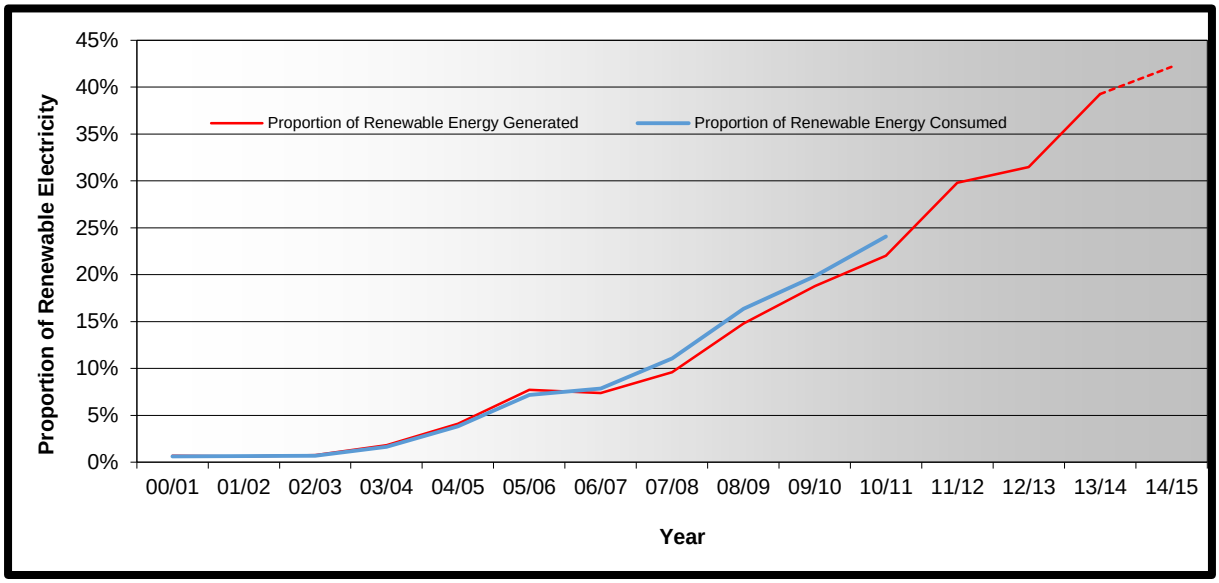
Progress towards the Renewable Electricity Generation Target

2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
0.6%	0.7%	1.8%	4.1%	7.7%	7.4%	9.6%	14.8%	18.8%	22.0%	29.8%	31.5%	39.3%	42.2%

Progress towards the Renewable Electricity Consumption Target

2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
0.6%	0.7%	1.7%	3.8%	7.2%	7.9%	11.1%	16.4%	19.8%	24.1%

Progress towards renewable electricity targets (Source: EMPD)



For the reporting period, the snapshot of the renewables sector is as follows.

- In 2014-15, wind generation was again the second most predominant fuel source for electricity generation (after gas), contributing approximately 34 per cent of the State's total electricity generation.
- As at 10 November 2015, there were 16 fully operational wind farms in South Australia, with a total installed capacity of 1,473 megawatts.
- As at 31 October 2015, there were nearly 204,265 customers approved to connect a solar system to the grid, with approximately 182,663 having their solar system installed and operating.
- $6.6 billion has already been invested in renewable energy (including wind, solar PV systems and other sources), approximately 40 per cent of it in regional areas; more than 1,330 South Australians are directly employed in the sector. Modelling suggests that every direct job created in the sector generates a further two jobs.

Section 4 – Progress against sector-based or interim targets

This section fulfils the requirement of Section 7(2)(d) of the Act and provides a report on progress toward any sector-based or interim target.

No sector-based or interim targets were established under Section 5 of the Act within the reporting period.

Section 5 – Climate change sector agreements

This section fulfils the requirement of Section 7(2)(e) of the Act and provides a report on sector agreements entered into under the Act within the reporting period.

The continued use of partnership agreements to facilitate climate change action was clearly supported by South Australia's Low Carbon Economy Expert Panel, advice from the Premier's Climate Change Council and the community consultation process on the development of the new Climate Change Strategy. The *South Australian Climate Change Strategy 2015-2050: Towards a low carbon economy* has committed to a review of the sector agreement process to ensure that sector agreements are effective in promoting partnership approaches that will assist in delivering the net zero emissions target and building a resilient state.

Two new climate change sector agreements were entered into in 2015, and two earlier agreements remain in operation.

Sector agreements commenced 2014-2015

SECTOR AGREEMENT TITLE	KEY AIMS
Adelaide City Council	• Deliver the Carbon Neutral Adelaide initiative for the area comprising the Adelaide City Council municipal area • Develop a shared vision for the Carbon Neutral Adelaide initiative, as well as an underpinning framework and an action plan • Develop and implement climate change policies and initiatives to deliver the carbon neutral vision • Foster innovation and opportunities in climate change • Implement and deliver the Building Upgrade Finance mechanism, commencing in the City of Adelaide, subject to negotiation of a suitable funding model and establishment of an appropriate legislative framework • Develop and implement climate change adaptation measures to grow community resilience to climate change impacts and costs, and enhance the City of Adelaide's liveability and vibrancy • Empower the community, businesses and institutions to take action in support of the Carbon Neutral Adelaide vision • Develop annual greenhouse gas inventories • Demonstrate climate change action leadership locally, nationally and globally
Eyre Peninsula	• Identify and promote low carbon economic opportunities in the energy, water, transport and infrastructure industry sectors • Recognise differences across the region and facilitate geographically specific responses to climate change • Collaborate to support a better understanding of climate change risks and issues for communities • Collaborate in a regional approach to further implement the adaptation plan • Facilitate and grow community engagement, and industry participation in programmes designed to promote behaviour change

Agreements in operation during the reporting period (commenced prior to the reporting period)

The LGA of South Australia sector agreement continued in operation during the reporting period and the SA Water Corporation agreement was extended to continue in operation.

SECTOR AGREEMENT TITLE	KEY AIMS
Local Government Association	• Support the implementation of South Australia's Climate Change Adaptation Framework • Implement the *Science to Solutions Project* to support adaptation decision making at the local scale • Work with the State Government to develop and implement the Building Upgrade Finance mechanism • Support the formulation of policy to address sea level rise impacts on coastal development
SA Water Corporation	• Reduce greenhouse gas emissions associated with the provision of water and waste water services for South Australia • Increase the use of renewable energy sources • Develop measures to adapt to climate change • Support necessary research

Agreements concluded

Seven climate change sector agreements completed their full term during the reporting period. These agreements were the Adelaide City Council (previous agreement), Eyre Peninsula Regional Agreement (previous agreement), Barossa Regional Agreement, Southern Adelaide Regional Agreement, Western Adelaide Regional Agreement, and the Yorke Peninsula and Mid-North Regional Agreement, and the Adelaide Brighton Cement agreement.

SECTOR AGREEMENT TITLE	KEY TARGETS
Adelaide City Council (Adelaide Green City)	• Reduce greenhouse gas emissions through measuring, reporting and implementing a reduction target • Show leadership in innovation and demonstrating new technologies • Support the greening of buildings and improved urban design • Explore options for a smarter and more efficient energy network • Support more sustainable transport • Encourage improved resource recovery in buildings and the public realm • Support the efficient use of sustainable and/or alternative water supplies • Improve and conserve the Adelaide Park Lands
Barossa Regional Agreement	• Develop and implement a community education and behavioural change programme • Work with local industry and businesses to develop climate change action plans and take advantage of environmental opportunities • Reduce greenhouse gas emissions from regional transport by improving transport and land-use planning, investigating infrastructure improvements and exploring alternative transport options • Promote sustainable urban design principles in regional development
Eyre Peninsula Regional Agreement	• Undertake integrated adaptive option assessments for Eyre Peninsula • Assess and identify economic opportunities for the Eyre Peninsula relating to climate change • Develop knowledge through science and research • Develop and implement a broad-scale community education and behavioural change programme • Develop and implement a climate change plan for the region
Southern Adelaide Regional Agreement	• Develop and deliver climate change adaptation planning and programmes in a cooperative, coordinated and consultative manner in the region • Adapt and respond to the impacts, risks, and opportunities across sectors within the region to assist with the transition to a carbon and water constrained future • Cooperate in the timely implementation of the Adaptation Plan, and its ongoing evaluation and review

Western Adelaide Regional Agreement	• Undertake an integrated vulnerability assessment of the area, and map out strategies for the region in talking climate change • Address impacts such as sea level rise, storm water, heat waves and other changes from altered climatic conditions, and their effect upon the western region of Adelaide.
Yorke Peninsula and Mid-North Regional Agreement	• Promote whole of community, interagency approach to managing climate change across the Mid-North and Yorke Region • Promote and showcase local initiatives aimed at addressing climate change impacts or mitigation • Disseminate information on the economic, environmental and social impact of climate change to this region • Develop a regional climate change adaptation plan to address the risks and vulnerabilities climate change may pose to business, the environment and communities within the region • Implement partnership projects with government, non-government, commercial, educational and research bodies that support adaptation management or mitigation of climate change impacts in the region
Adelaide Brighton Cement	• Reduce greenhouse gas emission associated with the manufacture and use of cement and lime products in South Australia • Increase the use of renewable energy • Encourage industry partners and other external stakeholders to implement similar measures • Jointly promote the development of, and ultimately participating in, a global sector agreement for the cement and lime manufacturing sectors

Section 6 – Levels of emissions and renewable energy

This section fulfils the requirement of Section 7(2)(f) of the Act and provides a report on levels of the State's greenhouse gas emissions and the development of technologies to reduce greenhouse gas emissions or to remove them from the atmosphere.

Analysis of South Australia's greenhouse gas emissions

The latest measure of South Australia's greenhouse gas emissions was released by the Federal Department of the Environment in May 2015 and provides estimates of emissions in 2012/13 and revises data in previous years[1].

The dataset maintained by the Federal Government provides the basis for reporting each State Greenhouse Gas Inventory (SGGI), the National Greenhouse Gas Inventory (NGGI) and related reporting for meeting international obligations under the UNFCCC.

Using the latest available data, total South Australian net emissions fell by 9 per cent from 1990 to 2013, from 32.31 mega tonnes (Mt) of CO_2e to 29.25 Mt of CO_2e[2].

Energy use is the dominant source of emissions (75 per cent of the overall emissions inventory), with 35 per cent of total energy-related emissions attributed to electricity generation (including imports/exports associated with the interstate interconnector) and 30 per cent attributed to transport fuels.

Agriculture is the next largest emitter, contributing 19 per cent of the State's total emissions. The primary industries sector, including forestry and some forms of agricultural land use, plays an important role in storing carbon.

The increase in renewable energy continues to contribute to a fall in emissions from the energy sector. Also contributing to the reduction in emissions is a decline in emissions attributable to the agricultural and waste sectors since 1990, a decline of some heavy industry activity in recent years, along with an increase in abatement in the Land Use, Land Use Change and Forestry (LULUCF) sector, which has reversed from an emission source prior to 1990, to a significant sink of 2.99 Mt of CO_2e in 2013. This is mainly as a result of regulatory reforms in the 1980s that restricted broad acre vegetation clearance and an increase in revegetation and forestry activity.

Net emissions in South Australia peaked at 37.2 Mt of CO_2e in 2005/06 and have been in decline since.

Appendix B provides a more comprehensive report and breakdown of South Australia's greenhouse gas emissions.

Renewables

RenewablesSA is a State Government initiative to support the further growth of the State's renewable energy industry. It seeks to remove barriers to investment through policy and regulatory changes, provision of commercially relevant information to potential investors and working with companies to develop projects and take advantage of external funding. The initiative was the Government's response to a key recommendation by the Economic Development Board (EDB) to position South Australia as a leader in renewable energy. In its Economic Statement in March 2009, the EDB identified renewable energy as an important industry for the State's economic future and recommended strategies to promote technological innovation in a diverse range of technologies, fast track demonstration plants, minimise regulatory impediments and secure industry investment.

[1] Due to updated methodologies, introduction of new sources of emissions and improved data on activity levels within the economy, the data reported in the NGGI can change. As a result of such revisions, the latest SGGI is used to provide reporting and includes revised data on all earlier years, including 1990 to 2013. At times this will introduce inconsistencies with earlier reporting.

[2] Includes Land use, Land Use Change and Forestry (LULUCF) as well as net emissions associated with the import and export of electricity interstate.

RenewablesSA commenced in mid-2009, coinciding with the Government's announcement of its target to increase the State's renewable energy production to 33 per cent by 2020. This target was achieved in 2013/14. In 2014, a new target of 50 per cent by 2025 was set, subject to national renewable energy policy being retained. South Australia's significant installed capacity in renewables has translated into investment to the State of $6.6 billion to date, with 40 per cent of this occurring in regional areas. In recognition of the economic benefits, South Australia has committed to an investment target of $10 billion in low carbon generation by 2025.

RenewablesSA undertook public consultation in 2015 on a Low Carbon Investment Plan strategy paper to support the investment target of $10 billion in low carbon generation by 2025. A final Investment Plan was released in December 2015.

A significant focus for RenewablesSA has been the implementation of reforms to the regulatory environment to make the State the most attractive jurisdiction for renewable energy investors. When the *Pastoral Land Management and Conservation Act 1989* was originally drafted, renewable energy development was not envisaged. RenewablesSA supported the passage of the *Pastoral Land Management and Conservation (Renewable Energy) Amendment Bill 2014* through Parliament in October 2014 to allow the co-existence of wind farm developments with pastoralism and fast-track access to pastoral land for commercial scale solar development. In September 2015, the Governor of South Australia proclaimed legislative amendments to provide a form of tenement for wind farm developers on pastoral leasehold land and fast-track access to pastoral land for commercial scale solar development.

In instances where prospective mineral, energy and wind resources are co-located, a framework for multiple land uses is important to ensure that wind energy generation can co-exist with mineral and energy exploration and mining or production activities. Using multiple land use principles, and working with Department of Planning, Transport and Infrastructure (DPTI), RenewablesSA facilitated multiple land access issues for a major wind farm development.

RenewablesSA is continuing to work with a company which is developing a renewable project integrating existing diesel generators at the off-grid township of Coober Pedy to reduce reliance on diesel by facilitating approvals for land access for the project. It also facilitated the Government's sponsorship of two renewable energy projects under Section 49 of the *Development Act 1993*, enabling these projects to be assessed under the crown development pathway.

Another focus has been the commissioning of commercially relevant information to inform investment decisions. In October 2014, RenewablesSA released a resource for potential solar developers and investors interested in understanding the general processes to develop commercial scale solar projects in South Australia.

RenewablesSA has worked with Unity Housing Company, the largest non-government and not-for-profit housing provider in South Australia, and provided $100,000 of State Government funding towards a pilot project using a new model for financing to enable people in low income regional housing to take advantage of solar power. As part of the Commonwealth Government's National Affordable Rental Scheme (NRAS), the initiative was completed in late 2014, resulting in solar installations in 80 newly constructed affordable houses in regional towns in the Mid North and Upper Spencer Gulf, using locally manufactured Tindo Solar products.

Section 7 – Offset programmes and national emissions trading scheme

This section fulfils the requirement of Section 7(2)(g) of the Act. It provides information regarding emissions offset programmes established or recognised under the Act during the reporting period and reports progress in establishing a national emissions trading scheme.

A report on emissions offset programmes established or recognised under the Act during the reporting period

No South Australian emissions offset programmes have been established or recognised under the Act.

South Australia's Climate Change Strategy 2015-2050 – Towards a low carbon economy includes a commitment to develop a new State Carbon Sequestration Strategy to provide direction to, and outline opportunities for, carbon sequestration activity in South Australia. South Australia's Low Carbon Economy Expert Panel reported that South Australia has an excellent opportunity to develop a profitable offsets industry. As a first step, a discussion paper will be developed in consultation with NRM boards, primary producers and industry that outlines the challenges and risks, current science and potential opportunities.

The Australian Government introduced the National Carbon Offset Standard on 1 July 2010, providing national consistency in the voluntary carbon market. The Commonwealth Government conducted a review of the standard and a new version of the National Carbon Offset Standard and the Carbon Neutral Programme Guidelines, which were released on 24 November 2015. The review outcomes related to streamlined auditing procedures, improved guidance on emissions reporting and a revised list of offsets eligible under the National Carbon Offset Standard, which will be implemented throughout 2016. The aim of these reforms is to make it easier for organisations to become carbon neutral, provide better opportunities for businesses to take voluntary action on climate change, and give consumers wider carbon neutral purchasing choices.

A report on progress in establishing a national emissions trading scheme

On 8 November 2011, the Senate passed the national Clean Energy Future package. This macro-economic reform commenced with a price on carbon from 1 July 2012 and transitioned to a cap and trade emissions trading scheme on 1 July 2014. Following the election of a Federal Coalition Government, the *Clean Energy Legislation (Carbon Tax Repeal) Bill 2013* to remove Australia's carbon pricing system was introduced to the Parliament on 13 November 2013 by the Prime Minister. The carbon tax repeal legislation took effect from 1 July 2014. In securing the passage of the repeal legislation, an agreement was reached to retain the Climate Change Authority. The Authority has been tasked with undertaking an 18-month enquiry into the establishment of an Emissions Trading Scheme (ETS), including a review of schemes being implemented by Australia's major trading partners. Its report is now available at http://www.climatechangeauthority.gov.au/.

South Australia continues to advocate for the adoption of a national ETS to provide a market-based mechanism for reducing emissions. Putting a price on carbon is considered to be the most effective mechanism for reducing emissions across the globe. This is confirmed by the two year period in which the Clean Energy Future package was in operation. Data from the Australian Energy Regulator (AER) shows that in the National Electricity Market (NEM) between 2012/13 and 2013/14:

- output from brown coal generators fell by 16 per cent;
- output from black coal generators fell by 9 per cent;
- emissions intensity of the National Emissions Market declined by 4.7 per cent; and
- reduced emissions intensity coupled with reduced demand resulted in emissions being 10.3 per cent lower.[1]

AER's 2015 report also observes that the repeal of the carbon pricing mechanism has led to coal generators being returned to service and a significant fall in hydro generation output, contributing to a rise in emissions in the NEM of 4.3 per cent in the year to 30 June 2015. It also notes concerns of Pitt & Sherry relating to rising emissions in the NEM, projecting them to be 4.7 per cent higher than current levels by 2018-19.

[1] Australian Energy Regulator, State of the Energy Market 2015

Section 8 – Intergovernmental agreements

This section fulfils the requirement of Section 7(2)(h) of the Act and provides a report on inter-governmental agreements relevant to climate change entered into by the South Australian Government. Relevant international agreements are reported in Section 9.

The Government did not enter into any formal intergovernmental agreements associated with climate change during the reporting period.

However, on 4 May 2015, the Premier and the Minister for Climate Change hosted a leading United Nations climate change official, who briefed climate change ministers and senior officials from local government, States, Territories and the Australian Government about the work being done to develop the new global agreement on climate change. The Executive Secretary of the UNFCCC, Ms Christiana Figueres, congratulated Adelaide on its carbon neutral aspirations and spoke about what was being done at an international level. In particular, Ms Figueres spoke about the progress towards generating a new global agreement on climate change for the COP 21 under the UNFCCC which was held from 30 November to 11 December 2015.

Jurisdictional representatives included the Deputy Chief Minister from the Australian Capital Territory and Environment and Climate Change Ministers from South Australia, Victoria and Queensland. The Australian, New South Wales and Tasmanian Governments were represented at the Senior Official level. Local government was represented by the Australian Local Government Association and the Lord Mayor of Adelaide.

The meeting agreed on four key focus areas for collaborative action:

- identify opportunities to develop joint policies to drive uptake in renewable energy, including large scale solar and wind projects
- identify approaches to harmonise the delivery of energy efficiency schemes to further reduce costs for households and businesses and to improve consistency across States and Territories
- improve information sharing and best practice delivery in adaptation to support community resilience in responding to the impacts of climate change, and
- share information on emission reduction targets and how individual jurisdictions are tracking against these targets.

All attending Ministers agreed to work collaboratively, including through the establishment of a Senior Officer level working group.

Section 9 – International commitments

This section fulfils the requirement of Section 7(2)(i) of the Act and provides a report on international commitments or agreements relevant to climate change made or entered into by South Australia. National commitments and agreements have been reported on in Section 8.

South Australia continued its international leadership role during the reporting period. This included the signing of several new international agreements, leading a peer forum on adaptation and attending events associated with The Climate Group's States and Regions Alliance. South Australia is a founding member of the Alliance and its longest standing co-chair. The Alliance brings together sub-national government leaders from around the world in a network to influence international dialogue on climate change, to share expertise, and to show the impact of sub-national government actions to address climate change. It comprises over 30 sub-national governments, including Quebec, California, New York State, the Basque Country, Scotland, Bavaria, Lombardy, Gujarat, Rio De Janeiro, KwaZulu-Natal and the China Regional Low Carbon Alliance.

In April 2015, South Australia became a signatory to the *Compact of States and Regions*, the first ever single, global account of greenhouse gas reduction targets made by state and regional governments. The Compact is supported by the United Nations and is a partnership between The Climate Group, R20, the Network of Regional Governments for Sustainable Development (nrg4SD) and CDP (formerly known as Carbon Disclosure Project). In May 2015, the Government submitted its first report under the *Compact of States and Regions*. At the same time, Adelaide City Council signed the equivalent *Compact of Mayors*, making South Australia the first Australian State where a State government and the capital city council had both signed key international agreements on climate change.

In 2014, DEWNR supported participation by the State Government at the United Nations Climate Summit in New York and at the COP20 under the UNFCCC in Lima, Peru. These key international events provided an important forum to showcase South Australia's leadership in climate change action and progress. In June 2015, the Minister for Climate Change spoke at an event organised by the Honorable Ulrike Scharf, Bavarian State Minister for the Environment and Consumer Protection, on *Adaptation to Climate Change in the Focus of Companies - Opportunities and Risks for the Economy*. In July 2015, the Premier and the Minister attended the World Summit of Climate and Territories held in Lyon, France. The Summit was supported by the Government of France as an official event in the lead up to the COP21 under the UNFCCC.

The Premier, the Minister, the Chair of the Premier's Climate Change Council and the Lord Mayor of Adelaide attended COP21, which was held from 30 November to 11 December 2015. At the commencement of the conference, the States and Regions Alliance released a COP21 position paper outlining the achievements of the Alliance members and highlighting their critical role, calling on national governments to take similar strong action through the international agreement in Paris. This paper was originally proposed by the Premier of South Australia as co-chair of the States and Regions Alliance.

The *Subnational Global Climate Leadership Memorandum of Understanding* (known as the "Under2MOU") is a joint initiative of the Governments of California and Baden-Württemberg and is supported by The Climate Group. It brings together states and regions willing to commit to limiting greenhouse gas emissions to 2 tonnes per capita, or 80-95 per cent below 1990 levels, by 2050. Signing of the Under2MOU at COP21 complemented the new target set by the State Government of net zero emissions by 2050, exceeding the Under2MOU requirement. During COP21, South Australia also became a founding member of the *RegionsAdapt* initiative, which aims to help sub-national governments develop adaptation plans and facilitate global peer learning and best practice. The initiative recognises that climate mitigation and adaptation are crucial and complementary strategies, and that it is at the sub-national level where a strong adaptation response is most needed and where government has the jurisdictional capacity to act.

Following COP21, South Australia became a signatory to the *Paris Pledge for Action*. The intent of this pledge is to recognise the leadership and commitment shown by all non-state actors, including state and regional governments. The pledge is an opportunity to bring together the various different pledges, commitments and announcements from sub-national governments, cities, businesses and investors, civil society and trade unions into a collective official statement.

Section 10 – Impacts of climate change

This section fulfils the requirement of Section 7(2)(j) of the Act and provides information on rates, trends or impacts associated with climate change.

Changes in the climate system have already been observed at the global and local levels. Climate change will have varied impacts on all parts of the community and the South Australian economy. Despite global action to curb greenhouse gas emissions, South Australia is likely to be affected by changing agricultural production, impacts on public health, community wellbeing, natural landscapes and wildlife habitats, and damage to both coastal property and public and private infrastructure.

In 2015, two new and complementary sources of climate impacts information were launched – a national *Climate Change in Australia* website and the *SA Climate Ready* projections developed by the Goyder Institute for Water Research.

Climate Change in Australia website

The Climate Change in Australia website was developed using funding from the Commonwealth Department of the Environment under the Regional Natural Resource Management Planning for Climate Change Fund. The project was co-funded and delivered by the CSIRO and the Australian Bureau of Meteorology.

This website contains numerous links to climate change projections information for Australia. The projections are spatially focused around natural resource management "clusters" for which summary information is available. Also available to registered users is a range of model outputs, including climate model data formulated specifically for use in further studies or applications.

The website includes a number of "dashboards" that allow users to explore the projections through looking at maps of change and graphical descriptions of change. The website is available at http://www.climatechangeinaustralia.gov.au.

Climate Change in Australia indicates that South Australia is projected to experience:

- continued increases in average temperatures across all seasons
- more hot days and warm spells, with fewer frosts
- decreases in annual rainfall, with decreasing rainfall in the cool season (although rainfall projections in the warm season are less clear)
- increases in the intensity of extreme rainfall events and time spent in drought
- continued mean sea level rise and an increase in the height of extreme sea level events, and
- a harsher fire weather climate in the future.

Goyder Institute for Water Research

As part of its work on *SA Climate Ready*, the Goyder Institute for Water Research has developed, for the first time, projections for individual weather stations across the State's natural resources management regions that extend to 2100, for "intermediate" and "high" emissions pathways. This information can be accessed through the Institute's website (http://www.goyderinstitute.org/) and the Government's Enviro Data SA website (https://data.environment.sa.gov.au).

Temperature and rainfall projections

The latest rainfall and temperature projections to 2050 and 2090 are presented below. This information is based on selected future climate change scenarios, projected to occur under two future emissions scenarios described by the Intergovernmental Panel on Climate Change (IPCC) as "representative concentration pathways" (RCPs). The high emissions scenario referred to in this document is RCP8.5 and the intermediate emission scenario is RCP4.5. Each table displays the median projection in bold (50th percentile) and the range (10–90th percentile) below this figure in brackets. Changes are relative to the 1995 baseline period. The table displays information from *Climate Change in Australia* (CCIA) and *SA Climate Ready* projection (Goyder) sets.

Climate change projections for South Australia to 2050

Source	Region	Annual rainfall change (%) Median (range)		Annual maximum temperature increase (°C) Median (range)		Annual minimum temperature increase (°C) Median (range)	
		Intermediate Emissions	High Emissions	Intermediate Emissions	High Emissions	Intermediate Emissions	High Emissions
CCIA	**Southern and South Western Flatlands**	**-7.3** (-16.4 to 1.0)	**-10.7** (-20.7 to 1.2)	**1.3** (0.9 to 1.7)	**1.6** (1.4 to 2.1)	**1.1** (0.7 to 1.4)	**1.4** (1.8 to 1.8)
Goyder	**Adelaide and Mount Lofty Ranges**	**-6.8** (-8.8 to – 3.5)	**-7.4** (-14.0 to -4.0)	**1.3** (1.1 to 1.5)	**1.6** (1.5 to 2.3)	**1.0** (0.7 to 1.2)	**1.3** (1.2 to 1.8)
	Kangaroo Island	**-7.5** (-10.2 to -4.5)	**-8.9** (-13.9 to -3.8)	**1.1** (0.8 to 1.2)	**1.3** (1.1 to 1.8)	**0.8** (0.6 to 1.1)	**1.1** (0.9 to 1.6)
	Northern and Yorke	**-12.0** (-17.5 to -4.7)	**-13.5** (-24.2 to -7.3)	**1.4** (1.2 to 1.6)	**1.7** (1.6 to 2.5)	**1.1** (0.9 to 1.3)	**1.5** (1.3 to 2.0)
	Eyre Peninsula	**-9.5** (-14.5 to -5.4)	**-10.1** (-19.4 to -6.0)	**1.2** (1.0 to 1.4)	**1.6** (1.5 to 2.1)	**1.0** (0.8 to 1.2)	**1.3** (1.1 to 1.8)
CCIA	**Rangelands**	**-1.7** (-12.7 to 7.3)	**-2.1** (-14.6 to 8.8)	**1.6** (1.1 to 2.1)	**2.0** (1.5 to 2.6)	**1.4** (0.9 to 1.9)	**1.9** (1.6 to 2.4)
Goyder	**Alinytjara Wilurara and SA Arid Lands**	**-12.1** (-16.9 to -1.9)	**-7.6** (-23.7 to -0.6)	**1.5** (1.2 to 1.7)	**2.1** (1.7 to 2.6)	**1.2** (1.1 to 1.5)	**1.6** (1.6 to 2.3)
CCIA	**Murray Basin**	**-1.0** (-12.5 to 6.5)	**-3.7** (-14.2 to 8.0)	**1.4** (0.9to 1.9)	**1.9** (1.4 to 2.3)	**1.2** (0.8 to 1.4)	**1.6** (1.3 to 2.0)
Goyder	**SA Murray Darling Basin**	**-10.4** (-12.5 to -4.5)	**-12.2** (-18.4 to -7.7)	**1.3** (1.2 to 1.6)	**1.7** (1.6 to 2.4)	**1.0** (0.9 to 1.3)	**1.5** (1.2 to 1.9)
	South East	**-4.8** (-8.4 to -3.1)	**-7.9** (-10.1 to -1.9)	**1.1** (1.0 to 1.4)	**1.4** (1.3 to 2.2)	**0.9** (0.8 to 1.1)	**1.3** (1.1 to 1.7)

Climate change projections for South Australia to 2090

Source	Region	Annual rainfall change (%) Median (range)		Annual maximum temperature increase (°C) Median (range)		Annual minimum temperature increase (°C) Median (range)	
		Intermediate Emissions	High Emissions	Intermediate Emissions	High Emissions	Intermediate Emissions	High Emissions
CCIA	**Southern and South Western Flatlands**	**-10.4** (-21.6 to -0.5)	**-14.6** (-36.2 to -2.5)	**1.8** (1.2 to 2.3)	**3.8** (2.7 to 4.3)	**1.6** (1.0 to 2.0)	**3.2** (2.5 to 3.8)
Goyder	**Adelaide and Mount Lofty Ranges**	**-7.7** (-10.7 to - 5.0)	**-15.6** (-25.3 to -11.2)	**1.8** (1.5 to 2.2)	**3.2** (2.8 to 4.3)	**1.3** (1.0 to 1.9)	**2.8** (2.3 to 3.5)
	Kangaroo Island	**-8.0** (-11.3 to -5.4)	**-16.9** (-26.4 to -13.3)	**1.4** (1.1 to 1.9)	**2.6** (2.3 to 3.6)	**1.2** (0.9 to 1.7)	**2.2** (2.0 to 3.1)
	Northern and Yorke	**-14.1** (-18.6 to -9.6)	**-23.6** (-36.8 to -20.3)	**1.9** (1.7 to 2.4)	**3.4** (3.0 to 4.7)	**1.5** (1.2 to 2.1)	**3.1** (2.6 to 3.9)
	Eyre Peninsula	**-9.1** (-14.2 to -6.9)	**-19.2** (-30.8 to -12.8)	**1.7** (1.5 to 2.1)	**3.1** (2.7 to 4.0)	**1.4** (1.1 to 1.9)	**2.6** (2.4 to 3.5)
CCIA	**Rangelands**	**-4.7** (-15.4 to 6.6)	**-4.1** (-31.9 to 17.7)	**2.2** (1.4 to 3.1)	**4.4** (2.9 to 5.6)	**2.0** (1.3 to 2.7)	**4.1** (3.1 to 5.2)
Goyder	**Alinytjara Wilurara and SA Arid Lands**	**-9.9** (-14.2 to -2.1)	**-13.8** (-31.5 to -8.5)	**2.0** (1.9 to 2.5)	**4.0** (3.2 to 4.9)	**1.8** (1.5 to 2.4)	**3.3** (3.2 to 4.5)
CCIA	**Murray Basin**	**-5.7** (-16.1 to 3.9)	**-5.0** (-26.7 to 8.6)	**2.0** (1.3 to 2.6)	**4.1** (2.9 to 5.0)	**1.7** (1.1 to 2.1)	**3.5** (2.8 to 4.2)
Goyder	**SA Murray Darling Basin**	**-11.0** (-15.0 to -8.4)	**-21.5** (-29.3 to -14.4)	**1.8** (1.6 to 2.3)	**3.3** (3.0 to 4.5)	**1.4** (1.2 to 2.0)	**3.0** (2.6 to 3.7)
	South East	**-6.8** (-9.2 to -3.5)	**-15.7** (-21.3 to -10.8)	**1.6** (1.3 to 2.0)	**2.9** (2.7 to 4.1)	**1.3** (1.0 to 1.8)	**2.6** (2.3 to 3.4)

Sea level rise projections

Mean sea level will continue to rise and the height of extreme sea level events will also increase. By 2030 the projected range of sea level rise for the southern Australian coastline (comprising Tasmania, southern Victoria and south-east New South Wales, south-west Western Australia and southern South Australia) is 0.07 to 0.19 metres above the 1986-2005 level, with only minor differences between emission scenarios. By 2090, the intermediate emissions case (RCP4.5) is associated with a rise of 0.27 to

0.66 metres and the high case (RCP8.5) a rise of 0.39 to 0.89 metres. Under certain circumstances, sea-level rises higher than these may occur[2].

Impacts of climate change in South Australia

Impacts arising from climate change in South Australia are likely to include changing agricultural production and impacts on public health, community wellbeing, natural landscapes, wildlife habitats, and public and private infrastructure, particularly in coastal areas.

South Australia's Adaptation Framework provides for the detailed assessment of potential impacts and adaptation responses at a regional scale across South Australia. Within each region, the relevant local government authorities, NRM board and Regional Development Australia (RDA) Committee are responsible for collaborating to develop a regional adaptation plan, in partnership with the Government. All of the 12 State Government regions are on track to deliver their adaptation plans by 2016, with five already completed (Yorke and Mid North, Eyre Peninsula, Southern Adelaide, Murray Darling Basin and Barossa).

A number of broad themes have emerged from these five plans, though it must be noted that four are from rural areas. The key issues highlighted in more than one region include: biodiversity management; water resources management; industry adaptation; vulnerable citizens; community services; and planning, development and infrastructure, including green infrastructure. Regional adaptation plans can be accessed from the DEWNR website: http://www.environment.sa.gov.au.

In addition South Australia's State Public Health Plan: *A Better Place to Live* has identified preparing for climate change as one of five key priorities for action, creating a requirement for regional public health plans to consider climate change impacts. Further information can be accessed from the SA Health website: www.sahealth.sa.gov.au. Projected direct and indirect health impacts of climate change include heat stress, increases in vector-borne, water and food-borne infectious diseases, increases in respiratory diseases and allergies and physical and mental health consequences.

In addition, the following organisations and publications continue to provide new and updated information relating to climate change impacts in South Australia.

- Intergovernmental Panel on Climate Change: http://www.ipcc.ch
- National Climate Change Adaptation Research Facility: www.nccarf.edu.au
- Commonwealth Department of the Environment: https://www.environment.gov.au/climate-change
- Australian Government Climate Change Authority: http://www.climatechangeauthority.gov.au
- Commonwealth Scientific and Industrial Research Organisation: http://www.csiro.au
- Bureau of Meteorology: http://www.bom.gov.au
- South Australian Research and Development Institute: http://pir.sa.gov.au/research
- Goyder Institute for Water Research: http://www.goyderinstitute.org.

[2] Bureau of Meteorology and CSIRO (2015) *Southern Australia Projections Summaries*, http://www.climatechangeinaustralia.gov.au/en/climate-projections/future-climate/regional-climate-change-explorer/super-clusters/?current=SSC&tooltip=true&popup=true, accessed online, 23 December 2015

Section 11 – CSIRO Assessment

Under Section 7(5) of the Act, a report from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) is required in every second report under Section 7 of the Act.

A CSIRO report is not required for the 2015 Section 7 report.

APPENDIX A. Effectiveness of South Australia's climate change initiatives progress report, 2014/15

This Appendix provides a detailed overview of all individual activities undertaken in South Australia to achieve progress in climate change action during the reporting period. It is intended to complement the main body of this report, providing additional information in key areas, without repeating what has already been provided.

Key actions and achievements are reported against specific objectives set out in *Tackling Climate Change: South Australia's Greenhouse Strategy 2007-2020*, which was the relevant policy framework for meeting South Australia's greenhouse emission reduction targets and commitments until the release of the *South Australia's Climate Change Strategy 2015 – 2050: Towards a Low Carbon Economy* in late November 2015.

These objectives fall under eight areas:

1. Government Leadership
2. Adaptation
3. Community
4. Industry
5. Energy
6. Transport and Planning
7. Buildings
8. Natural Resources

Many of the objectives and their associated actions and achievements are highly interrelated. For example, the Government's leadership objective of building capacity to tackle climate change (1.3) is clearly related to, and aligned with, the adaptation objective of increasing our understanding of risks, vulnerabilities and opportunities (2.1) and the community objective of promoting individual, household and community behaviour change (3.1).

1. GOVERNMENT LEADERSHIP

Goal: South Australia will lead the nation in tackling climate change.

South Australia has built a national and international reputation for climate change leadership, through the establishment of a bold new target of net zero emissions by 2050, through involvement in The Climate Group's States and Regions Alliance, and by participating in the Lima-Paris Action Agenda as part of COP21.

Objective 1.1: To encourage early action in reducing greenhouse gas emissions

South Australia's Climate Change Strategy 2015 – 2050

The Government's new climate change strategy released in November 2015 – *South Australia's Climate Change Strategy 2015 – 2050: Towards a Low Carbon Economy* – highlights its commitment to a low carbon economy and reinforces its national and international leadership in climate change. Of note, it sets a bold new target of net zero emissions by 2050.

The strategy is organised into the following six themes.

- South Australia taking the lead on climate change action
- Towards net zero emissions
- Showcasing Carbon Neutral Adelaide
- Innovating to drive a resilient and competitive low carbon economy
- Creating a prosperous and resilient state, and
- Building community capacity to take action on climate change.

Initiatives outlined in the new strategy include:

- Continuing to support renewable energy in the State, with a target to generate 50 per cent of our electricity from renewable sources by 2025
- Investigating potential new renewable energy options for the State
- A range of initiatives to improve government's own operations, including improving the energy efficiency of government buildings, decarbonising government's electricity supply and reducing emissions from the government motor vehicle fleet
- Developing a State carbon sequestration strategy
- Supporting the deployment and uptake of energy storage options
- Supporting the uptake of electric vehicles
- Increasing Adelaide's green infrastructure
- Developing a state-wide, whole-of-government adaptation action plan, and
- A range of initiatives to build community capacity to take action on climate change.

Further information can be found at http://www.environment.sa.gov.au/Science/Science_research/climate-change/climate-change-initiatives-in-south-australia/sa-climate-change-strategy.

The Strategy was developed through a public consultation programme in September and October 2015. Six consultation papers were released, along with a Low Carbon Investment Plan strategy paper produced by the Department of State Development (DSD). The consultation included facilitated workshops in all 12 State Government regions, as well as an adaptation workshop, an industry workshop and a workshop held with the conservation sector.

Over 320 people participated in the workshops and approximately 200 written submissions and 40 blog posts were received. DEWNR analysed written submissions and outcomes of the workshops to inform the new Strategy.

Carbon Neutral Adelaide

The Government announced its ambition for the City of Adelaide to be the world's first carbon neutral city in February 2015 and in partnership with the Adelaide City Council released a framework, *Carbon Neutral Adelaide - A shared vision for the world's first carbon neutral city,* to support development of a detailed action plan in 2016.

A package of measures will be used to achieve the carbon neutral goal including:

- Building partnerships and encouraging community action
- Investing in energy efficiency and renewables in the city
- Transforming the way we travel
- Reducing emissions from waste
- Investing in large scale renewables across the State, and
- Identifying offset opportunities to reduce emissions and deliver economic return.

Low Carbon Investment Plan for South Australia

On 1 December 2015, the Government released a Low Carbon Investment Plan for South Australia. This plan stands alongside South Australia's Climate Change Strategy, and outlines current and new initiatives to underpin achievement of the Government's target for $10 billion investment in low carbon energy generation by 2025. The plan is framed around four strategies: clear policy and efficient regulatory environment; information to inform investment; sponsoring uptake and wider market deployment; and facilitating projects to leverage funding and support.

Premier's Climate Change Council

The primary function of the Premier's Climate Change Council is to provide independent advice to the Minister for Climate Change on emissions reduction and adaptation. It is also responsible for consulting with business, the environment and conservation movement and the wider community about climate change issues and disseminating information to encourage action. The 2014 and 2015 reporting period included some renewal of membership, as the Council commenced its third term in May 2014, and a review of its role during 2014 as part of the broader reform of the Government's boards and committees.

The members of the Council are Mr Bruce Carter (Chair), Ms Kathryn Bellette, Ms Ros DeGaris, Mr Brian Foster, Ms Nicole Halsey, Mr John O'Brien, Ms Sandy Pitcher, Dr Don Russell and Ms Michelle Tucker.

In February 2014, the Council provided the Government with comprehensive advice in *South Australia's climate change vision: Pathways to 2050*, proposing eight high-level recommendations and 29 actions to support South Australia's transition to a low carbon, resilient economy. The recommendations included:

- Continued strong leadership on climate change
- Developing bipartisan support for climate change targets
- Consulting comprehensively across community, industry, business and government
- Capturing all cost-effective abatement to reduce emissions
- Identifying funding sources to implement adaptation priorities
- Prioritising support for vulnerable community members
- Ensuring the land-use planning system supports adaptation and low carbon transition, and
- Creating the settings for an industry-led transition.

In its formal response to this advice, the Government made a commitment to develop a new strategy for climate change action, in consultation with the community. During 2015 the Council focussed on providing strategic input to the development of this new strategy.

The Chair represented the Council during meetings of a newly-formed Climate Change and Carbon Neutral Adelaide Cabinet Taskforce and its Senior Officials Group to oversee development of the climate change strategy, as well as the Government's Carbon Neutral Adelaide initiative. Council members also played an integral role in the design, delivery and promotion of the community and industry consultation programme to inform the new strategy.

During 2014 and 2015, the Council made submissions as part of the public consultation processes for:

- Draft reform recommendations of South Australia's Expert Panel for Planning Reform
- Terms of reference for South Australia's Royal Commission into Nuclear Fuel Cycle, and
- The establishment and future operations of Green Industries SA.

The Council was also represented during key State Government events to engage with South Australia's renewable energy and cleantech sectors, including the Clean Energy Summit in December 2014 and the Green Jobs Forums held in June and November 2015.

Low Carbon Economy Experts Panel

The Government appointed a panel of experts to review South Australia's current activities towards achieving a low carbon economy and provide recommendations for further action. Its members were Dr John Hewson, an economist and former leader of the Federal Liberal Party, Ms Anna Skarbek, the Executive Director of ClimateWorks, and Dr Frank Jotzo, Director of the Centre for Climate Economics and Policy at the Australian National University.

Under its Terms of Reference, the Panel was tasked with providing specific advice on: the matter of targets (including pathways to achieving targets); economic development opportunities and benefits from taking early action; measures to accelerate a reduction in emissions, increase the deployment of clean energy technologies and improve energy efficiency incentivised through government procurement and regulation; and how climate change should be taken into account when making infrastructure investment decisions.

The Panel's final report, released in November 2015, concludes that it is feasible for South Australia to achieve a target of net zero emissions by 2050 and that a commitment to this target will position South Australia well in a low carbon world. The full report can be found at http://www.environment.sa.gov.au/Science/Science_research/climate-change/climate-change-initiatives-in-south-australia/sa-low-carbon-economy-experts-panel

Objective 1.2: To demonstrate best practice in reducing emissions

Government energy efficiency

SASP includes Target 61: *Energy efficiency – government buildings: Improve the energy efficiency of government buildings by 30 per cent by 2020 (baseline: 2000-01),* with an interim target of a 25 per cent increase in efficiencies by 2014.

The *Buildings Energy Strategy 2013-2020* is the key document for managing energy use in government buildings. The energy efficiency of government buildings improved by 23.8 per cent between 2000/01 and 2013/14 and is on track to meet the 2020 target. The greenhouse gas emissions intensity of government buildings has reduced by almost 42 per cent since 2000-01.

In addition, 85 per cent of the floor space of CBD buildings (over 2,000 sqm) leased and occupied by the State Government have a NABERS energy rating of 4.0 or more stars.

Improvements in government building energy efficiency are achieved through activities such as reprogramming building management systems and upgrading lighting, air conditioning and other equipment to more efficient options.

Water efficiency in government buildings

The Government's Water Efficient Fixtures in Government Buildings policy, introduced in 2011, outlines requirements that apply to new buildings, substantial refurbishments and fitouts that directly result in the need to replace showers or taps, and contracts for general maintenance of facilities.

Water sensitive urban design – creating more liveable and water sensitive cities in South Australia was released in 2013. It commits to establishing a framework for adopting relevant performance principles into future state-managed infrastructure projects, where appropriate. A proposed approach is expected to be finalised for consideration by the Government in 2016.

Solar panels for government buildings

Solar panels continued to be installed on all new and substantially refurbished government owned and operated buildings in accordance with the Solar Panels for Government Buildings Policy. There were 34 projects which incorporated 5 kilowatt solar panels in the 2014 and 2015 calendar years.

Origin was selected to work with Renewal SA in resolving a delivery agreement for a three megawatt capacity solar electricity project at Tonsley. Subject to the resolution of commercial terms, it is intended that Origin will build and own the system and retail the electricity generated by the solar array to businesses within the development.

Low carbon electricity supply and storage for government buildings

In November 2015, an expression of interest process commenced to deliver reliable and affordable low-carbon electricity to meet up to 100 per cent of the State Government's electricity needs.

During 2015/16, an expression of interest process up to the value of $1.1 million is being undertaken to install energy battery storage at demonstration sites in government buildings within the City of Adelaide.

Objective 1.3: To build capacity to tackle climate change

South Australia's international leadership and engagement

The South Australian Government has been actively engaged in international deliberations on climate change and sustainable development issues, as highlighted in Sections 1 and 9 of this report.

Sector agreement programme

Refer to Section 5 of this report on the operation of the Act for information relevant to the reporting period.

State of the Environment reporting

State of the Environment reports are reviewed every five years, with the next report due in 2018. The most recent (2013) report includes a chapter dedicated to climate change, incorporating information on the current status of knowledge, key drivers and pressures, main responses and future priorities. It can be accessed at:
http://www.epa.sa.gov.au/data_and_publications/state_of_the_environment_reporting

2. CLIMATE CHANGE ADAPTATION

Goal: South Australia will be equipped to the best of its ability to adapt to climate change and capture opportunities.

Prospering in a Changing Climate: A Climate Change Adaptation Framework for South Australia (2012) provides the foundation for South Australians to develop well-informed and timely actions to increase their preparedness for the impacts of climate change. It guides action by government agencies, local government, non-government organisations, business and the community.

Objective 2.1: To increase our understanding of risks, vulnerabilities and opportunities

South Australia's Climate Change Adaptation Framework

The implementation of the Climate Change Adaptation Framework released in 2012 is based on three principles.

- Partnerships and co-investment: The Framework guides the development of regional adaptation action plans for each of the 12 State Government Planning Regions. These are delivered through partnerships between State and local government, regional development, natural resources management and industry.
- Integrating climate information into existing decision making processes: The adaptation action planning process delivers information that directly informs local government, natural resources management and regional development planning. It provides the basis for future iterations of those plans to be better informed by climate change.
- Innovation: Because most climate impacts will be experienced at the local scale, local innovation is likely to deliver the most effective adaptation actions. The Framework promotes the development of new ideas and establishes processes to rapidly disseminate innovation across the State.

The *Prospering in a Changing Climate Grants Scheme* distributed funds in 2012/13, 2013/14 and 2014/15 to support implementation of the *Climate Change Adaptation Framework* by providing grants for:

- Regional adaptation planning projects
- Adaptation actions that are innovative, and can serve as case studies or examples for other bodies throughout the State
- Research projects that support climate change adaptation, and
- The development and testing of innovative community engagement tools.

Regional Climate Change Adaptation Plans

SASP includes a *Target 62: Climate change adaptation: Develop regional climate change adaptation plans in all State Government regions by 2016 (baseline: 2011).* As highlighted in this report, five regions have completed their adaptation plans. Key issues highlighted in more than one region include water resources management, industry adaptation, vulnerable citizens, community and emergency services, and planning, development and infrastructure, including green infrastructure and coasts.

Primary Industry Adaptation

PIRSA's Climate Change Management Framework (2011) identifies strategies and proposed actions in South Australia's agriculture, fisheries, aquaculture and forestry sectors to support ecologically and economically sustainable development under changing climatic conditions. This includes:

- Implementation of the National Drought Programme Reform package of measures
- Working with primary industries (including dryland farming systems groups, irrigated horticulture and viticulture, commercial fishers and aquaculture industry and the forestry sector) to better understand impacts and adaptation options, and
- Managing pests, disease and biosecurity in a changing climate.

PIRSA also has made a significant contribution to the reduction of greenhouse gases by:

- Supporting the New Horizons initiative to significantly improve broad acre crop and livestock pasture productivity, sequestering soil carbon through advanced soils modifications
- Reducing livestock methane production intensity
- Reducing fuel consumption through controlled traffic adoption
- Refining role of carbon plantings in production systems, and
- Reducing production of Nitrous Oxide (N2O) in crops and pastures.

The South Australian Research and Development Institute (SARDI) Climate Applications Science Programme works to improve the assessment and management of climate risk, utilising experience in agro-climatic analysis for key dryland and irrigated industries and regular interaction with climate science from CSIRO, Bureau of Meteorology and the university sector.

A Biodiversity Corridors project aims to improve the connectivity and extent of ecosystems locally and at landscape scales with the co-benefit of increasing resilience to climate change. The last two years have seen the completion of three new corridors and commencement of a further two. A total of 14 corridors have been established to date. Monitoring has demonstrated a benefit to birds, with quantitative measures showing greater benefit at sites with significant understorey. School groups will be involved in enhancing understorey of existing corridor areas in the coming years, to improve their value in the landscape and allow faster re-colonisation of native species after droughts or fires.

Objective 2.2: To build resilient and healthy communities

Climate Change and Public Health

Public health risk assessment and research

The effectiveness of current policies and actions during extreme heat have been evaluated by comparing the health outcomes (ambulance, hospital and emergency outcomes) in the 2009 extreme heat period, during which only minimal prevention strategies were employed, with the 2014 period where wide-reaching heat health prevention strategies across were used. The results indicated a significant improvement of adverse health outcomes during the 2014 extreme heat periods.

Collaborative research between the Department of Health and Ageing and the University of Adelaide looking at the impact of extreme heat has continued to focus on environmental, social, economic and personal risk factors. Individual projects have included:

- A two-year study (2015/16) under the National Emergency Management Project scheme that will carry out a national extreme heat warning study; it will explore the regional needs for such a warning and assess relevant regional temperature triggers
- Council workers' experiences and perceptions of heat in Adelaide, and
- Investigating a set of health-related climate change indicators relevant for South Australia

Management strategies

The Department of Health and Ageing's Emergency Management Unit has developed a number of strategies to inform the public regarding extreme heat events. This includes a booklet describing heat-related conditions and what to do if people have any symptoms, along with practical tips on preparing for and coping during periods of extreme heat. The booklet and other heat health related fact sheets have been translated to provide information for non-English speaking communities.

In addition, the Office of the Chief Psychiatrist (Department of Health and Ageing) has developed a mandatory compliance directive setting out the standard procedure to be followed by SA Health staff for identifying and monitoring vulnerable mental health consumers during events of high or extreme heat conditions.

Public health planning, evaluation and climate change

Public health planning in South Australia comprises two interrelated planning mechanisms – the State Public Health Plan and Regional Public Health Plans. South Australia's first State Public Health Plan has four interrelated priority areas for action, one

of which is *Preparing for Climate Change*. It provides the opportunity to integrate public health actions with broader state-wide actions, such as climate change adaptation planning.

In addition, all Regional Public Health Plans address the impacts of climate change on public health and community wellbeing. Within this planning framework, local councils have reviewed their planning for climate change preparedness to ensure that public health implications are recognised.

The development of a public health evaluation system including public health related climate change indicators is building as the Regional Public Health Plans are evolving. In October 2015, local and State Government climate change experts came together to workshop a draft set of climate change indicators for South Australia that will inform the evaluation of both climate change adaptation plans and regional public health plans.

SA Health continues to support councils to implement their plans under this priority, through local and regional climate change adaptation planning projects. It is also working in partnership with the LGA to identify and review selected policies from the South Australian Planning Policy Library that relate to public health and will likely be impacted by climate change.

Water resource management

Water for Good, released in 2009, is South Australia's strategy to ensure safe, reliable water supplies to 2050, and to prepare for the future impacts of climate change. According to a five-year independent review conducted in early 2015, 96 per cent of the actions had been delivered, were on track or were only slightly delayed. Significant milestones relating to water resource management completed during the 2014 and 2015 calendar years include:

- An increase in the State's stormwater harvesting capacity to 22.7 gigalitres per year, compared to 13.2 gigalitres per year in 2013
- Continued the implementation of the Murray Darling Basin Plan, with delivery of around 809 gigalitres of held environmental water to priority watering sites in South Australia including the River Murray channel and the Lower Lakes, Coorong and Murray Mouth icon sites in 2014-15, and
- Around $170 million of investment has supported over 160 projects to improve farm productivity and return of a total of 34 gigalitres to the River under the South Australian River Murray Sustainability (SARMS) programme.

Further information can be found at http://www.environment.sa.gov.au/managing-natural-resources/water-use/water-planning

Objective 2.3: To improve hazard management and minimise risks

Coastal management

DEWNR has integrated climate change considerations into its coastal management programme and provides direct support to the Coast Protection Board, including funding projects that are aligned to the Board's strategic priorities. The programme's priorities include vulnerability assessments and protection strategies and responding to development applications referred by planning authorities under the *Development Regulations 2008*.

The Coast Protection Board works programme provided $137,000 in grants for adaptation investigations and works in 2013/14 and $161,000 in 2014/15.

In addition, a coastal survey programme to monitor erosion where development is vulnerable was undertaken, involving precise measurement of beach and seabed levels, to inform ongoing activities, such as sand management along Adelaide's beaches. In August 2013, the Premier's Climate Change Council provided the Minister for Sustainability, Environment and Conservation with advice in the report *Opportunities to facilitate appropriate land use decisions in order to adapt to sea level rise inundation*. In October 2013, Council's advice and the Minister's statement of response were tabled in Parliament. The Minister's response stated that the Government, in collaboration with the LGA and the Coast Protection Board, had commissioned a problem definition statement on sea level rise. The report, *Defining the sea level rise problem in South Australia*, released in December 2014, examines South Australia's coastal management systems, including coast protection and land use planning. It identifies system breakdowns and barriers to adaptation to sea level rise, as well as opportunities to improve the response to sea level rise risks.

Emergency risk management programmes

During the 2014 and 2015 calendar years, emergency risk management reports that summarise over 100 emergency risk assessment and risk treatment workshops conducted across the nine hazards (specified in the State Emergency Management Plan) were completed or reached final approval stage. Climate change data was included in the risk assessment processes where relevant and available. The Emergency Response Management reports underpin the State's 11 Zone Emergency Management Plans (ZEMPs). As at October 2015, three ZEMPs had been approved, with the remainder in final draft stage or in the assurance process.

Through 2014, presentations on the key risks associated with each of the nine hazards were provided to both the State Mitigation Advisory Group and the State Emergency Management Committee.

3. COMMUNITY

Goal: The South Australian community will be leaders in reducing greenhouse gas emissions and adapting to climate change in a way that promotes social equity and health.

The Government of South Australia has continued to deliver a range of awareness and behaviour change projects relating to climate change.

South Australia leads the nation in the uptake of roof top solar photovoltaics, with installations in one in four households. South Australia's recycling efforts in 2013-14 saved approximately 1.12 million tonnes of CO_2e.

Objective 3.1: To promote individual, household and community behaviour change

Awareness and behaviour change programme

Evidence indicates that people continue to be unclear about what personal actions they can take to mitigate the impacts of climate change. In response a brochure was developed to raise public awareness about climate change; *Climate Change 101 – things you can do to help tackle climate change* is used at community and other events to raise awareness.

The Conservation Council of South Australia received assistance to engage the community. The Council is undertaking a range of activities, including exploring community owned energy schemes, a public art project in the CBD, developing a Roadmap for Energy Transition with unions and industry, and organising a series of expert speaker seminars.

Objective 3.2: To improve the efficient use of resources by households and communities

Encouraging solar power

The success of the Solar Feed-in Scheme in promoting the uptake of solar PV systems, and the Government's commitment to support a pilot solar scheme in public housing, were highlighted earlier in this report. The Scheme closed to new entrants on 31 September 2013. Customers in the 44c/kWh feed-in tariff (FiT) category will continue to receive the premium tariff until 30 June 2028 and customers in the 16c/kWh FiT category will continue to receive it until 30 September 2016 (subject to maintaining their eligibility).

As at 31 October 2015, there were around 204,265 customers with approval to connect a solar PV system to the grid. Approximately 182,500 of these had their solar PV system installed and operating. South Australia leads the nation in the uptake of roof top solar PV, with installations in one in four households.

Sustainable City Incentives Scheme

The Adelaide City Council's *Sustainable City Incentives Scheme* reimburses building owners and tenants for the installation of water and energy savings systems. It includes Australia's first consumer rebate for energy storage. The Government, through DEWNR, is supporting the scheme by matching the Adelaide City Council funding of $150,000 in 2015/16 to provide a total of $300,000.

SA Water H2OME rebate programmes

Between November 2007 and March 2013, the Government's H2OME Rebate scheme provided more than 268,772 rebates, worth in excess of $48.6 million. The Stand Alone Rainwater Tank Rebate was the last available under the scheme (ending in March 2014). More than 32,000 rebates worth in excess of $6 million were provided.

Irrigated Public Open Space Programme

This programme, launched in 2007, was initially developed to support water efficiency during recent drought conditions and water restrictions. It continues today under Water Wise Measures, with SA Water customers irrigating greater than 5000sqm required to subscribe to the programme. Councils and schools also participate. A total of 329 IPOS permits were current in 2014/15. Many authorise irrigation for multiple sites.

The IPOS Code of Practice was reviewed and updated to reflect the changing climatic conditions and the State's environmental and water landscape. The review is now complete and the Minister for Water and the River Murray launched a new *IPOS Code of Practice and an Operational Guide for the Irrigation of Open Space* at SA Water House on 22 October 2015.

Waste avoidance, reduction and recycling programmes

South Australia's new waste strategy was released in 2015 and includes targets to reduce: municipal solid waste to landfill by 70 per cent by 2020; commercial and industrial waste to landfill by 80 per cent by 2020; and construction and demolition waste to landfill by 90 per cent by 2020.

Throughout 2014 and 2015, the Office of Zero Waste SA (now known as the Office of Green Industries SA) managed a range of grant programmes aimed at diverting waste from landfill.

Under the Metropolitan Infrastructure and Regional Implementation programmes, Zero Waste SA awarded $2.6 million to industry and councils in 2013/14 and $2.3 million in 2014/15 to stimulate investment in local waste reprocessing infrastructure. The Commercial Food Waste Incentive Programme (CFWIP) provided incentive payments of $146,490 to increase the diversion of commercial food waste across metropolitan Adelaide through collection contractors. Around 4,900 tonnes of commercial food waste from 642 sites across metropolitan Adelaide was sent to composting between May 2013 and April 2015.

In 2013/14, 1.12 million tonnes of carbon dioxide were prevented from entering the atmosphere due to landfill diversion, equivalent to taking approximately 256,900 passenger cars off the road.

Australian Service Excellence Standards for Community Organisations

The Department for Communities and Social Inclusion (DCSI) supports the community services sector in improving the quality of services and organisational systems through the Australian Service Excellence Standards (ASES). It is now mandatory for organisations to implement environmental initiatives to achieve accreditation at the Certificate Level and Award Level.

Currently there are 237 organisations engaged and working through the ASES, with 83 accredited at the Certificate Level (the accreditation cycle is three years). This constitutes 98 per cent of DCSI-funded non-government organisations involved in ASES. During the 2014 and 2015 calendar years, 51 assessments were undertaken, with all organisations achieving accreditation against the standards.

Objective 3.3: To build greenhouse friendly communities

Housing SA Design Guidelines for Sustainable Housing and Liveable Neighbourhoods

Design Guidelines for Sustainable Housing and Liveable Neighbourhoods have been developed for all types of new residential construction and set out requirements for builders in a range of areas, including environmental sustainability. They are updated annually.

Safer, Greener and More Active Travel Community Programmes

DPTI co-ordinates a number of initiatives to encourage safer, greener and more active travel in partnership with community organisations, including:

- The Local Government Partnership and Smarter Travel @ Work programmes, in partnership with local councils
- The TravelSMART Households programme, which engages with residents in a specific target area, most recently the Adelaide City Council area
- The Way2Go programme , which aims to get more students safely walking, riding and using public transport for school travel, and
- Adelaide Carpool, a free, web-based service for city-based organisations that want to support their staff to share their drive to work travel.

DPTI also partners with the Motor Accident Commission to provide community grants for groups and organisations to deliver small projects that focus on improving road safety, getting people cycling, walking or catching public transport, doing things locally and replacing car journeys with technology.

4. INDUSTRY

Goal: South Australia's industry will be a leader in managing greenhouse emissions and tackling climate change

Government initiatives provided support and information to South Australian industry to capture the economic opportunities associated with local and global action on climate change.

The Australian Bureau of Statistics determined that the renewable energy sector supported 1,330 jobs in South Australia in 2013/14, 11 per cent of national levels.

Objective 4.1: To manage business risk associated with climate change

Primary industry development under changing climatic conditions

PIRSA manages a range of programmes to improve the resilience of South Australia's primary industries in the face of climate change and help industries to adapt. These support the Government's Climate Change Management Framework. PIRSA also has lead responsibility for research and trials which investigate opportunities to increase carbon sequestration or reduce emissions in the primary industries sector of South Australia.

Long-term climate change research trials continued across a range of sites and tree species to determine which South Australian native species can adapt to low rainfall and produce carbon absorbing dense timber. Oil Mallee trials also continued in the low rainfall regions of the Murray Mallee and Eyre Peninsula to identify the most suitable species for plantation forestry, as they absorb carbon and have the potential to provide renewable biofuel, ameliorate soil erosion and enhance biodiversity.

The *New Horizons* programme highlighted in this report is investigating ways to significantly improve productivity of South Australia's poorly performing soils (approximately 40 per cent of the dryland agricultural area). In addition, PIRSA is investigating opportunities to increase soil carbon and offset carbon emissions in the agricultural sector.

PIRSA and the South Australian Oyster Industry participated in research conducted by the National Climate Change Adaptation Research Facility's (NCCARF) Climate Change Adaptation in the Australian Edible Oyster Industry Project. The project has highlighted areas to build resilience and adaptability to the management and development of the oyster industry to combat climate change. PIRSA also participated in the National Interim Climate Change Response Plan for Fisheries and Aquaculture, with counterparts in other States, to increase the resilience of fisheries and aquaculture industries and build adaptive regulatory governance processes for industry management.

Tourism business

The South Australian Tourism Industry Council administers a Climate Action Certification programme (first developed in 2008 as a joint initiative between the South Australian Tourism Commission and the Great Barrier Reef Marine Protection Authority), which allows travellers to identify tourism operators who are committed to reducing their carbon emissions.

Objective 4.2: To reduce greenhouse gas emissions while driving and improving business competiveness

Zero Waste SA Industry Programme

The Zero Waste SA Industry Programme helps commercial enterprises and industry understand, develop and implement cost effective resource efficiency measures in the areas of waste materials, energy and water management improvements.

During 2014 and 2015, 26 South Australian businesses were assisted to evaluate and understand their greenhouse gas emissions – twelve from the wine industry, ten from the food industry and four from the print industry. In addition, four programmes were run in partnership with industry associations to provide on-site assessments for 116 SA businesses collectively. Tools, templates and guides were developed and published to encourage broader uptake of efficiency projects by SA organisations.

Objective 4.3: To target commercial opportunities and develop products and services of the future

Premier's Research and Industry Fund

This fund – a joint initiative between the Government and the Premier's Science and Industry Council – invests in key science and research initiatives of strategic and sustainable value to the State, particularly those that have a demonstrable potential to generate significant and sustainable economic, social and/or environmental benefits.

Between 2003/04 and 2012/13, $8 million was awarded to projects that focus on climate change or renewable energy. Since 2013/14, the programme has awarded $3.2 million to six renewable energy projects and four climate change related projects.

TAFE SA Sustainable Industries Education Centre

The $120 million Sustainable Industries Education Centre (SIEC) commenced training delivery at Tonsley Park in early 2014. The Centre will specialise in new green technologies training associated with the construction industry and is a crucial element of South Australia's sustainability commitment. It is designed to transform training in the building, construction and water industries and open the way to incorporating more clean green technology into future building projects.

The SIEC involves the creation of approximately 43,000 square metres of world-class, energy efficient, trade training infrastructure and the divestment of over 80,000 square metres of inefficient and unfit-for-purpose training spaces in the metropolitan area.

Green skills and vocational training

WorkReady, which replaced Skills For All in July 2015, is the State Government subsidy framework for vocational training that assists people into jobs. It subsidises vocational training courses from Certificate I to advanced Diploma levels and provides a vehicle to meet the Commonwealth's Green Skills sustainable training agenda, as well as South Australia's future sustainable training needs delivered through the SIEC.

Low carbon and clean technology innovation

Manufacturing Works, the Government's strategy for delivering high value manufacturing, provides for a number of programmes to assist local manufacturers to innovate, including those that supply low carbon and clean technologies.

In December 2014, the Premier convened a Clean Energy Summit with industry and community leaders to discuss the need for continued investment in renewable energy in Australia, in the context of uncertainty for the renewable energy sector arising from the Federal Government's review of the Renewable Energy Target (RET) scheme.

In June 2015, the Premier and Minister for Climate Change hosted a Green Jobs forum to gather feedback from industry and researchers regarding the opportunities to grow the cleantech sector in South Australia, and the role that Government can play to help businesses create jobs by linking local and global action on climate change with industry development. A follow up forum in November 2015 provided an update on key State Government procurement and policy initiatives that seek to reaffirm the strong commitment to action on climate change and support local industry.

Water Efficiency Plan Programme

SA Water provides a tool kit for businesses that includes a guide to important steps in planning for water efficiency. Use of the toolkit and support is available to all non-residential businesses requiring assistance. Discussions have been undertaken with the Office for Recreation and Sport regarding tailoring the toolkit for sports clubs to help them better understand and improve water efficiency on their sites.

National Business Water Efficiency Benchmarking Project

SA Water is a partner in this national project with other water utilities and the Water Services Association of Australia. The aim is to develop sector and region specific industry benchmarks for business water and wastewater efficiency. An online tool to help customers gain more of an understanding about water efficiency for their industry is now available from www.nbweb.com.au.

5. ENERGY

Goal: South Australia's energy systems will significantly reduce greenhouse emissions while continuing to support productivity and prosperity.

The proportion of renewable energy production in the State continues to rise, with over 40 per cent of South Australia's total electricity generation from renewable energy in 2014/15.

The 2014 annual Retail Energy Efficiency Scheme report quantified greenhouse gas emission reductions for calendar year 2014 of approximately 600,000 tonnes of CO_2e.

The number of South Australian geothermal licences has grown from 3 in 2002 to 135 in late 2015.

In October 2014, the *Pastoral Land Management and Conservation (Energy Management) Bill 2014* was passed. The legislation was enacted in 2015 and provides renewable energy investors with access to 40 per cent of South Australia's land mass that is Crown land subject to pastoral lease.

Objective 5.1: To improve the efficiency of energy use

Residential energy efficiency

South Australia's Strategic Plan Target 60 requires an improvement in the energy efficiency of dwellings by 15 per cent from 2003/04 levels by 2020. This has already been achieved, with latest available data showing a 26 per cent improvement.

Household energy usage has reduced over recent years as a result of policies such as such as Minimum Energy Performance Standards for appliances, energy efficiency requirements for new homes, South Australia's low emission water heater installation requirements, policies promoting the residential use of solar PV systems, and schemes such as the Retailer Energy Efficiency Scheme (REES).

REES is a Government initiative that requires larger energy retailers to help households and business save energy. On 6 November 2014, regulations were made to enable its continuation to 31 December 2020. In 2015, the scheme expanded to include the small to medium sized business sector. Over Stage 1 and 2 (2009 to 2014), REES achieved reduced emissions of approximately 1.8 million tonnes of CO_2e[3].

Energy Partners Programme

Established in 2011, the Energy Partners Programme works with over 90 organisations across the social, environmental, local and State government sectors to help South Australian households manage their energy use and costs, and improve their energy efficiency. By empowering a large network of community-based organisations, the programme reaches a large number of people, particularly the vulnerable and those most in need, and can target information and support to where it is needed most.

SA Water Renewable Energy Target

SA Water has a target to contribute 20 per cent of its total energy use from self-generated renewable energy and/or purchased accredited renewable energy sources. It has exceeded this target by self-generating renewable electricity at its wastewater treatment sites, hydroelectric facilities and by purchasing accredited renewable energy.

The climate change sector agreement between SA Water and the Minister for Climate Change, signed in July 2015, outlines SA Water's commitment to reduce net greenhouse gas emissions to an amount equivalent to a linear reduction pathway so that by 31 December 2050 its emissions will be no greater than 40 per cent of its 1990 levels.

SA Water co-digestion trial

SA Water's Sewage Treatment Plants (STP) at Glenelg, Bolivar, Christies Beach and some regional areas have anaerobic digesters for stabilising organic sludge produced in the sewerage treatment process. Organic material fed into these digesters undergoes biological breakdown to ensure optimum end product quality. The process also generates methane, which can be

[3] http://www.escosa.sa.gov.au/residential-energy-efficiency-scheme-rees/rees-annual-reports.aspx

used to produce electricity, offsetting some of the STPs' energy demand. Possible expansion of this system to other STPs is being investigated.

Biogas generated from SA Water's wastewater treatment process is captured and used on site to fuel cogeneration generating equipment, providing a renewable energy source of electricity and heat required to treat wastewater.

In 2015, SA Water also increased its electricity generation installed capacity to 14 megawatts by installing new reciprocating gas engines at its Bolivar wastewater treatment plant. With co-digestion continuing to increase biogas production, the Bolivar plant at times was 100 per cent energy self-sufficient, with surplus energy exported to the grid.

Objective 5.2: To increase take-up of renewable and low emission technologies

RenewablesSA

Highlights of the RenewablesSA renewable energy programme are outlined earlier in this document.

Of particular note, in 2015 South Australia became the first jurisdiction to enact legislation that specifically allows a wind farm developer to apply for a licence to build and operate a wind farm on Crown land that is subject to a pastoral lease, and for the wind farm to coexist with the activities of pastoral leaseholders. The *Pastoral Land Management and Conservation (Renewable Energy) Amendment Act 2015* also expedites access to pastoral land for solar energy projects. The legislation ensures that 95 per cent of the licence payment is passed on to pastoral lessees and native title holders. In total, the Act provides renewable energy investors with access to Crown land that comprises 40 per cent of the State's land area.

Geothermal energy

Work continues to be done to foster progress towards the commercialisation of vast Australian geothermal energy resources by providing regulatory certainty in South Australia and reducing information asymmetries in regards to geothermal research, demonstration, development and deployment across Australia. The number of South Australian geothermal licences has grown from three in 2002 to 135 in late 2015.

Objective 5.3: To ensure investment and markets follow a transition pathway to low greenhouse gas emissions

Unconventional gas as a transition fuel

In 2010, the Government established the Roundtable for Unconventional Gas Projects in South Australia, with industry and other stakeholders, to assess the adequacy of supply chain infrastructure and technologies necessary to support unconventional gas prospects, and to inform industry strategies and Government policies. It now has an expanded role for all oil and gas projects both onshore and offshore.

The Roundtable informed the *Roadmap for Unconventional Gas Projects in South Australia*, released by the Department of State Development (DSD) on 12 December 2012, to support the development of South Australia's unconventional gas resources and foster the security of competitively priced natural gas supplies.

Carbon capture and storage

The Energy Resources Division within DSD supports legislative, research and development initiatives that will enable the proof-of-concept, demonstration, pre-competitive deployment and up-scaling of low emissions technologies and carbon capture and storage projects.

One gas storage retention licence (45 km^2) and 34 gas storage exploration licences (66,370 km^2) had been granted in the Cooper, Officer, Simpson and Otway Basins to the end of October 2015. A further 40 gas storage exploration licence applications (89,763 km^2) are pending determination over lands in the Cooper, Arckaringa and Officer Basins.

The working groups responsible for measuring and monitoring greenhouse gas emissions, formed by the Roundtable for Unconventional Gas Projects, are facilitating university research to develop cost effective, remote sensing technologies, to detect and measure fugitive greenhouse gas emissions.

6. TRANSPORT AND PLANNING

Goal: South Australia will substantially reduce transport related greenhouse gas emissions while maintaining accessibility and economic development.

The Government's passenger and light commercial motor vehicle fleet contributed to SASP Target 59 by reducing greenhouse gas emissions per kilometre travelled in 2014/15 by 10 per cent over the 2009/10 level.

There has been significant investment in upgrading the passenger rail network and increasing the size of the bus fleet.

Adelaide's network of bicycle lanes and paths was extended from approximately 480 km in 2002 to 1,227 km in 2015.

Objective 6.1: To reduce trip lengths and the need for motorised travel through integrated land use and transport planning

Integrated Transport and Land Use Plan

In July 2015, the Government released the Integrated Transport and Land Use Plan. This works in concert with the Planning Strategy and the Strategic Infrastructure Plan to integrate longer-term planning for land development, transport and infrastructure. In Greater Adelaide, the Plan will support higher density living along primary public transport corridors, including the expansion of the tram system. It also will see completion of the electrification of metropolitan rail services, new park-and-ride facilities and extensions to cycling infrastructure.

Public Transport

In 2008, the State Government committed to a multi-billion investment in the public transport system. During the reporting period this saw the extension of the Noarlunga line to Seaford with two new stations, the electrification of the Noarlunga/Seaford and Tonsley lines and the purchase of 22 Three Car Sets of electric rail cars to service the lines.

Investment was announced in 2012/13 to increase the opportunity for commuters to park at outer suburban public transport locations to take advantage of rapid transit services to the city. During the reporting period, this saw new or upgraded facilities established at Mt Barker, Clovelly Park, Seaford, Meadows, Noarlunga and Modbury (Tea Tree Plaza).

To increase the usage of public transport, the Government has introduced measures to improve access and enhance the customer experience. During 2013, the Metro*Card* ticketing system was introduced and has been very successful, reducing boarding times and allowing for the introduction of new products such as 28 day passes, Park n Ride payments and efficient security at bike cages.

During 2013 the Government also introduced the Real-Time Passenger Information service, which uses satellite tracking technology to predict when the next vehicle will arrive based on its schedule, speed and last reported GPS location. Patrons can access the information on their computer, tablet or smartphone.

Objective 6.2: To achieve more sustainable travel behaviour

Cycling and walking

A number of projects were implemented across South Australia to support SASP Target 2, which seeks to double the number of people cycling in South Australia by 2020. These included:

- Black Spot and State Bicycle funds provided annually to local councils to improve local cycle networks
- $1.6 million for the construction of the Norwood and Prospect Bikeways (boulevards) projects, and
- extension of Adelaide's network of bicycle lanes and paths from approximately 480 kilometres in 2002 to 1,227 kilometres in 2015.

Annual Adelaide City Bike cordon counts indicate that the number of people cycling to and from the city has increased to about 10,000 on a typical day. Use of the Mike Turtur Bikeway (which parallels the Glenelg Tramway) has grown by an average of 16 per cent per year since 2006, with a 74 per cent increase from the opening of the South Road overpass in 2010. It now services 1,000 cyclists a day.

Objective 6.3: To improve emissions performance of vehicles and fuels

Reducing emissions from the State Government fleet

Greenhouse gas emissions from the Government's passenger and light commercial motor vehicle fleet fell by over 20 per cent between 2009/10 and 2014/15. This was achieved by reducing vehicle numbers, using smaller vehicles, embracing high-efficiency petrol, diesel, LPG, electric, hybrid and bio fuel vehicles, and promoting fuel-efficient driving. An expression of interest process commenced in November 2015 to investigate opportunities to convert the State Government fleet to low or zero emissions.

Support for Low Emissions Vehicles

The Government fleet is also being used to evaluate new technologies and driver behaviours that can reduce emissions. A successful three-year trial of two Mitsubishi iMiEVs by DPTI and DCSI concluded in February 2014. Further trials are subject to the availability of suitable electric vehicles at appropriate leasing rates.

Objective 6.4: To shift transport to low greenhouse emission modes

Electric vehicle recharging

Under the Visible Solar Project – a partnership between RenewablesSA, Regional Development Australia and the Kangaroo Island Council – the Council installed six electric vehicle charging stations on Kangaroo Island (KI) and has leased three Nissan LEAF electric vehicles, two of which are available to the public. An "electric highway" from Adelaide is now proposed to link the city to KI for tourism purposes.

7. BUILDINGS

Goal: South Australia's building sector will anticipate and respond to climate change and become a world leader in the creation of a carbon neutral built environment.

The *Local Government (Building Upgrade Agreements) Amendment Bill 2015*, which provides for the introduction of Building Upgrade Finance in South Australia, passed through Parliament in December 2015. Building Upgrade Finance is one of the key focus areas outlined in the Carbon Neutral Adelaide sector agreement between the State Government and the Adelaide City Council, which was signed in November 2015.

Objective 7.1: To develop high performance green standards for building design, construction and operation

South Australian Planning Strategy

The South Australian Planning Strategy provides an important vision of a shift towards a low carbon society, a sustainable and liveable environment based on a more compact urban form as well as support for green technologies and industry.

As part of this strategy, the 30 Year Plan for Greater Adelaide is being reviewed. An updated plan, due for release in 2016, will include strategies and actions that further support reducing emissions and creating climate change resilience in our city and communities. The Government has also introduced new zones and policies to enable mixed use developments along transport corridors and activity nodes which will assist to reduce the demand for private vehicle use.

Regional volumes of the South Australian Planning Strategy similarly seek to contain the growth of townships and urban centres in order to protect and preserve high-value environmental and primary production land.

Within regional areas, several local councils have undertaken structure planning and/or are reviewing local development plans to better plan for sustainable future growth. Part of this process will include consideration of the impacts of climate change and identifying options to accommodate and adapt to climate change impacts at a local level.

The Planning, Development and Infrastructure Bill 2015

The *Planning, Development and Infrastructure Bill 2015* was developed to provide a guiding framework for South Australia's planning reforms. The Bill sets out statutory objects which are then further elaborated in principles of good planning. These include a focus on ecologically sound policy frameworks responsive to emerging challenges and seeking to promote equity between present and future generations; and sustainability principles with a specific focus on energy efficient urban environments, sustainable resource use and renewal. At the time of drafting this report, the Bill was before Parliament.

CRC for Low Carbon Living (CRC4LCL)

The CRC for Low Carbon Living (CRC4LCL) was formally incorporated in 2012. A key aim of the CRC is to help cut Australia's residential and commercial carbon emissions by 10 mega tonnes by 2020. The CRC4LCL aims to achieve this through developing low carbon building construction materials and increasing the evidence base for government policy and planning. The Adelaide Living Laboratory Hub is a key CRC4LCL research project that comprises sustainable development sites at Lochiel Park, Bowden and Tonsley. In 2012, DEWNR signed a Participants Agreement with the CRC for a three-year membership. In 2015, the State Government renewed its support for another three years.

Designing sustainable environments

Good design helps to improve the quality and sustainability of the built environment. The Office for Design and Architecture SA develops design guidelines, leads the Design Review Programme and provides strategic advice to Government on design, procurement, planning and development of major projects.

Objective 7.2: To optimise energy performance and subsequent cost effectiveness of buildings

Building Upgrade Finance

Consistent with advice of the Premier's Climate Change Council and following extensive consultation and the development of a business case, in February 2015 the Government introduced legislation which enables the establishment of a Building Upgrade Finance mechanism in South Australia. The Bill passed through Parliament in December 2015. This is a voluntary scheme which assists building owners to access loans to improve the energy, water and environmental efficiency of existing commercial buildings. Under the mechanism, loans are tied to a property rather than a property owner, with loan repayments being collected via a local government charge that is levied on the property. Loan repayments are then passed on to the financier by the local council.

Building Upgrade Finance is one of the key focus areas outlined in the Carbon Neutral Adelaide sector agreement between the State Government and the Adelaide City Council, which was signed in November 2015.

National Energy Efficient Building Project

The South Australian Government is leading the National Energy Efficient Building Project (NEEBP), an initiative of the Council of Australian Government Energy Council. The NEEBP aims to improve compliance with the National Construction Code energy efficiency requirements for new residential and commercial buildings.

Objective 7.3: To increase market and community awareness of the benefits of improved building performance

Sustainable design in urban renewal

The Government is incorporating sustainable design in its significant urban renewal projects at Bowden, Tonsley and Lochiel Park. Renewal SA is responsible for delivering the Bowden project, which has incorporated a range of sustainability initiatives such as 5 Green Star rated buildings across the project and advice for developers; alternative energy systems investigation through joint research with the University of South Australia; and a sustainability incentive rebate scheme for residential and retail customers. To date, eight buildings in the Bowden precinct have achieved 5 Green star 'as designed' ratings for residential development, with a further five developments registered for ratings.

A dedicated Sustainability Manager has been appointed for the Tonsley Park redevelopment project to drive sustainability outcomes, in response to advice from the Premier's Climate Change Council on climate smart precincts. The Tonsley redevelopment has achieved a 6 Star Green Star – Communities certification and is Australia's first mixed-use urban redevelopment to achieve this certification.

The Lochiel Park "green village" being delivered by Renewal SA includes energy efficient building design, solar energy systems and improved waste management to minimise the impact on the environment. It also contains a Zero Carbon home designed to be carbon neutral within 32 years.

Objective 7.4: To develop built environments that are responsive to climate change

Water sensitive urban design

A State Government policy on Water Sensitive Urban Design (WSUD) was released in October 2014. Activity to date has largely focused on three of the 14 key action areas: establishing a framework for WSUD to be considered in State infrastructure projects; embedding WSUD in the State's planning system; and developing a business case for and establish a WSUD capacity building programme.

A WSUD capacity building programme was launched in January 2015 as Water Sensitive SA (http://www.watersensitivesa.com/).

Green Infrastructure Project

The Green Infrastructure Project is a collaborative partnership between Renewal SA, DPTI, the Adelaide Mount Lofty Ranges NRM Board and DEWNR. Hosted by the Botanic Gardens of South Australia the project aims are to:

- advocate for the values, benefits, principles and practices of green infrastructure

- embed green infrastructure into urban planning and design frameworks
- improve capacity in government, industry and community for the development and maintenance of green infrastructure, and
- contribute to the development and communication of research and knowledge.

The project has contributed to building the capacity of planners, engineers, designers and other practitioners to deliver green infrastructure outcomes. Specific work has been undertaken with local government to assist in development of green infrastructure strategies and guidelines. Forums, field trips, workshops and conference papers have been delivered to diverse audiences both nationally and locally. Regular lectures have been delivered to undergraduate and postgraduate students in the fields of planning, design, engineering, education and health at the University of Adelaide, University of South Australia and TAFE SA, and green infrastructure has become part of the curriculum for many of these courses.

A collaboration with University of South Australia has progressed the mapping of green infrastructure throughout the greater Adelaide region in order to identify hotspots and priorities. The project is also a partner in the CSIRO Land and Water Flagship project to develop a national research agenda for Green Infrastructure. At the 2014 Planning Institute Awards, the Evidence Base for Green Infrastructure won an award of excellence in the category of Cutting Edge Research and Teaching.

The Government is also introducing the new initiative, *Living Adelaide*, which will increase and link green infrastructure across greater Adelaide to provide a more holistic approach to place management, including planning and design of green space.

8. NATURAL RESOURCES

Goal: South Australia's natural resources sector and ecosystems will be managed sustainably with optimum resilience and capacity to adapt to climate change

Revegetation projects create carbon storage and support ecosystem resilience. The Coorong, Lower Lakes and Murray Mouth (CLLMM) Recovery Project Vegetation Programme coordinated the planting of 2.2 million native seedlings throughout 2014 and 2015, by community groups, Ngarrindjeri people and contractors.

Revegetation of an additional 121 hectares of public land was undertaken as part of the River Murray Forest project in 2015. This work was undertaken across previously cleared and/or cropped land within the Marne Valley Conservation Park, Lowan Conservation Park and Ettrick Conservation Park, as well as on degraded sand dunes within the Katarapko Conservation Park.

The SA Seed Conservation Centre has banked more than 2,000 plant species and 68 per cent of the State's threatened flora. During 2014/2015, the data sets and images for more than 2,000 species of SA flora were uploaded onto the Seeds of South Australia database for use by the community.

Objective 8.1: To strengthen the resilience of industries reliant on natural resources in the face of the potential impacts of climate change

Natural Resource Management

The State Natural Resources Management Plan 2012-2017, *Our Place – Our Future* provides the framework and policy guidance for regional NRM boards working with State Government agencies and their regional communities to develop regional plans and programmes. Under the Plan, DEWNR supports a landscape scale approach to conservation and sustainable land use and management in response to the challenges of climate change. Highlights include:

- assisting regional NRM Boards to identify climate change vulnerability and adaptation options
- completion of a project investigating climate change impacts in South Australia's cropping zone
- development of more sustainable farming systems and land use options to maintain soil stability, prevent soil erosion and enhance biodiversity, including participation in the Future Farm Industries which is part of the national Cooperative Research Centre
- improving knowledge of carbon sequestration in soils and through revegetation, and
- landscape analysis of the potential impacts, both positive and negative, of large-scale tree planting on natural resources.

Soils and land management

DEWNR leads and implements a collaborative effort with industry, NRM boards and agency partners to raise awareness and improve the capacity of land managers to protect land from erosion and to define and promote best practice. Quantitative soil erosion protection targets have been included in Regional NRM plans and projects developed to promote best practice land management.

The Sustainable Dryland Agriculture Initiative addresses existing risks of soil erosion as well as those posed by climate change. During 2014 and 2015, approximately 15 projects were developed, funded and delivered. Projects addressed existing threats to sustainable land use from soil erosion, improvements to soil health and resilience, as well as likely threats in the face of climate change. An additional project focussed on estimating current and potential soil carbon stocks across the agricultural areas.

The measure for the SASP Target 70 is the number of days that agricultural cropping land in South Australia is adequately protected from erosion. From a baseline of 276 days in 2003, protection increased to 336 days in 2014 and reached 340 days in 2015. Most of this improvement can be attributed to adoption of improved land management practices by farmers.

Objective 8.2: To incorporate climate change in the sustainable management of water resources and water supply

Recycled water

SA Water owns and is responsible for the operation and/or supply of the majority of recycled water used in South Australia. Over 25 per cent of sewerage system wastewater is recycled and reused in South Australia.

Over the past two years it has increased the area of SA Water land that is irrigated with recycled water by approximately 30 hectares (mainly at Myponga and Aldinga Waste Water Treatment Plants). Consequently, this has reduced discharge into the receiving environment, with the associated benefit of improved water quality. SA Water has also identified an opportunity to significantly increase the volume of reuse from the Glenelg to Adelaide Park Lands Recycled Water Scheme and is developing a trial to test the feasibility of this proposal.

The Government has supported the development of eight stormwater harvesting and reuse schemes in Greater Adelaide, which when completed will have the capacity to harvest eight gigalitres of stormwater annually.

Two research projects are underway to determine the ability to irrigate open space with recycled water to reduce the air temperature (and urban heat island) and offer heat refuge. Outcomes from these projects will be available at the end of 2017.

Impacts of Climate Change on Water Resources Project

This ongoing project, conducted by DEWNR, provides new understanding of the risks of climate change impacts on the future capacity of the natural water resources of South Australia to provide sufficient water for communities, industry and the environment. Projects undertaken since the previous report include:

- Completion of the Goyder Institute's climate change projections project, which developed downscaled climate projections for South Australia to support adaptation in water resource planning and management, and
- Development of the new Draft Water Allocation Plan for the Southern Basins and Musgrave Prescribed Wells Areas.

Objective 8.3: To increase the capacity of ecosystems to adapt to climate change

Coorong, Lower Lakes and Murray Mouth (CLLMM) Recovery Project

This five-year project aims to stabilise the ecological decline of the CLLMM region and support a healthy and resilient wetland and community which is able to adapt to changing water levels. This is being achieved through the integration of NRM programmes, including revegetation, pest and weed control and fencing along with research and monitoring.

In the first two years, more than 1.8 million native plants have been planted and there are early indications of increasing community resilience, including several community nurseries successfully tendering for commercial propagation contracts.

In addition, weir pool raising events at Locks 1, 2 and 5 were undertaken through the Riverine Recovery Project in 2014-2015 to facilitate adaptation to predicted reduced flows in the future by reinstating some of the natural variability of water levels in the River Murray.

Transects for Environmental Monitoring and Decision Making

Initially funded through the Premier's Science and Research Fund, Transects for Environmental Monitoring and Decision Making (TREND) provides a system of data collection across South Australia's native ecosystems, marine environments, primary production regions and regional communities. By assessing the impacts of various potential climatic and environmental shifts, it will provide an early warning system for changes in South Australia's diverse environments and a lasting legacy of long-term monitoring, informed policy and proactive response to environmental change.

Strong progress was made in 2014-2015, with a focus on consolidating and publishing results, and identifying opportunities for preserving TREND infrastructure and data.

Objective 8.4: To reduce greenhouse gas emissions from the natural resources sector and increase carbon sinks

River Murray Forest project

This pioneering project, initiated by the Government in 2006, was developed to link biodiversity assets and offset greenhouse gases through carbon sequestration. In recent years significant planting and revegetation work has taken place at various sites around the State.

Million Trees Programme

The *Million Trees Programme* was completed in 2014 as planned and achieved its goal of establishing three million local native trees and associated understorey plants on public land in Greater Adelaide. The Programme has reconstructed approximately 2,000 hectares of predominantly grassy woodland habitat, building the capacity of the urban and peri-urban environment and ecosystems to respond to climate change.

Seed Conservation Centre

The primary role of the South Australian Seed Conservation Centre (SASCC) is to assist in safeguarding South Australia's flora and plant communities against extinction, including through the impacts of climate change. Seed researchers have been collecting and banking seeds since 2006. Currently 61 per cent of the State's threatened flora is conserved in secure long-term storage at sub zero temperatures in the seed bank in the Adelaide Botanic Garden.

The process of searching for threatened plants and collecting seeds has led to a better understanding of the size and frequency of threatened populations in the State. Providing current records of populations in their natural habitat is a valuable contribution to the database of the South Australian flora.

The SASCC is currently building an online resource to disseminate the information collected. The *Seeds of South Australia* website provides photographic images of plants that will assist the identification of species and also includes details of seed morphology and techniques for germination. The aim is to provide useful and detailed information to the general public about the flora of South Australia, with an emphasis on seeds and germination methods.

APPENDIX B. South Australian Emissions and Energy Data report

The information in this Appendix has been prepared by DEWNR based on information in the Australian Greenhouse Emissions Information System (AGEIS) and is supplemented by information from other sources as indicated herein.

All emissions estimates are presented as mega tonnes (Mt), or as otherwise indicated, of Carbon Dioxide Equivalent (CO_2e) to reflect the different Global Warming Potential (GWP) of the greenhouse gases incorporated in the inventory.

The Australian Government Department of the Environment published the *Australian National Greenhouse Accounts State and Territory Greenhouse Gas Inventories (SGGI) 2013* in 2015. This represents the most recent data released at the time of preparing this report[4].

The latest measure of South Australia's greenhouse gas emissions provides estimates of emissions in 2013 and revises data in previous years[5].

The SGGI data is supplemented by DEWNR to incorporate an estimate of the emissions 'imported' or 'exported' over the State's electricity interconnectors. This data is provided by the Australian Government Department of the Environment.

The following sections provide information relating to South Australia's greenhouse gas emissions and energy profiles.

[4] Emissions data for South Australia can be accessed online via AGEIS http://ageis.climatechange.gov.au/

[5] The latest report provides replacement data for all years from 1990 to 2013. There are a number of significant changes in the 2013 inventory as a result of revised UNFCCC and Kyoto Protocol (second commitment period) reporting guidelines including 1. Updates to the global warming potentials used to aggregate gases, 2. Revised IPCC guidelines for the preparation of national inventories, and 3. Broadening of the land sector base to include three new land sector activities, being forest, cropland and grazing land management. This will introduce inconsistencies with earlier reporting.

B.1. South Australian Emissions Inventory Total

Using the latest available data, total South Australian net emissions fell by 9 per cent from 1990 to 2013, from 32.31 mega tonnes (Mt) of CO_2e to 29.25 Mt of CO_2e[6].

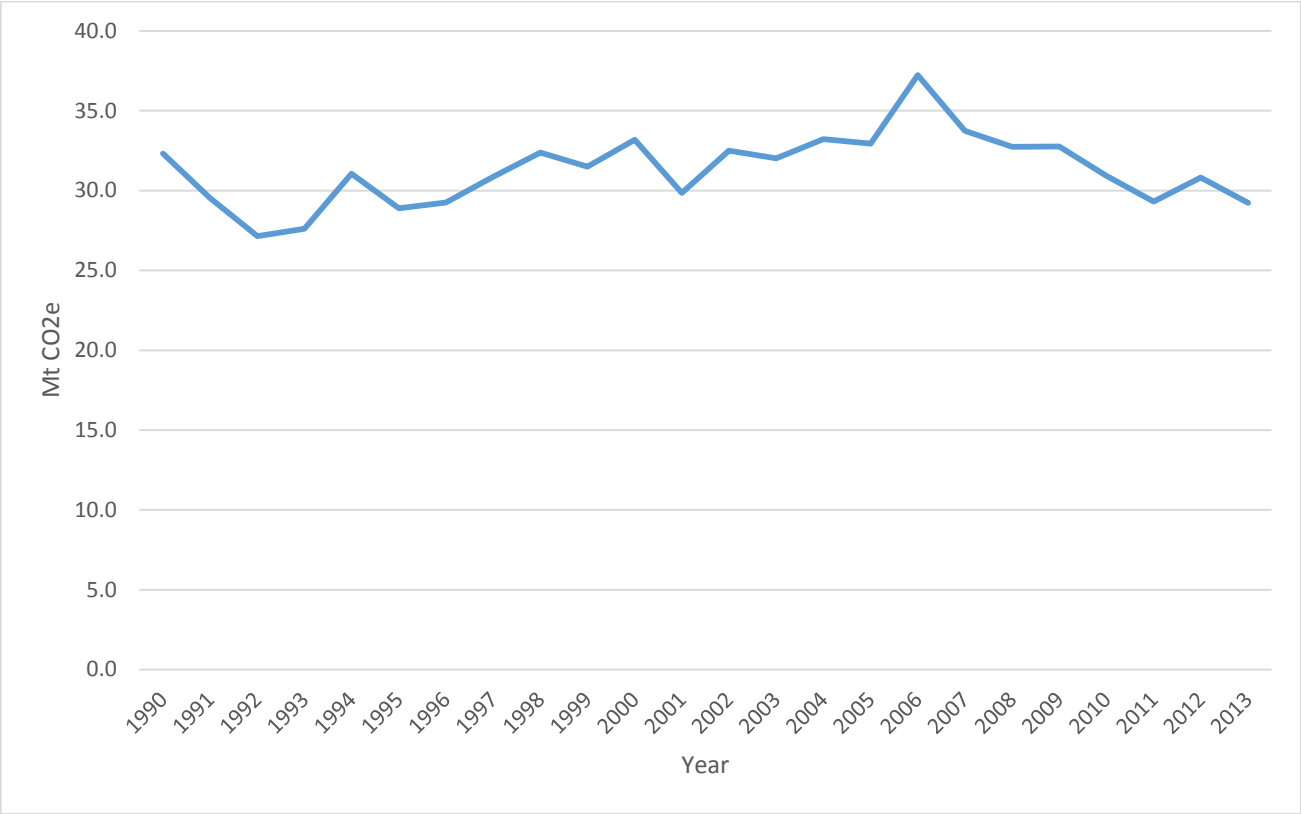


Figure 1: South Australian total net greenhouse gas emissions 1990-2013 (including interconnectors and LULUCF)

The South Australian community and economy has expanded significantly over the period of emissions reporting since 1990. Although emissions have fallen since 1990, the State's economy has grown by more than 60 per cent.

[6] Includes Land Use, Land Use Change and Forestry (LULUCF) as well as net emissions associated with the import and export of electricity interstate.

In terms of population,

Figure 2 illustrates emissions per person for South Australia and for Australia[7], expressed as tonnes of CO_2e per capita.

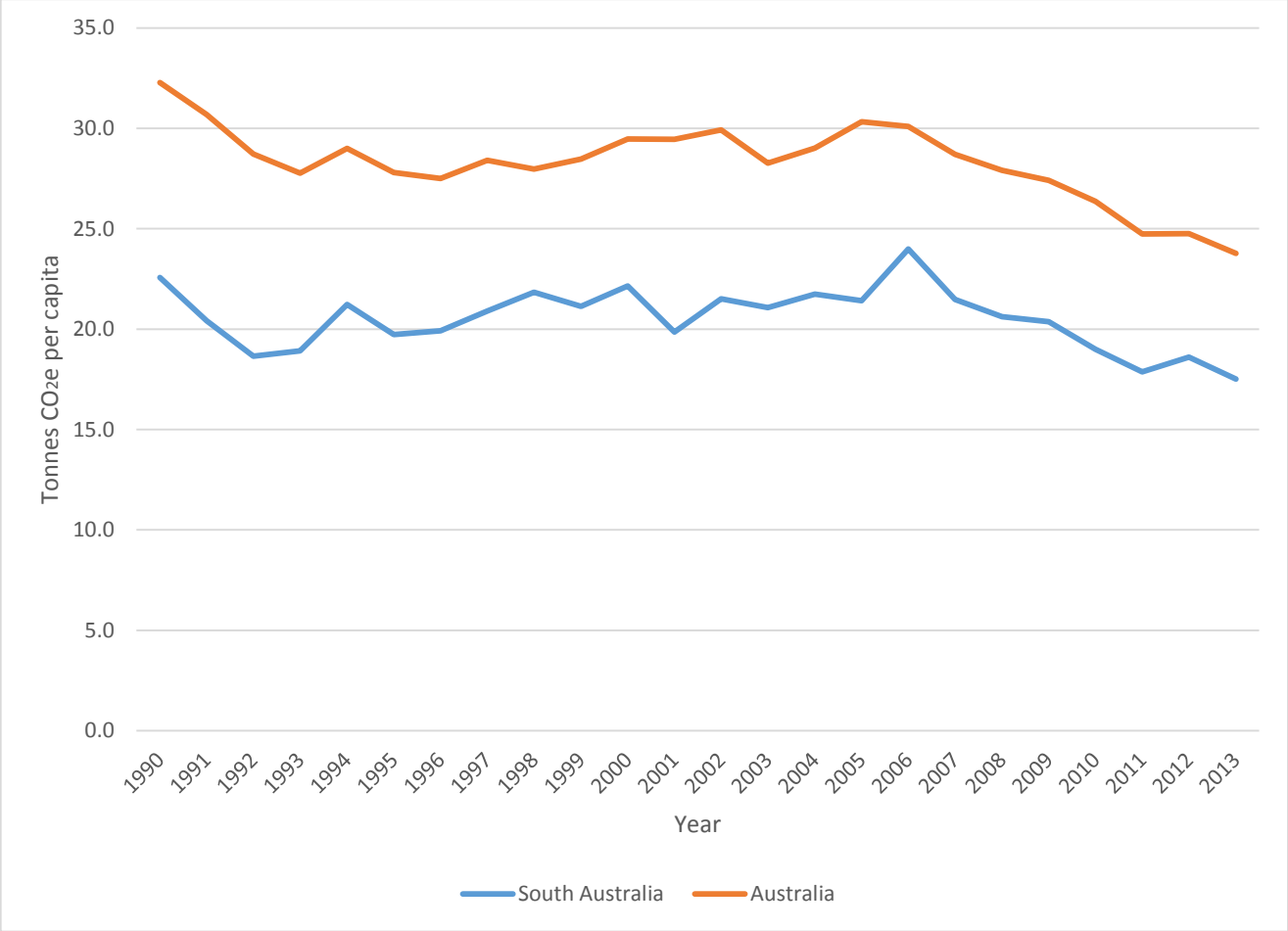


Figure 2: Greenhouse gas emissions per person 1990-2013 (including SA interconnector and LULUCF)

[7] Population estimates from Australian Bureau of Statistics ABS Cat No. 3101.0 (2014).

In terms of economic expansion,

Figure 3 illustrates state and national emissions per million dollars of Gross State Product (GSP) and Gross Domestic Product (GDP) for Australia[8], expressed as kilo tonnes (Kt) of CO_2e per capita.

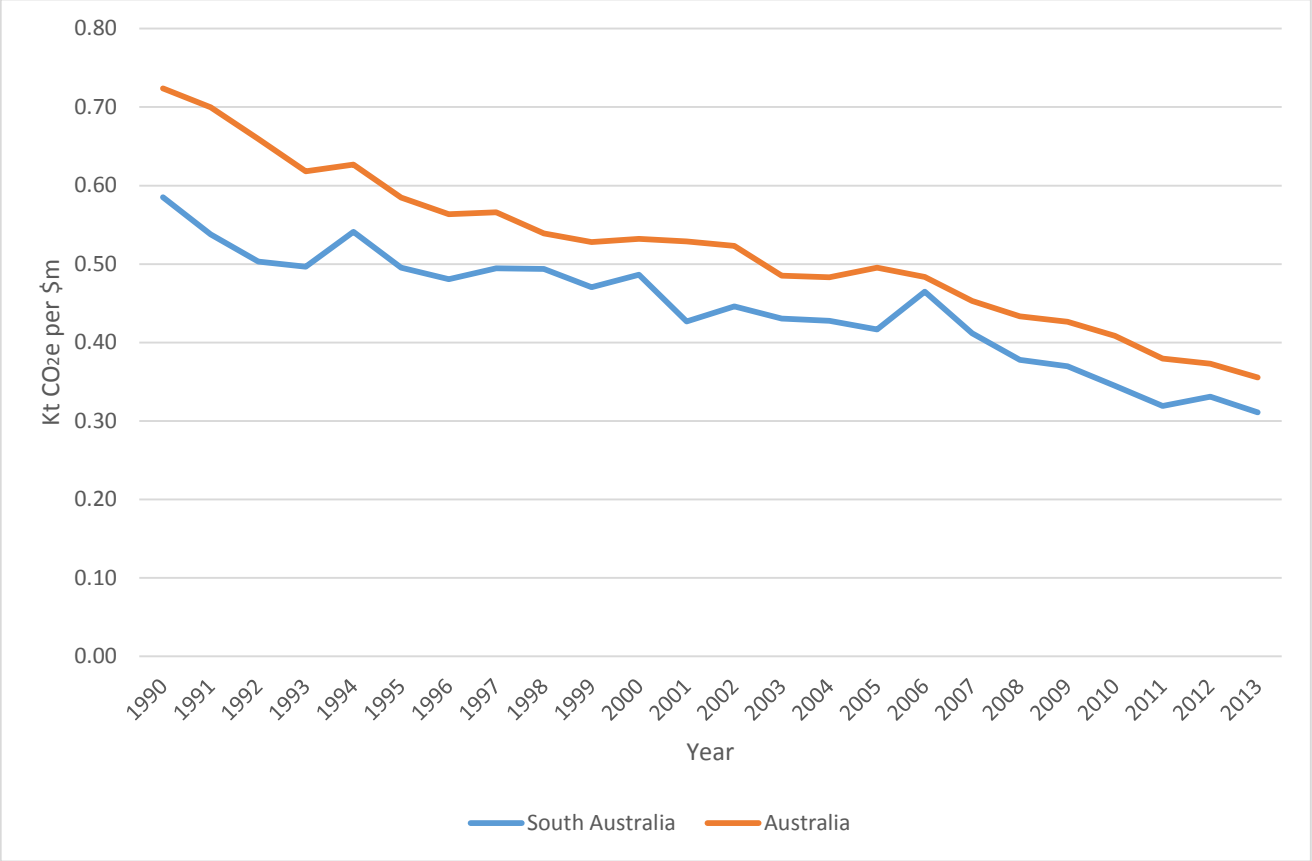


Figure 3: South Australian and national emissions per $m GSP/GDP respectively, 1990-2013 (including SA interconnector and LULUCF).

[8] Estimates from Australian Bureau of Statistics ABS Cat No. 5220.0 to (2014)

To provide an understanding of emission trends in key economic sectors, AGEIS incorporates a breakdown of South Australian emissions allocated to key economic sectors based on the Australian and New Zealand Standard Industrial Classification (ANZSIC) system[9]. This same classification system is used in the Australian Bureau of Statistics' breakdown of the contributions of each economic sector to GSP. These are shown in Table 1 and Table 2, below.

Mt CO_2e	1990	2007	2011	2013	Change 1990-2013 (%)		Change 2007-2013 (%)	
Div. A Agriculture, Forestry and Fishing	7.03	4.85	2.92	3.25	-53.8	↓	-32.9	↓
Div. B Mining	5.14	4.47	3.02	3.85	-25.2	↓	-14.0	↓
Div. C Manufacturing	5.27	5.27	5.39	5.25	-0.3	↓	-0.4	↓
Div. D Electricity, Gas and Water Supply	7.06	9.84	8.25	6.22	-11.8	↓	-36.8	↓
Div. E Construction	0.57	0.59	0.61	0.62	9.6	↑	4.4	↑
Div. F-H, J-Q Commercial Services	2.01	1.89	1.97	2.02	0.4	↑	6.8	↑
Div. I Transport, Postal and Warehousing	1.22	1.58	1.95	1.94	58.1	↑	22.4	↑
Residential	3.39	3.89	4.07	4.21	24.3	↑	8.2	↑
Total	31.7*	32.4*	28.2*	27.4*	-13.7	↓	-15.5	↓

* This figure excludes imports/exports associated with the interstate electricity interconnector

Table 1: Summary greenhouse gas emissions by economic sector (Mt CO_2e)[10].

$bn contribution to GSP	1990	2007	2011	2013	Change 1990-2013 (%)		Change 2007-2013 (%)	
Div. A Agriculture, Forestry and Fishing	2.55	2.80	5.18	4.54	78.0	↑	61.9	↑
Div. B Mining	1.67	2.31	3.05	3.26	95.6	↑	41.3	↑
Div. C Manufacturing	6.69	7.41	7.38	7.37	10.1	↑	-0.5	↓
Div. D Electricity, Gas and Water Supply	3.14	3.71	3.88	3.95	25.5	↑	6.3	↑
Div. E Construction	2.57	4.69	5.80	6.27	144.3	↑	33.7	↑
Div. F-H, J-Q Commercial Services	24.50	40.74	45.36	47.33	93.2	↑	16.2	↑
Div. I Transport, Postal and Warehousing	2.16	3.63	4.09	4.21	94.7	↑	16.0	↑
Gross State Product (overall total)	55.23	81.98	91.82	94.01	70.2	↑	14.7	↑

Table 2: Summary contributions to Gross State Product ($billion)[11] by economic sector.

It is evident that most sectors in the economy have continued to see a rise in economic activity, apart from a slight decrease in the manufacturing sector. Despite an overall increase in economic activity, net emissions in South Australia have reduced by 9 per cent on 1990 levels. As can be seen in Table 1, this can be attributed to increasing renewable energy in the energy sector, some structural changes within the economy in recent years and sequestration of carbon in the LULUCF sector.

[9] Refer to ABS Catalogue No. 1292.0 for further information

[10] AGEIS economic sector data excludes emissions associated with interconnector electricity imports/exports.

[11] Source: ABS Catalogue No. 5220.0 Australian National Accounts: State Accounts Table 5. Expenditure, Income and Industry Components of Gross State Product, South Australia, Chain volume measures and current prices, Issued December 2014.

B.2. South Australian Emissions – Sectoral Trends

Based on international greenhouse gas accounting rules for the allocation of emissions, the South Australian Emissions Inventory is presented in its key components in Figure 4 (including emissions associated with interconnector import/export of electricity and LULUCF).

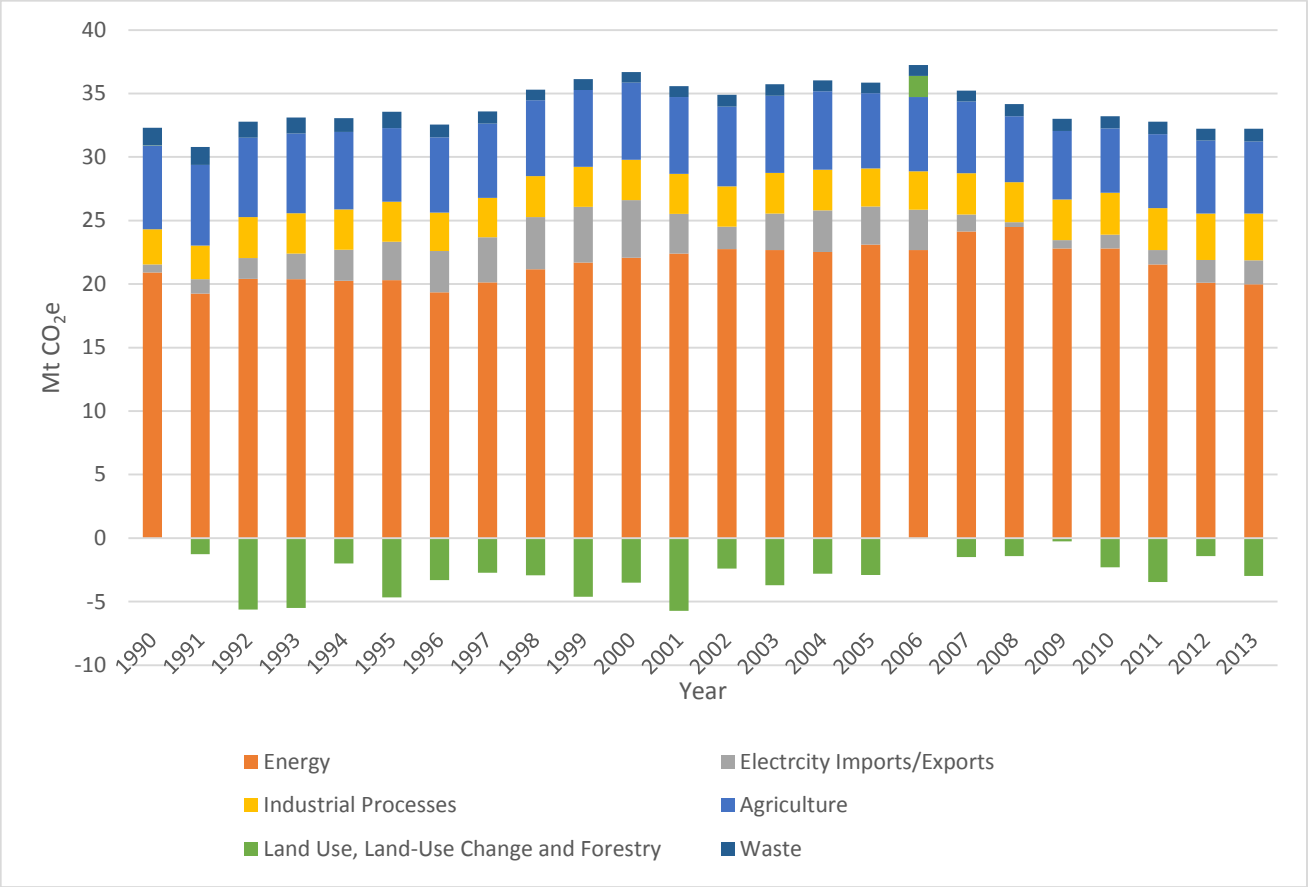


Figure 4: Net South Australian greenhouse gas emissions, 1990-2013.

Energy use is the dominant source of emissions (75 per cent of the overall emissions inventory) in 2013, with 35 per cent of total energy related emissions attributed to electricity generation (including imports/exports associated with the interstate interconnector) and 30 per cent attributed to transport fuels.

Agriculture is the next largest emitter, contributing 19 per cent of the State's total net emissions. The primary industries sector, including forestry and some forms of agricultural land use, plays an important role in storing carbon.

The increase in renewable energy continues to contribute to a fall in emissions from the energy sector. Also contributing to the reduction in emissions is a decline in emissions attributable to the agricultural and waste sectors since 1990, some structural changes within the economy in recent years, along with an increase in abatement in the LULUCF sector, which has reversed from an emission source prior to 1990, to a significant sink of 2.99 Mt of CO_2e in 2013. This is mainly as a result of regulatory reforms in the 1980's that restricted broad acre vegetation clearance and an increase in revegetation and forestry activity.

Net emissions in South Australia peaked in 2005/06, at 37.2 Mt of CO_2e and have been in decline since.

B.2.1 South Australian Emissions – Energy Sector

Energy sector emissions are presented in Figure 5 and are broken down into the following components:

- Energy sector - the combustion of fuel used to generate electricity for public use, emissions from net interconnector flows from interstate (energy imports minus exports) and stationary energy including petroleum refinery, gas processing and the manufacture of solid fuels (including coal mining and oil and gas extraction/processing)
- Manufacturing industries and construction - direct emissions from fuel combustion to provide energy for steel, non-ferrous metals, chemicals, food processing, non-energy mining and pulp and paper
- Transport - road transport vehicles, domestic air transport, shipping and rail
- Fugitive emissions – emissions other than energy use including in mining activities and oil and gas sector operations (including venting, flaring, exploration, extraction, production, processing and transmission), and
- Other sectors - energy used by the commercial, institutional, residential sectors as well as fuel used by agricultural, fishery, forestry and military sectors.

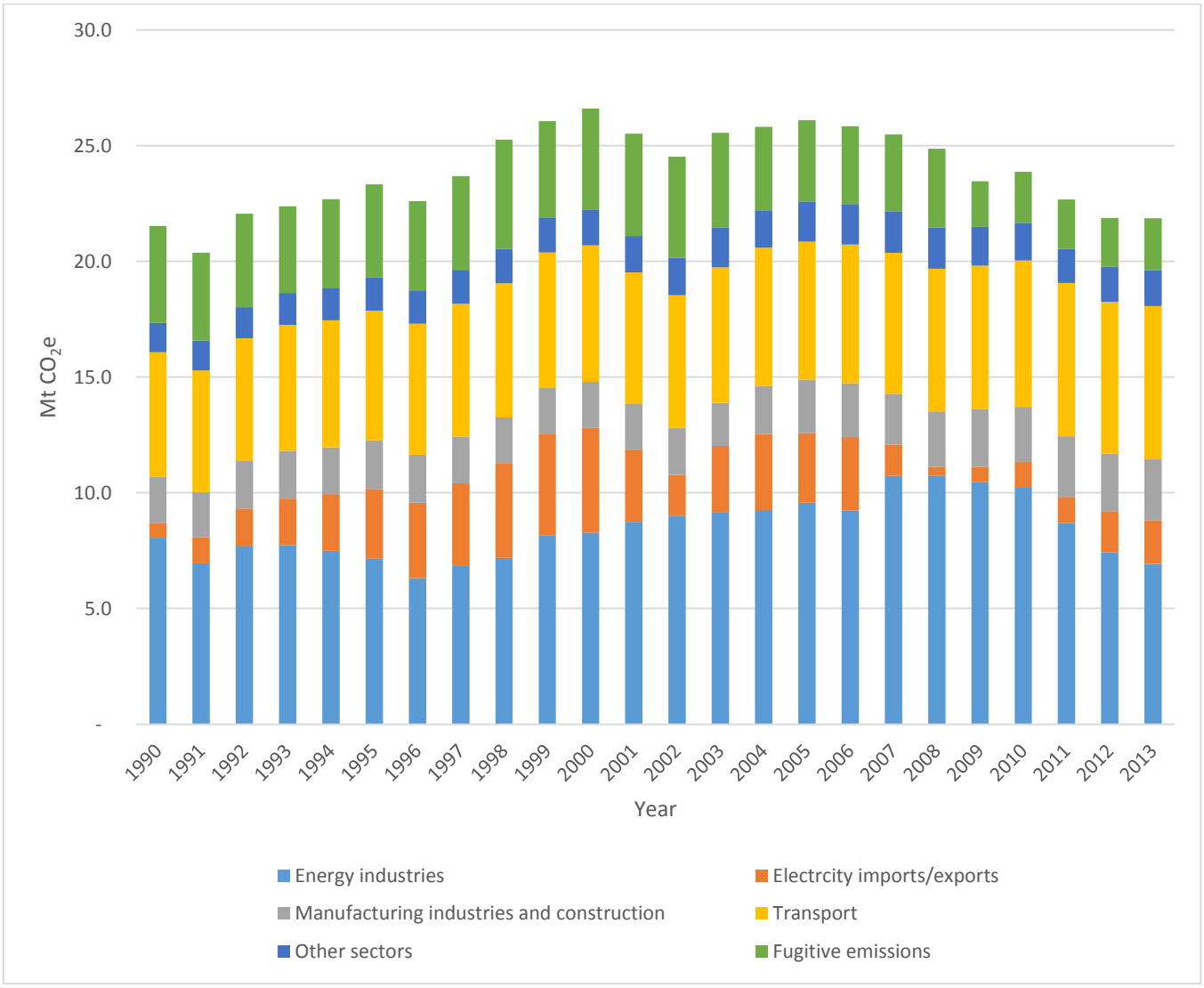


Figure 5: Energy sector emissions trend, South Australia, 1990-2013 (Mt CO_2e)

Table 3 presents the changes from the emissions reporting baseline year of 1990 to the most recent reporting year of 2013. A comparison is also provided since 2007, the year when the Act was introduced.

Mt CO_2e	**1990**	**2007**	**2011**	**2013**	**Change 1990-2013 (%)**		**Change 2007-2013 (%)**	
Energy industries	8.07	10.74	8.71	6.93	-14.1	↓	-35.5	↓
Electricity imports/exports	0.62	1.35	1.12	1.89	202.5	↑	39.7	↑
Manufacturing industries and construction	2.01	2.18	2.62	2.64	31.3	↑	20.6	↑
Transport	5.38	6.10	6.62	6.62	23.0	↑	8.5	↑
Fugitive emissions	4.18	3.34	2.14	2.23	-46.6	↓	-33.1	↓
Other sectors	1.27	1.77	1.46	1.55	22.0	↑	-12.3	↓
Total	21.53	25.49	22.67	21.86	1.5	↑	-14.2	↓

Table 3: Energy sector emissions (Mt CO_2e)

B.2.2 South Australian Emissions – Industrial Processes

Industrial processes emissions are presented in Figure 6 and are broken down into the following components:

- Minerals industry – carbon dioxide (CO_2) from cement clinker and lime production, the use of limestone, dolomite and other carbonates in industrial smelting and other processes, soda ash production and use and magnesia production
- Non-energy products from fuels and solvent use - CO_2 produced by oxidation of lubricating oils and greases
- Product uses as substitutes for ozone depleting substances (ODS) – hydrofluorocarbons, refrigerating and air conditioning equipment, foam blowing, metered dose inhalers, fire extinguishers and solvent use, and
- Other product manufacture and use - CO_2 from the consumption of CO_2 in the food and beverage industry, the use of sodium bicarbonate and SF6 from electrical equipment.

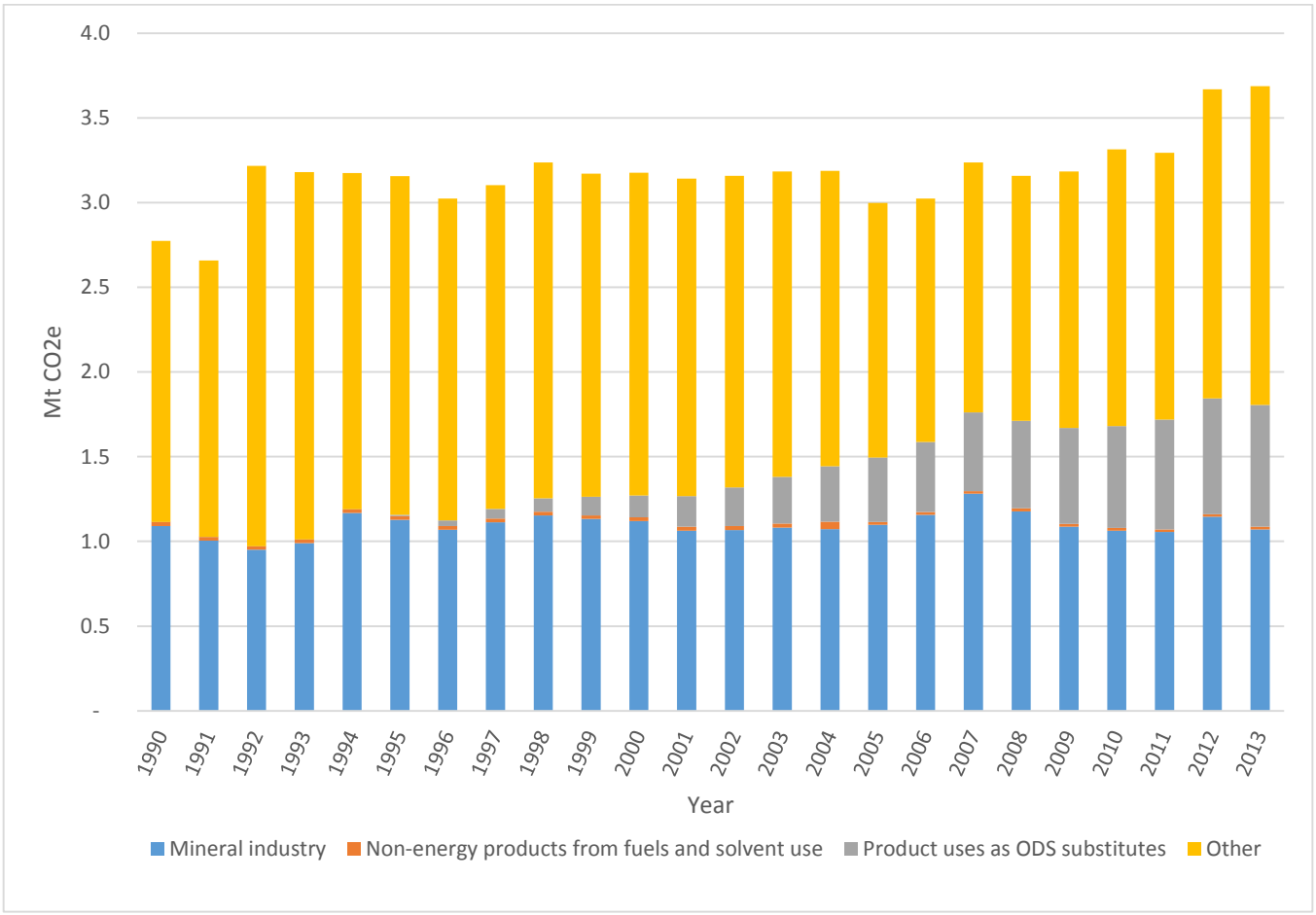


Figure 6: Industrial processes emissions trend, South Australia, 1990-2013 (Mt CO_2e).

Table 4 presents the changes from the emissions reporting baseline year of 1990 to the most recent reporting year of 2013. A comparison is also provided since 2007, with the introduction of the Act.

Mt CO_2e	**1990**	**2007**	**2011**	**2013**	**Change 1990-2013 (%)**		**Change 2007-2013 (%)**	
Mineral industry	1.09	1.28	1.06	1.15	5.0	↑	-10.5	↓
Non-energy products from fuels and solvent use	0.02	0.02	0.02	0.01	-34.3	↓	-3.8	↓
Product uses as ODS substitutes	0.00	0.46	0.65	0.68	1430619.7	↑	46.9	↑
Other	1.66	1.48	1.57	1.82	9.9	↑	23.6	↑
Total	2.77	3.24	3.29	3.67	32.2	↑	13.3	↑

Table 4: Industrial processes emissions (Mt CO_2e) *N.B. The percentage change figure for Product uses as ODS substitutes is significant between 1990 and 2013 due to the low base figure recorded in 1990.*

B.2.3 South Australian Emissions – Agriculture

Agricultural emissions are presented in Figure 7 and are broken down into the following components:

- Enteric fermentation in livestock - emissions associated with microbial fermentation during digestion of feed by ruminant (mostly cattle and sheep) and some non-ruminant domestic livestock
- Manure management - emissions associated with the decomposition of animal wastes while held in manure management systems
- Agricultural soils - emissions associated with the application of fertilisers, crop residues and animal wastes to agricultural lands and the use of biological nitrogen fixing crops and pastures
- Prescribed burning of savannas - emissions associated with the burning of tropical savanna and temperate grasslands for pasture management, fuel reduction and prevention of wildfires
- Field burning of agricultural residues - emissions from field burning of cereal and other crop stubble, and the emissions from burning sugar cane prior to harvest
- Carbon dioxide emissions from the application of urea and lime.

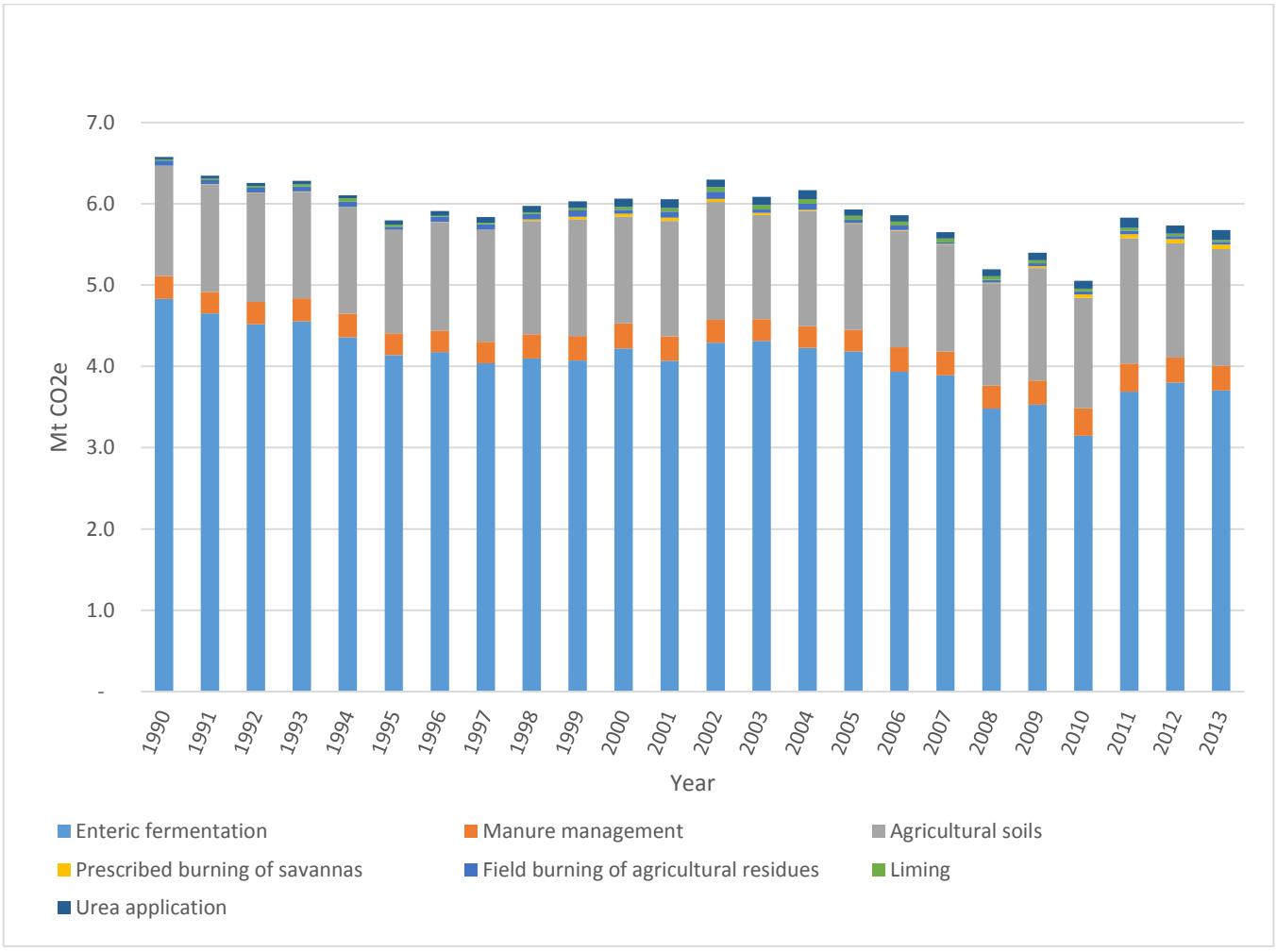


Figure 7: Agricultural emissions trend, South Australia, 1990-2013 (Mt CO_2e).

Table 5 presents the changes from the emissions reporting baseline year of 1990 to the most recent reporting year of 2013. A comparison is also provided since 2007, the year in which the Act was introduced. *N.B. The percentage change figures for Prescribed burning of savannas are significant between 1990 and 2013 and 2007 to 2013 due to the low base figure recorded in 1990.*

Mt CO_2e	**1990**	**2007**	**2011**	**2013**	**Change 1990-2013 (%)**		**Change 2007-2013 (%)**	
Enteric fermentation	4.83	3.89	3.69	3.70	-23.3	↓	-4.9	↓
Manure management	0.28	0.29	0.35	0.31	7.5	↑	4.3	↑
Agricultural soils	1.35	1.31	1.54	1.44	6.3	↑	9.4	↑
Prescribed burning of savannas	0.00	0.01	0.05	0.06	1131.7	↑	636.5	↑
Field burning of agricultural residues	0.06	0.02	0.05	0.03	-48.2	↓	54.8	↑
Liming	0.01	0.05	0.03	0.02	89.1	↑	-48.6	↓
Urea application	0.03	0.08	0.13	0.12	290.0	↑	52.7	↑
Total	6.58	5.65	5.83	5.68	-13.7	↓	0.5	↑

Table 5: Agricultural emissions (Mt CO_2e)

B.2.4 South Australian Emissions – Land Use, Land Use Change and Forestry

Land use, land use change and forestry emissions are presented in Figure 8 and are broken down into the following components:

- Deforestation - emissions and removals (i.e. sinks) from the replacement of forest with pasture, crops or other uses since 1990. Emissions arise from the burning and decay of cleared vegetation, and changes in soil carbon from current and past events
- Afforestation and reforestation - emissions and removals from forests established on agricultural land since 1990. Growth of the forests and regrowth on cleared lands provides a carbon sink, while emissions can arise from soil disturbance on the cleared lands (N_2O)
- Forest management - emissions and removals in forests managed under a system of practices designed to support commercial timber production such as harvest or silvicultural practices or practices that are designed to implement specific sink enhancement activities. Forest harvesting causes emissions due to the decay of harvest slash and any subsequent prescribed burning. The regrowth of forests following harvesting provides a carbon sink and the harvested wood product pool can be a carbon sink or source depending on the rate of input and the rate of decay. Wildfire emissions on forest management land are reported using the natural disturbances provision
- Cropland management - Anthropogenic emissions and removals on croplands occur as a result of changes in management practices on cropping lands, from changes in crop type - particularly woody crops - and from changes in land use, and
- Grazing land management - Anthropogenic emissions and removals on grasslands result from changes in management practices on grass lands, particularly from changes in pasture, grazing and fire management; changes in woody biomass elements and from changes in land use.

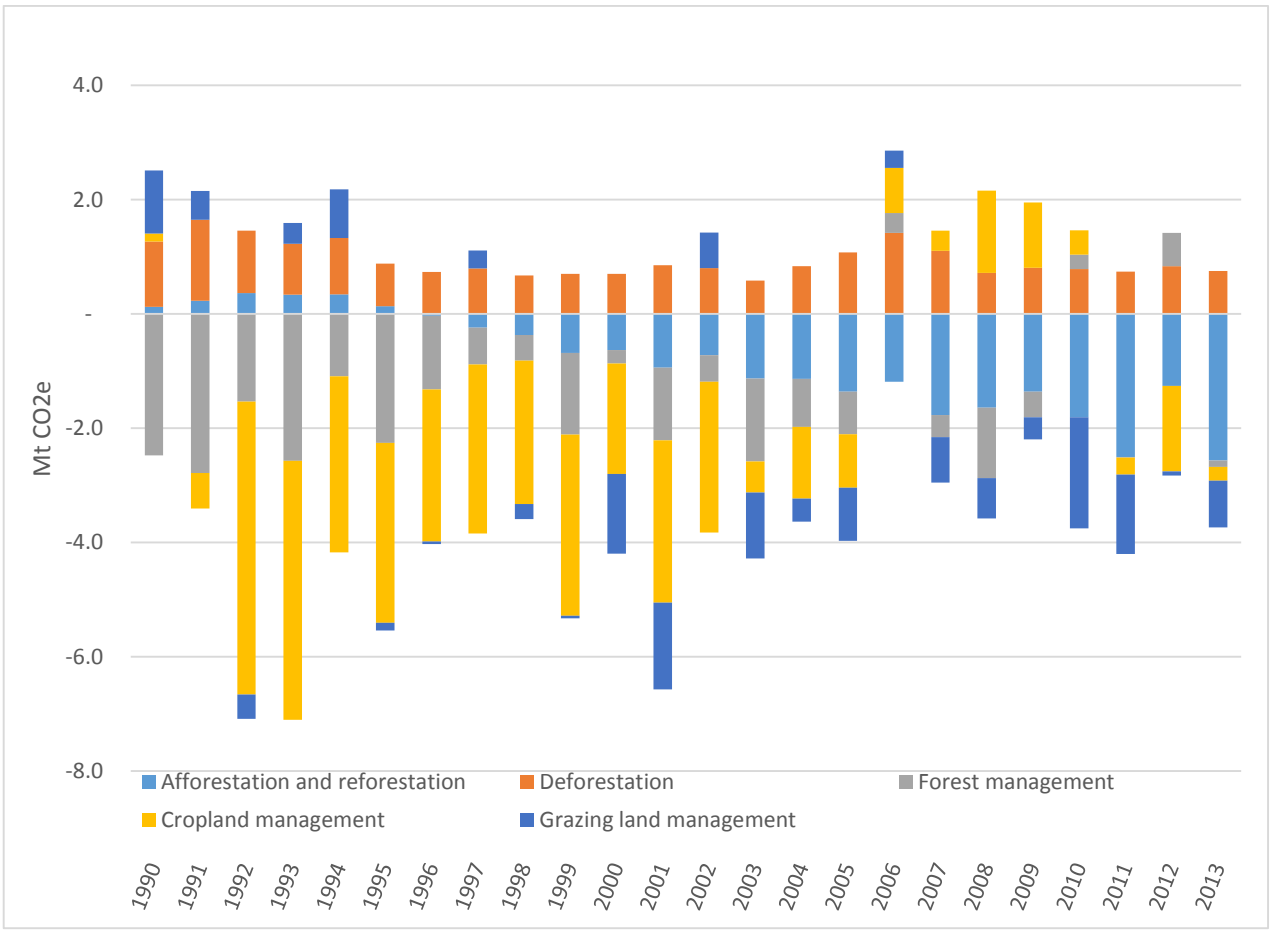


Figure 8: Land sector emissions trend, South Australia, 1990-2013 (Mt CO_2e)

Table 6 presents the changes in these key components from the emissions reporting baseline year of 1990 to the most recent reporting year of 2013. A comparison is also provided since 2007, with the introduction of the Act. *N.B. The percentage change figures for Afforestation and reforestation and total emissions are significant between 1990 and 2013 and 2007 to 2013 due to the low base figures recorded in 1990.*

Mt CO_2e	**1990**	**2007**	**2011**	**2013**	**Change 1990-2013 (%)**		**Change 2007-2013 (%)**	
Afforestation and reforestation	0.12	-1.77	-2.50	-2.57	-2192.8	↓	-2192.8	↓
Deforestation	1.14	1.10	0.74	0.75	-34.2	↓	-32.0	↓
Forest management	-2.47	-0.39	-0.01	-0.11	95.5	↑	71.3	↑
Cropland management	0.14	0.35	-0.30	-0.24	-268.3	↓	-168.8	↓
Grazing land management	1.10	-0.79	-1.39	-0.82	-174.1	↓	-2.8	↓
Total	0.04	-1.50	-3.46	-2.99	-8411.6	↓	-99.2	↓

Table 6: Land use, and use change and forestry emissions (Mt CO_2e)

B.2.5 South Australian Emissions – Waste

Waste emissions are presented in Figure 9 and are broken down into the following components:

- Solid waste - emissions resulting from anaerobic decomposition of organic matter in landfills
- Wastewater - emissions resulting from anaerobic decomposition of organic matter in sewerage facilities (including on-site systems such as septic tanks) during treatment and disposal of wastewater
- Incineration - emissions resulting from the incineration of solvents and clinical waste, and
- Biological treatment of solid waste - emissions resulting from the anaerobic decomposition of organic material in composting and anaerobic digester facilities.

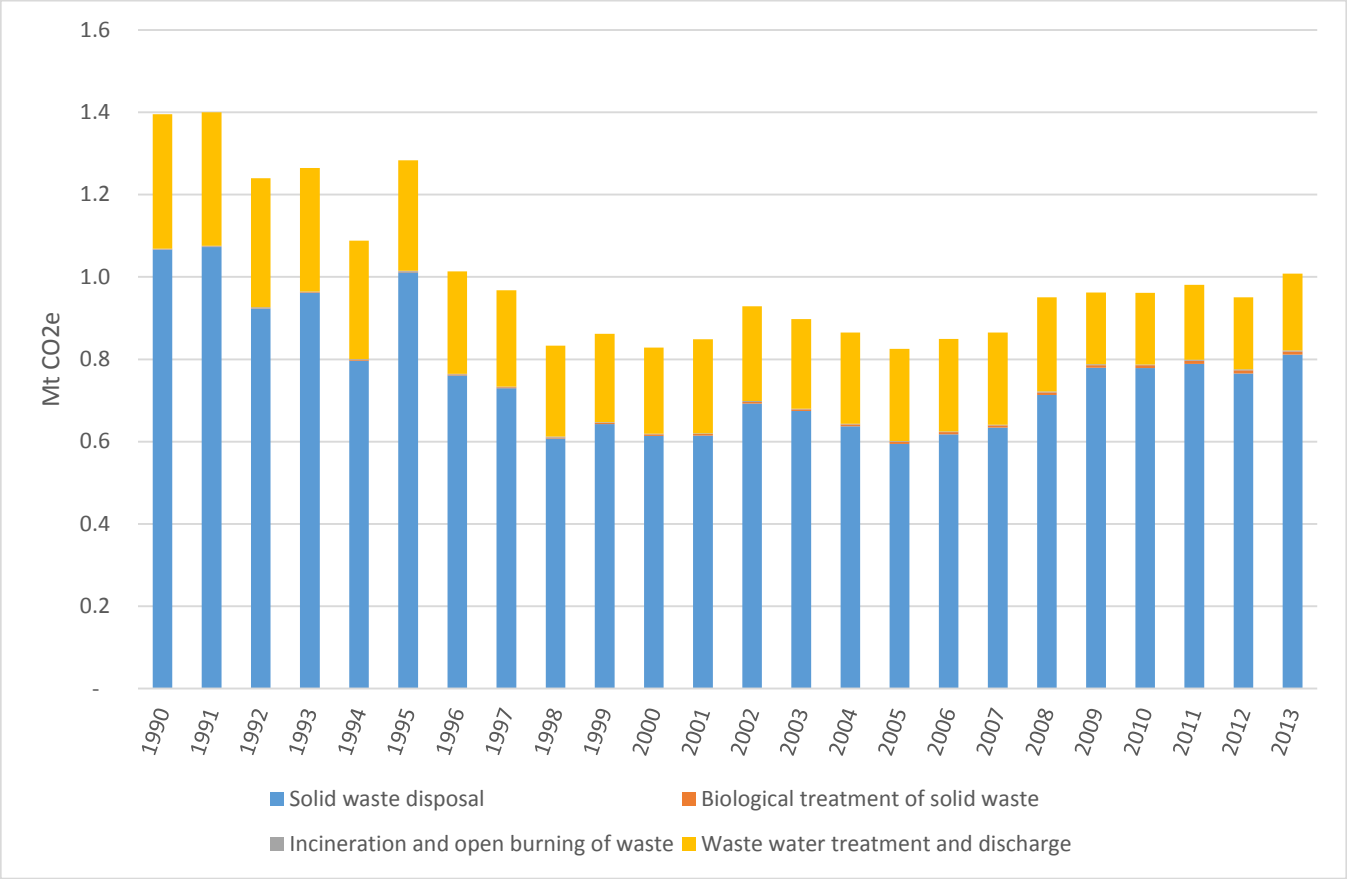


Figure 9: Waste emissions trend, South Australia, 1990-2013 (Mt CO_2e).

Table 7 presents the changes in these key components from the emissions reporting baseline year of 1990 to the most recent reporting year of 2013. A comparison is also provided since 2007, with the introduction of the Act. *N.B. The percentage change figures for Biological treatment of solid waste are significant between 1990 and 2013 due to the low base figures recorded in 1990.*

Mt CO_2e	**1990**	**2007**	**2011**	**2013**	**Change 1990-2013 (%)**		**Change 2007-2013 (%)**	
Solid waste disposal	1.07	0.63	0.79	0.81	-24.0	↓	28.0	↑
Biological treatment of solid waste	0.001	0.005	0.008	0.008	1046.8	↑	50.8	↑
Incineration and open burning of waste	0.0016	0.0020	0.0018	0.0017	4.0	↑	-15.8	↓
Waste water treatment and discharge	0.33	0.22	0.18	0.19	-42.8	↓	-16.5	↓
Total	1.40	0.86	0.98	1.01	-27.8	↓	16.5	↑

Table 7: Waste emissions (Mt CO_2e)

Reader to note: A number of changes to have been made to the data presented in this report compared with that released in 2011, due to changes in the State Greenhouse Gas Inventory (SGGI). This includes reduced availability due to aggregation of data for some sectors for confidentiality purposes, as advised by the Australian Government Department of the Environment. DEWNR therefore has prepared this report consistent with the SGGI for 2013 and retained information in the report as provided in previous years where possible.