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

December 2013

Government of South Australia
Department of Environment, Water and Natural Resources

Department of Environment, Water and Natural Resources

GPO Box 1047, Adelaide SA 5001

Telephone National (08) 8463 6946

International +61 8 8463 6946

Fax National (08) 8463 6999

International +61 8 8463 6999

Website www.environment.sa.gov.au



Report prepared by

Climate Change Unit, Water and Climate Change Branch, Strategy and Advice Group
Report on the operation of the *Climate Change and Greenhouse Emissions Reduction Act 2007* – December 2013, Government of South Australia, through Department of Environment, Water and Natural Resources, Adelaide

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# Foreword

South Australia has been a national leader in responding to climate change having established the *Climate Change and Greenhouse Emissions Reduction Act 2007* (the Act) which aims to promote action within South Australia that provides consistency with national and international schemes. In 2007, the *Tackling Climate Change: South Australia's Greenhouse Strategy 2007-2020* was also released and sets a framework for rising to the challenge of reducing greenhouse gas emissions in South Australia.

The Act contains specific targets to reduce greenhouse gas emissions and increase renewable energy. In particular, it contains a target 'to reduce by 31 December 2050 greenhouse gas emissions within South Australia by at least 60 per cent to an amount that is equal to or less than 40 per cent of 1990 levels' as part of a national and international response to climate change. This target is incorporated in *South Australia's Strategic Plan,* which includes an additional first step to achieve the Kyoto target by limiting the state's greenhouse gas emissions to 108 per cent of 1990 levels during 2008-12.

The latest measure of progress towards South Australia's emission reductions target shows that our 2010-11 greenhouse gas emissions were almost nine per cent lower than the 1990 baseline. Much of this decrease has been achieved in the emissions category of Land Use, Land Use Change and Forestry. This is a result of South Australia moving from an era of net vegetation clearance in 1990, to the present era, which is characterised by revegetation and new forestry plantings. Without this contribution, emissions in 2011 were six per cent above 1990 levels. This increase is in the context of both growing energy use and a growing economy however, with South Australia's Gross State Product rising by 65 per cent between 1990 and 2011. This success has been achieved through government working collaboratively with industry and the community and demonstrates that economic growth can be decoupled from rising carbon emissions.

Between 2004 and 2011, South Australia performed better than the national average in stabilising and reducing emissions, primarily due to the increases in the generation of renewable energy in this state. South Australia's 20 per cent generation and consumption targets were achieved during 2010-11, approximately three years ahead of schedule. The state is on track to meet its 2020 target of 33.3 per cent renewable energy generation, with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) reporting that in 2011-2012 the proportion of renewable energy generated was 31.7 per cent. A key to achieving this has been through increased wind power generation which contributed to 27 per cent of the state's electricity generation in 2012-13, capturing investment exceeding $3 billion. It is possible we will achieve the 2020 target in the coming year.

In October 2013, Adelaide hosted the Greenhouse 2013 conference (Australia's pre-eminent climate change science conference run by the CSIRO). The Government of South Australia was a major sponsor. The conference coincided with the release of the Intergovernmental Panel on Climate Change (IPCC), Working Group 1 contribution to the Fifth Assessment Report (WGI AR5), which provided the latest update on climate change science. Dr Thomas Stocker, University of Bern, Switzerland and Co-chair of Working Group I was a keynote speaker. The IPCC Report highlights that warming of the climate system is unequivocal and that human influence on the climate system is clear. Its release has reinforced the need to take action on climate change.

At the Greenhouse 2013 conference, the Premier announced that the Premier's Climate Change Council would lead a review of policies and programmes to provide advice to the Government of South Australia on a new strategic direction for climate change action. Occurring within a fiscally constrained environment, this new direction will create a compelling vision for a state which is moving to a low carbon economy – prospering while achieving reduced emissions.

This progress report has been prepared to fulfil my obligations as Minister for Sustainability, Environment and Conservation pursuant to section 7 of the Act. It is the third progress report and includes a report from CSIRO which assesses whether targets set under the Act have been achieved. Climate change continues to be a pressing international issue and has significant implications for the wellbeing for South Australians. Given the change in national government policy, it is important for states like South Australia to continue to lead on climate change action.

**Hon Ian Hunter MLC**
**MINISTER FOR SUSTAINABILITY, ENVIRONMENT AND CONSERVATION**

# Contents

# 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. This report fulfils the reporting requirements of Section 7 of the Act including, providing 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
- climate change impacts related information

This is the third report on the operation of the *Climate Change and Greenhouse Emissions Reduction Act 2007*. It provides information pertaining to the reporting period for calendar years 2012 and 2013.

The first two progress reports were completed in 2009 and 2011 and are available from the Government of South Australia's website at: www.sa.gov.au/climatechange.

# Section 1 – Effectiveness of South Australia's climate change initiatives

Pursuant to section 7(1) of the *Climate Change and Greenhouse Emissions Reduction Act 2007* (the Act), the Minister responsible for administration of the Act, must prepare a report on the operation of the Act every two years. This report fulfils those obligations.

South Australia has implemented a number of notable programmes and initiatives that reduce emissions and assist the state to better manage and adapt to the impacts of climate change under the Act. Key outcomes of these programmes have been reported annually in the Annual Report of the Department of Environment, Water and Natural Resources.

This 2013 report includes 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 copy of the CSIRO report and summary of its findings are contained in Appendix C.

The Australian Government has reported that South Australia's net greenhouse gas emissions were 30.8 million tonnes of carbon dioxide equivalent (CO2-e) in 2011. This is almost nine per cent lower than the baseline year of 1990. Much of this decrease has been achieved in the emissions category of Land Use, Land Use Change and Forestry (LULUCF). This is a result of South Australia moving from an era of net vegetation clearance in 1990, to the present era, which is characterised by revegetation and new forestry plantings. Without the contribution of LULUCF, emissions in 2011 were six per cent above 1990 levels. This increase is in the context of both growing energy use and a growing economy however, with South Australia's Gross State Product rising by 65 per cent between 1990 and 2011.

In assessing progress toward South Australia's 2050 greenhouse gas emission target, the CSIRO concluded that there is considerable uncertainty and estimation risk in predicting changes so far into the future. Technological change, policy decisions, investment behaviour and consumer demand are all cited as sources of uncertainty. Given the influence of the federal policy context on South Australian emissions, the national 2020 target becomes a key milestone toward 2050 and progress toward the 5 per cent reduction target at a national level remains unclear as the Coalition Government moves to replace the carbon tax with its Direct Action Plan.

Nevertheless, electricity generation constitutes 24 per cent of South Australia's emissions and progress toward the 33.3 per cent 2020 target will have a positive impact on the ability of South Australia to meet its 2050 target.

The Act includes targets for 20 per cent renewable energy generation and consumption in 2014. The CSIRO concluded that these targets have already been met. South Australia is on track to meet its 2020 target of 33.3 per cent renewable energy generation, with the CSIRO reporting that 31.7 per cent was met in 2011-12. Further detail is provided in sections 3, 6, 11 and Appendix C.

In October 2013, the Premier announced a review of climate change policies undertaken since 2007. The review will be the first time the government has reflected on climate change activities undertaken by the state. Assessment of policies will be based on criteria such as carbon impact, behaviour change, economic opportunity, programme co-benefits, leverage of other funding sources, programme cost, policy consistency, regulation, net cost of living impact, alignment to highest risk, and building community and economic resilience. The review will be finalised in early 2014 and will assist to inform future government climate change policy.

Appendix A provides an overview of the effectiveness of South Australia's climate change programmes and initiatives undertaken within the 2012 and 2013 calendar years. This fulfils the requirement of section 7(2)(a) of the Act.

The *Tackling Climate Change: South Australia's Greenhouse Strategy 2007-2020* is a framework for meeting all of South Australia's greenhouse targets and commitments in a comprehensive and coordinated way. Key actions and achievements are listed against each strategic objective under the eight key areas of the Strategy. Selected highlights are summarised in the following table.

| **Key area** | **Programmes/Initiatives** | **Highlights** |
|---|---|---|
| 1. Government Leadership | • Premier's Climate Change Council<br>• Leadership for Geothermal Energy Programme<br>• State of the Environment Reporting<br>• Government Energy Efficiency – SASP Target 61<br>• Water Efficient Fixtures for Government Buildings Programme<br>• Solar Panels for Government Buildings Programme<br>• Government Fleet Target<br>• South Australia's International Leadership and Engagement Programme<br>• Sector Agreement Programme<br>• Climate Change Adaptation Awards | • South Australia has been recognised as a national leader for its approach to climate change adaptation. This community driven adaptation planning process has received state and national awards.<br>• South Australia has built a national and international reputation for climate change leadership, through involvement in the Climate Group's States and Regions Alliance, the Intergovernmental Panel for Climate Change's Renewable Energy Report, and the United Nations Conference on Sustainable Development (Rio+20). |
| 2. Adaptation | • South Australia's Climate Change Adaptation Framework<br>• Regional Climate Change Adaptation Plans - SASP Target 62<br>• Primary Industry Adaptation Programme<br>• Public Health, Risk Assessment and Research Programme<br>• Water Resource Management Programme<br>• Landscape Futures Analysis Programme<br>• Coastal Management Programme<br>• South Australian Emergency Management Programmes | • The *Climate Change Adaptation Framework* and the accompanying Government Action Plan were adopted and launched in August 2012. The Framework facilitates the involvement of local communities and experts in regional climate change planning. The Action Plan will ensure relevant Government of South Australia's agencies take climate change into account in service delivery planning. |

| Key area | Programmes/Initiatives | Highlights |
|---|---|---|
| 3. Community | • Awareness and Behaviour Change Programme<br>• Solar Feed-in Scheme<br>• Solar Hot Water Rebate Programme<br>• SA Water $H_2$OME Rebate Programmes<br>• Irrigated Public Open Space (IPOS) Programme<br>• Waste Avoidance, Reduction and Recycling Programmes<br>• Australian Service Excellence Standards for Community Organisations<br>• Housing SA Design Guidelines for Sustainable Housing and Liveable Neighbourhoods<br>• Off-Grid Remote Area Energy Efficiency Programme<br>• Safer, Greener and More Active Travel Community Programmes | • The Residential Energy Efficiency Scheme in its first three years (2002-2011) has saved 645,000 thousand tonnes of $CO_2$-e and 4.1 petajoules of energy. According to an independent evaluation of the scheme, it has saved households $100 million in energy costs and delivered a private benefit of $3.50 for every $1.00 spent on energy efficiency equipment[1].<br>• The Solar Feed-in Scheme has been successful in promoting the uptake and community acceptance of rooftop solar photovoltaic installations.<br>• As at 31 October 2013, there were nearly 181,500 customers approved to connect a solar system to the grid. Approximately 150,681 of these solar customers had their solar system installed and operating.<br>• South Australia's recycling efforts in 2011-12 saved approximately 1.28 million tonnes of $CO_2$-e. |
| 4. Industry | • Primary Industry Development under Changing Climatic Conditions<br>• South Australian Tourism Commission<br>• Zero Waste SA Industry Programme<br>• Final Tranche of Landfill Bans<br>• Premier's Research and Industry Fund<br>• TAFE SA Sustainable Industries Education Centre<br>• Green Skills and Vocational Training Programmes<br>• Environmental Sustainability Action Forum<br>• Cleantech Industry Development<br>• Water Efficiency Plan Programme<br>• National Business Water Efficiency Benchmarking Programme | • Government programmes provided support and information for key industries such as primary producers, tourism and the cleantech sector to actively improve business resource efficiency.<br>• A survey of members of the Zero Waste SA Industry Programme in 2012 indicated annual savings of 8,435 tonnes of $CO_2$-e through reductions in electricity and gas consumption and waste diverted from landfill. |
| 5. Energy | • Residential Energy Efficiency – SASP Target 60 | • 2011-12 was the first year in which wind generation overtook coal to become |

[1] *Evaluation of the South Australian Residential Energy Efficiency Scheme (REES) – Final Report* – by Pitt & Sherry prepared for DMITRE. Refer to: sa.gov.au/energy/rees

| Key area | Programmes/Initiatives | Highlights |
|---|---|---|
| | • Energy Efficiency Opportunities Programme<br>• SA Water Renewable Energy Target<br>• SA Water CO-Digestion Trial<br>• RenewablesSA Programmes<br>• Geothermal Energy<br>• Mini Wind Turbine Trial<br>• Unconventional Gas as a Transition Fuel Programme<br>• Carbon Capture and Storage Programme | the second most predominant fuel source for electricity generation (after gas).<br>• This performance was replicated in 2012-13 when wind contributed 27 per cent of the state's total electricity generation. Rooftop photovoltaic systems are estimated to have generated 600 gigawatt hours in South Australia, equivalent to approximately 4 per cent of the state's total energy generation for that period. |
| 6. Transport and Planning | • Public Transport – SASP Target 63<br>• Cycling and Walking – SASP Target 2<br>• South Australia's Low Emissions Vehicle Strategy 2012-2016<br>• Participating in Automotive Australia 2020 CRC (AutoCRC)<br>• Electric Vehicle Recharging Programme<br>• Trialling of Electric Vehicles in the State Government Electric Vehicles in Fleets<br>• Reducing Emissions from the State Government Fleet | • There has been significant investment in upgrading the passenger rail network and increasing the size of the bus fleet.<br>• Adelaide's network of bicycle lanes and paths has been extended from around 480 kilometres in 2002 to 1,120 kilometres in 2013. Annual Adelaide City Cordon Counts indicate that people cycling to and from the city on a typical day increased by 46 per cent from 2007 to 2012. |
| 7. Buildings | • South Australian Planning Strategy<br>• Cool Roofs Programme<br>• CRC For Low Carbon Living Programme<br>• Building Policy<br>• Sustainable Development Through Integrated Design<br>• Building Innovation Fund<br>• Building Upgrade Finance Programme<br>• National Energy Efficient Building Project<br>• Sustainable Design in Urban Renewal Programme<br>• Urban Heat Island Research Study<br>• Water Sensitive Urban Design Programme<br>• Evidence Base for Green Infrastructure<br>• Natural Disaster Resilience Programme | • South Australia is actively 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.<br>• 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.<br>• In 2012-13, the State Government worked with local government to explore the potential for introduction of a Building Upgrade Finance mechanism in South Australia. Consultation on |

| Key area | Programmes/Initiatives | Highlights |
|---|---|---|
| | | enabling amendments to the *Local Government Act 1999* is anticipated to commence in 2012-13.<br>• The work of Renewal SA and the Building Innovation Fund provided practical demonstrations that allow the South Australian community to experience the benefits of integrated design and sustainable urban development.<br>• A state-wide policy on Water Sensitive Urban Design (WSUD) was released in October 2013 which outlines 14 actions the State Government will pursue collaboratively with industry, local government, and others to encourage cost effective water sensitive approaches in urban developments and redevelopments. The policy was developed using the best available science from the Goyder Institute for Water Research, as well as significant consultation with local government, industries, and communities. |
| 8. Natural Resources | • Natural Resource Management<br>• Soils and Land Management<br>• Recycled Water Programme<br>• Impacts of Climate Change on Water Resources<br>• NatureLinks Programme<br>• Coorong, Lower Lakes and Murray Mouth Recovery Project<br>• Transects for Environmental Monitoring and Decision Making Programme<br>• Threatened Species and Ecological Communities Programme<br>• River Murray Forest Project<br>• Million Trees Programme<br>• Carbon Farming Initiative<br>• Seed Conservation Centre – Seed Bank | • Eight NRM regions have received a total of $3.9 million to ensure their plans guide climate change mitigation and adaptation in the landscape. Funding was provided through the Commonwealth Regional Natural Resources Management Planning for Climate Change Fund.<br>• Revegetation projects create carbon storage and support ecosystem resilience. By December 2013, 1.1 million trees, shrubs, grasses and sedges were planted by the Coorong, Lower Lakes and Murray Mouth (CLLMM) Vegetation Programme. More than 1,000 hectares of plantings have been established with over 2 million trees and associated understorey species planted under the Million Trees Programme.<br>• The Government of South Australia 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. |

# Section 2 – Targets and determinations

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

No new targets were established under section 5 of the *Climate Change and Emissions Reduction Act 2007* within the reporting period.

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

This section fulfils the requirement of section 7(2)(c) of *South Australia's Climate Change and Greenhouse Emissions Reduction Act 2007* 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
- 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 State Government announced a target of 33.3 per cent of South Australia's electricity generation to come from renewable energy by 2020, pursuant to section 5(7) of the *Climate Change and Greenhouse Emissions Reduction Act 2007*. This target has been incorporated into South Australia's Strategic Plan (SASP) as Target 64.

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.

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

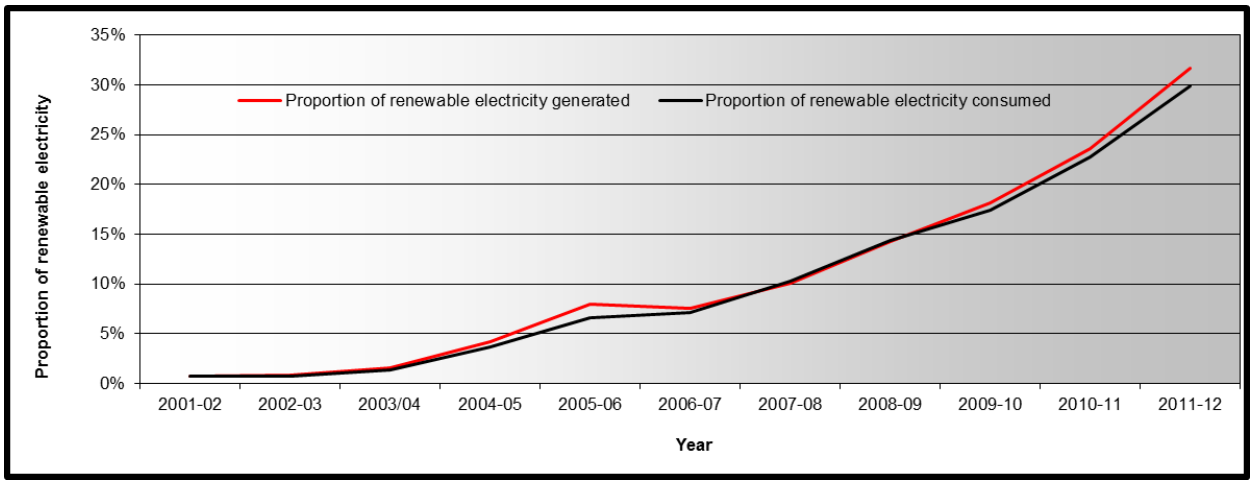
**Progress towards the Renewable Electricity Generation Target (Refer to Appendix C – CSIRO Report)**

| 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.7% | 0.8% | 1.6% | 4.2% | 8.0% | 7.5% | 10.1% | 14.3% | 18.1% | 23.6% | 31.7% |

**Progress towards the Renewable Electricity Consumption Target (Refer to Appendix – CSIRO Report)**

| 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.7% | 0.7% | 1.4% | 3.7% | 6.6% | 7.1% | 10.3% | 14.4% | 17.4% | 22.8% | 29.9% |

**Progress towards renewable electricity targets (Refer to Appendix C – CSIRO Report)**




The methods used to calculate progress towards the renewable electricity targets are based on recommendations by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). These are detailed in Appendix C – CSIRO Report. This is consistent with the requirement under the Act to incorporate a report from the CSIRO in every second progress report on the operation of the Act.

Rather than using generation data that is metered directly into the National Electricity Market, the CSIRO approach instead utilises data recorded from the regional reference node and applies loss factors.

For the purposes of reporting against the SASP target, the Government of South Australia continues to use its own methodology on the basis that it is less complex and, therefore, more easily understood. The state-based approach takes into account in-house energy use and maintains a consistent methodology across the timeframe. As a result, the CSIRO outcomes differ slightly in terms of the percentage of renewable energy generated in South Australia in a given year.

For comparison, using state-based methodology for 2011-12, South Australia's renewable energy production of the state's total energy generation amounted to 29.8 per cent and for 2012-13 it amounted to 31.5 per cent respectively. Given achievement of the renewable energy consumption target in 2010-11, the Government of South Australia has only measured progress towards its renewable energy generation target since this time.

Therefore, using the currently available data both methodologies demonstrate that South Australia could meet its 33.3 per cent renewable electricity generation target ahead of schedule.

For the reporting period (2012 and 2013), the snapshot of the renewables sector is as follows:

- 2011-12 was the first year in which wind generation overtook coal to become the second most predominant fuel source for electricity generation (after gas). This performance was replicated in 2012-13, when wind contributed approximately 27 per cent of the state's total electricity generation.
- If South Australia were a nation, it would rank second to Denmark as the world leader in terms of installed wind power on per capita basis.
- To the end of the reporting period, there were 15 fully operational wind farms in South Australia with a total installed capacity of 1,203 MW. According to Australian Energy Market Operator (AEMO), there was approximately 400 MW of installed solar capacity for the same period.
- As at 31 October 2013, there were nearly 181,500 customers approved to connect a solar system to the grid. Approximately 150,681 of these solar customers had their solar system installed and operating.

- Based on the state data, during 2012-13, rooftop photovoltaic systems are estimated to have generated 600 gigawatt hours in South Australia, equivalent to approximately 4.6 per cent of the state's total energy generation for that period.
- From 2003 to 2013, there has been $5.5 billion in investment in renewable energy (eg including wind, solar photovoltaic systems and other sources), with some $2 billion, or 40 per cent, of this investment occurring in regional areas.
- South Australia has attracted 75 per cent (an estimated $885 million of $1,187 million total) of all investment in Australian geothermal energy exploration projects from 2002 to 2013.
- The number of South Australian geothermal licences has grown from three in 2002 to 135 as of 20 September 2013.
- As of 1 December 2012 South Australian geothermal projects have been offered 90 per cent ($159 million of $172 million total) of all Australian Commonwealth Government grants for geothermal projects across the nation.

# 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 *Climate Change and Emissions Reduction Act 2007* 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 between the Minister and other person or entity entered into under the Act within the reporting period.

There are currently 11 climate change sector agreements in operation, with the following agreements being entered into during the reporting period.

**i Sector agreements commenced 2011-2013**

| SECTOR AGREEMENT TITLE | KEY AIMS |
|---|---|
| **Local Government Association** | • Support the implementation of South Australia's Climate Change Adaptation Framework<br>• Implement the Science to Solutions Project to support adaptation decision making at the local scale<br>• Work with the State Government to develop and implement the Building Upgrade Finance mechanism<br>• Support the formulation of policy to address sea level rise impacts on coastal development. |
| **Southern Adelaide** | • This agreement articulates a common goal amongst the key parties to develop and deliver climate change adaptation planning and programmes in a cooperative, coordinated and consultative manner in the region<br>• It has, as its key focus, adaptation and response to the impacts, risks, and opportunities across sectors within the region to assist with the transition to a carbon and water constrained future<br>• There is a commitment to cooperate in the timely implementation of the Adaptation Plan, and its ongoing evaluation and review. |
| **Western Adelaide** | • This agreement focuses on the preparation and implementation of the Western Adelaide Region Climate Change Adaptation Plan which is currently under preparation from 2012. The Plan will undertake an integrated vulnerability assessment of the area, and map out strategies for the region in tackling climate change over the next five years, in addition to longer-term aspirations<br>• The plan will address impacts such as sea level rise, storm water, heat waves and changes from altered climatic conditions. |

**ii Agreements in operation during reporting period (commenced prior to reporting period)**

| SECTOR AGREEMENT TITLE | KEY AIMS |
|---|---|
| **Adelaide Brighton Cement Ltd** | • Reduce greenhouse gas emissions associated with the manufacture and use of cement and lime products in South Australia.<br>• Increase the use of renewable energy<br>• Encourage industry partners and other external stakeholders to implement similar measures<br>• Jointly promote the development of, and ultimately participating in, a global sector agreement for the cement and lime manufacturing sectors. |
| **Barossa Regional Agreement** | • Develop and implement a community education and behavioural change programme<br>• Work with local industry and businesses to develop climate change action plans and take advantage of environmental opportunities<br>• Reduce greenhouse gas emissions from regional transport by improving transport and land use planning, investigating infrastructure improvements and exploring alternative transport options<br>• Promote sustainable urban design principles in regional development. |
| **Eyre Peninsula Regional Agreement** | • Undertake integrated adaptive option assessments for the Eyre Peninsula<br>• Assess and identify economic opportunities for the Eyre Peninsula relating to climate change<br>• Develop knowledge through science and research<br>• Develop and implement a broad-scale community education and behavioural change programme<br>• Develop and implement a climate change plan for the region. |
| **OneSteel Whyalla** | • Measure and report greenhouse gas emissions<br>• Encourage product and process innovation<br>• Provide industry leadership<br>• Support the development of sustainable business<br>• Identify and develop local partnerships<br>• Explore a global agreement for the steel industry. |
| **Renewal SA** | • Reduce greenhouse gas emissions associated with the urban development industry in South Australia<br>• Increase the use of renewable energy sources<br>• Promote new and alternative products that assist developers to reduce their carbon footprint. |
| **SA Water** | • Reduce greenhouse gas emissions associated with the provision of water and waste water services for South Australia<br>• Increase the use of renewable energy sources<br>• Develop measures to adapt to climate change<br>• Support necessary research. |

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| **Vocational Education and Training (VET)** | • Identify and respond to South Australia's industry skills and training needs<br>• Build the capacity of VET practitioners to deliver training packages and qualifications<br>• Develop, promote and implement new or revised training packages and qualifications<br>• Create environmental management plans across the sector<br>• Develop pilot demonstration projects that use sustainability tools to increase energy, water and waste efficiency. |
| **Water Industry Alliance (This agreement also concluded in the reporting period)** | • Support the implementation of practical and cost-effective actions that seek to reduce emissions associated with the reclamation, distribution and use of water<br>• Undertake the development of policies, knowledge, technologies, business capability and exports that lead to improved economic development and water use efficiency in South Australia<br>• Deliver improved water security and a healthier environment by reducing the greenhouse impacts of the sector<br>• Position South Australia as a water sensitive state and global leader in positively responding to climate change. |
| **Yorke and Mid North Regional Agreement** | • Promote a 'whole of community', inter-agency approach to managing and mitigating climate change across the Mid North and Yorke Region<br>• Promote and showcase local initiatives aimed at addressing climate change impacts or mitigation<br>• Disseminate information on the economic, environmental and social impact of climate change relevant to this region<br>• 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<br>• 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. |

### iii. Agreements concluded

Three climate change sector agreements completed their full term during the reporting period. These agreements were the Anglican Church Sector Agreement, the University Sector Agreement and the Jeffries Sector Agreement. Other sector agreements which completed their full terms prior to the reporting period are also listed below.

| SECTOR AGREEMENT TITLE | KEY TARGETS |
|---|---|
| **Adelaide City Council (Adelaide Green City)** | • Reduce greenhouse gas emissions through measuring, reporting and implementing a reduction target<br>• Show leadership in innovation and demonstrating new technologies<br>• Support the greening of buildings and improved urban design<br>• Explore options for a smarter and more efficient energy network<br>• Support more sustainable transport<br>• Encourage improved resource recovery in buildings and the public realm<br>• Support the efficient use of sustainable and/or alternative water supplies<br>• Improve and conserve the Adelaide Park Lands. |
| **Anglican Church** | • Demonstrate action to reduce greenhouse gas emissions and the ecological footprint of the Diocese, its Parishes, the Cathedral, Anglicare and other agencies, schools and church members |

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|---|---|
| | • Provide leadership to the community in caring for the environment, reducing greenhouse gas emissions and addressing the science of climate change within the Anglican philosophy<br>• Engage the broader community to reduce their ecological footprint<br>• jointly progress projects that promote sustainability and address climate change. |
| **Electronics and ICT Industry Association** | • Demonstrate leadership in sustainability and reduce greenhouse gas emissions through energy efficient processes and product innovation<br>• Adopt a readily available reporting tool for greenhouse gases and measuring progress in emissions abatement which is consistent with national requirements<br>• Undertake research and development in product innovation<br>• Demonstrate leadership in electronic waste management and recycling through product stewardship<br>• Identify potential market opportunities for products and services that address emissions reduction and climate change adaptation. |
| **Jeffries** | • Investigate the most effective ways to reduce greenhouse gas emissions of fuel and power used in the production of high quality compost<br>• Increase the volume of organic waste separation and treatment from state and local government agencies<br>• Promote industry leadership and local partnerships. |
| **Property Council** | • Encourage, support and promote improved energy efficiency, reduced greenhouse gas emissions, recycled water use and reduced was to landfill<br>• Accelerate uptake of performance based rating tools for assessing greenhouse gas performance<br>• Accelerate industry leadership in sustainable retrofitting of existing commercial buildings. |
| **Royal Automobile Association of South Australia (RAA)** | • Educate the motoring community and industry to help reduce greenhouse gas emissions<br>• Develop an environmental management plan across the association<br>• Support the establishment of a national centre of excellence in vehicle emissions testing. |
| **University** | • Demonstrate action to reduce greenhouse gas emissions and reduce the ecological footprint of the university campuses and related infrastructure<br>• Provide leadership in climate change research and curriculum development<br>• Educate industry and the broader community in climate change mitigation and adaptation<br>• Provide leadership in the South Australian university sector in reducing greenhouse gas emissions and progressing mitigation and adaptation measures<br>• Jointly progress projects that promote sustainability and address climate change. |
| **Urban Development Institute Australia (UDIA)** | • Promote and implement the EnviroDevelopment initiative in South Australia<br>• Develop a sustainable development reporting tool for the urban development industry<br>• Develop partnership projects with other industry bodies that reduce energy inputs and conserve resource use or waste to landfill<br>• Develop carbon footprint reduction targets for the industry. |
| **Waste Management** | • Develop a carbon measurement tool for municipal waste collection<br>• Encourage industry participation in programmes that promote greater energy efficiency in recycling<br>• Support industry education and climate change leadership through information and advice. |

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|---|---|
| **Wine Industry** | • Increase industry awareness and use of the Australian Wine Carbon Calculator to report industry greenhouse gas emissions<br>• Analyse and consider best practice certification standards for the wine industry to gain full market advantage from emissions reduction achievements<br>• Encourage the development of Environmental Action Plans to help improve energy efficiency, reduce greenhouse gas emissions, increase the use of recycled water and reduce waste to landfill by industry participants<br>• Support research to better understand climate change adaptation priorities and opportunities in the wine sector. |

# 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.

**i. Analysis of South Australia's greenhouse gas emissions produced by CSIRO**

Appendix B, South Australian Emissions and Energy Data report provides a comprehensive report and breakdown of South Australia's analysis of greenhouse gas emissions.

Using the latest available data, total South Australian emissions fell by 8.7 per cent from 1990 to 2011, from 33.7 million tonnes to 30.8 million tonnes when land use, land use change and forestry (LULUCF) are included as well as net emissions from interstate electricity flows.

The LULUCF emissions estimate for 1990 has been revised up to 3 million tonnes (from 1.5 million tonnes in past inventories) but has gone from a source of emissions to an emissions sink of 1.7 million tonnes in 2011 in the 2011 Inventory. This effective reduction in emissions of 4.7 million tonnes offsets increases in other sectors, particularly the energy sector. LULUCF emissions estimates are only available for the 1990, 2000 and 2008 to 2011 years and therefore, unlike other sectors, a complete time series since 1990 is not possible.

Energy use is the dominant source of emissions (72 per cent) with 29 per cent of total emissions attributed to electricity.

Allocated by economic sector, the residential and manufacturing sectors make the strongest contributions to emissions, both contributing 22 per cent of the state's emissions, mostly through electricity, gas and fuel use.

Over three quarters of greenhouse gas emissions in South Australia are carbon dioxide emissions. Methane and nitrous oxides are primarily produced by agricultural activities, with a much smaller amount produced during combustion in the use of energy.

Appendix B also provides data and national comparisons for four supporting indicators:

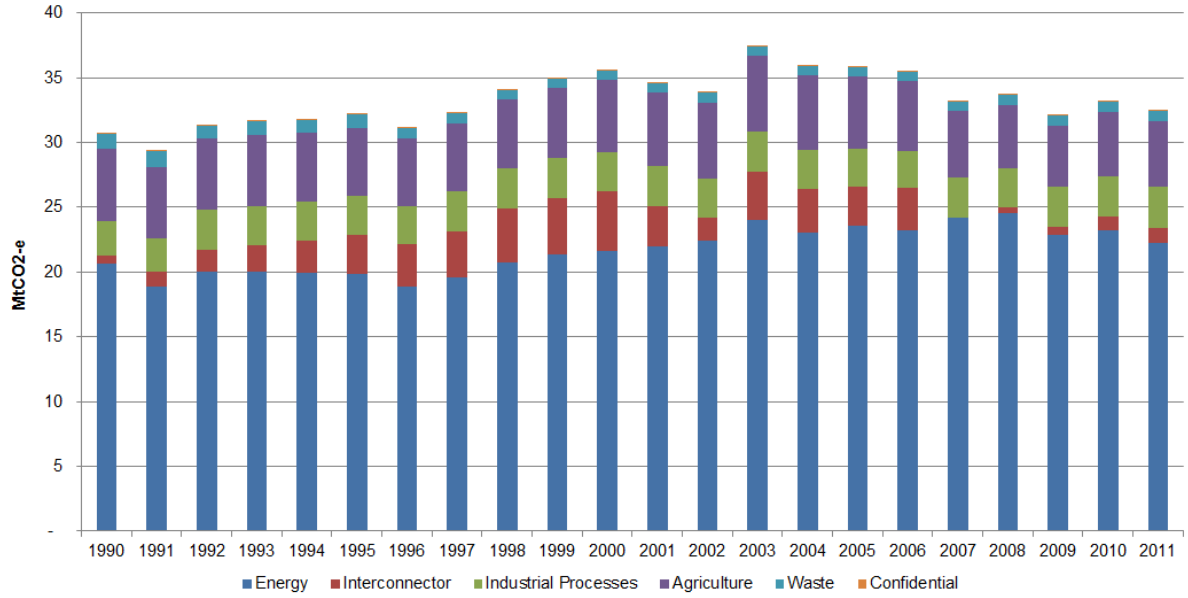
- South Australian emissions in relation to state population
- South Australian emissions in relation to gross state product
- South Australian residential emissions in relation to state population
- South Australian residential emissions in relation to the number of households.

In all four areas, South Australia's performance is generally on a par with the national average for the period from 1990 to 2004. However, over the most recent period from 2004 to 2011 South Australia has performed better than the national average in stabilising and reducing emissions, primarily due to the increases in the generation of renewable energy in this state.

**ii Reporting against renewable electricity targets (refer to section 3)**

South Australia is on track to meet its 2020 target of 33.3 per cent renewable energy generation, with the CSIRO reporting that 31.7 per cent was met in 2011-12. Refer to section 3.

**Total South Australian Greenhouse Gas Emissions, 1990 to 2011 without the impact of vegetation changes:**




Source: Department of Environment, Water and Natural Resources (2013) based on the Commonwealth Government's National Greenhouse Gas Inventory (NGGI) and the Australian Greenhouse Emissions Information System (AGEIS)

### iii. Technologies to reduce or remove greenhouse gases from the atmosphere

The State Government has undertaken or supported a range of actions and initiatives aimed at encouraging the commercialisation of renewable energy and emissions reduction technologies. These have focussed on renewable energy technologies and building innovation.

**Renewables**

RenewablesSA commenced in mid-2009 to provide a single focus for the Government's efforts to attract more renewable energy to the state through the implementation of an investment framework and management of a $20 million Renewable Energy Fund. A Board and Commissioner for Renewable Energy were appointed as part of the initiative which commenced the same time the government committed to a target of 33.3 per cent of the state's electricity from renewable energy source by 2020. Following a mid-year budget review, the Fund closed in December 2011. The RenewablesSA Board and Commissioner for Renewable Energy concluded their roles in June 2012. RenewablesSA continues to operate within Department for Manufacturing, Innovation, Trade, Resources and Energy (DMITRE).

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. In October 2012, a state-wide Wind Farm Development Plan Amendment to provide greater consistency and policy guidance for local Councils in the assessment of wind farm development applications was gazetted.

Another focus has been the commissioning of commercially relevant information to inform investment decisions such as:

- An assessment of the economic potential for energy storage technologies in South Australia. WorleyParsons and Sinclair Knight Mertz were commissioned to screen technologies, review geological data to assess large scale storage locations, model the South Australian transmission network to determine best large scale storage scheme locations from a network perspective and assess storage options in view of its interchangeability with transmission investment.
- The development on an online map and datasets on existing diesel generation plants (off-grid, on-grid and used in mini-grids) in the state. This included plants used by mining, pastoral stations, businesses and towns in South Australia. The project sought to collect site specific information for access by proponents to assess the opportunity to offset use of diesel with solar battery as the cost of these technologies continues to decline. Economic modelling of hybrid options at various load sizes by IT Power accompanied the release of the data.

At the time the Renewable Energy Fund was closed, RenewablesSA had awarded around $6 million in grant funding to further leverage investment in the renewable energy sector in South Australia. In 2012 and 2013, several significant projects supported by funding concluded. These included the development of a solar thermal system for a horticultural plant at Sundrop Farms 0.2 hectare site near Port Augusta ($345,000) and the research, development and deployment of a solar thermal air-conditioner at a residential house by the University of South Australia ($200,000).

In 2013, RenewablesSA supported the deployment of a new model for financing solar panel installation on low income rental housing in the state's northern region. The project involves a supply partnership for up to 100 systems at 1.5 kilowatt each between Unity Housing Company (the state's largest not for profit housing provider) and Tindo Solar, (a South Australian manufacturer of solar photovoltaic) panels.

From the original 16 projects that received grant funding, two continue to be administered. These include:

- Sunray Tracker – to test a locally developed, small scale automatic solar tracking device, $100,000
- Regional Development Australia Adelaide Hills, Fleurieu and Kangaroo Island – to commission a visible advanced solar power technology installation at Kangaroo Island, South Australia, $500,000.

Further reporting on the renewable energy targets is also outlined in section 3 of this report. Appendix A contains other information relating to programmes that support the data and uptake of renewables low carbon technologies for the reporting period covering 2012 and 2013. Refer to the key area 'Energy' under Objective 5.2.

At the Greenhouse 2013 Conference on 8 October 2013, the Premier announced a target of attracting $10 billion of investment in low carbon generation by 2025 to support a renewed economic development focus, and to further support South Australia's ongoing push for increased renewable energy generation.

**Building innovation**

The Building Innovation Fund, which was a four-year $2 million initiative which commenced in 2008-09 and completed in 2011-12, aimed to demonstrate innovative ways to reduce the carbon footprint of existing commercial buildings. The Fund offered grants to owners of commercial buildings for initiatives that demonstrated new and leading edge approaches to reducing a building's energy use and greenhouse gas emissions.

As a result of four annual funding rounds, the Fund had supported:

- A feasibility study into the potential for 'green' walls in Adelaide's climatic conditions and innovative design options for green walls on multi-storey buildings (completed)
- The installation of a living 'green' wall system prototype at the former Telephone Exchange Building with performance evaluated for the next 12 months (completed)
- The installation of 'green' roof systems at the ANZ House with performance evaluated for the next 12 months (completed)
- A feasibility study to compare various innovative and sustainable concepts applicable to large scale commercial office buildings, with a focus on Chesser House (completed)
- Refurbishing 87-91 St Vincent Street, Port Adelaide with 'BlueGen' fuel cells and a solar cell array (completed)
- Design and construction of a 'solar façade' at 164 Fullarton Road, Dulwich, consisting of solar panels and solar 'glass' (grant continues to be administered)
- A feasibility study for the thermographic survey and façade improvement analysis of 22 King William Street, Adelaide (completed)
- A feasibility study into building-integrated photovoltaic and other options for commercial building facades, with a focus on 1 King William Street, Adelaide (completed)
- The installation of a Climate Wizard indirect evaporative cooler air conditioning technology at 67 Greenhill Road, Wayville (grant continues to be administered).

- The installation of a tri-generation engine with a revised heating plant and hot water coils in the air-conditioning system at Chesser House (grant continues to be administered).
- The installation of a sustainable energy system consisting of a tri-generation plant, a contemporarily-designed large scale solar photovoltaic installation and a façade protection and insulation system at 1 King William Street, Adelaide ((grant continues to be administered).

At the 2013 Australian Institute of Landscapes Architects SA awards, the green roof and wall projects won the Award of Excellence in the category of *Research and Communication in Landscape Architecture*. The green wall was also highly commended by the Civic Trust of South Australia in the *Environmental* category.

# Section 7 – Offset programmes and national emissions trading scheme

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

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

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

The Australian Government introduced the National Carbon Offset Standard on 1 July 2010, providing national consistency in the voluntary carbon market.

### ii A report on progress in establishing a national emissions trading scheme

On 8 November 2011, the Commonwealth Senate passed the Clean Energy Future package. The Clean Energy Future package is a national macro-economic reform commencing with a price on carbon from 1 July 2012 and transitioning to a cap and trade emissions trading scheme on 1 July 2014.

Following the election of a Federal Coalition Government on 7 September 2013, 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.

# 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 Government of South Australia.

The Government of South Australia has been a contributor to a number of national developments associated with climate change, including:

- The Select Council on Climate Change, established by the Council of Australian Governments (COAG) to progress issues relating climate change, including:
    - Adaptation
    - Complementary Measures review
    - Energy Efficiency.
- The Council for the Australian Federation Working Group on Adaptation and the Forum for Engagement with the National Climate Change Adaptation Research Facility for the States and Territories

# 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.

The Premier, Jay Wetherill, is the Co-Chair of the State and Regions Alliance, a group of 40 sub-national governments that are committed to accelerating action on climate change. The State Government has been an active contributor to the Alliance through the Adaptation Working Group and the Energy Efficiency Financing Working Group.

**Clean Revolution Leadership Summit/World Summit of States and Regions**

The States and Regions Alliance is a strong network that supports the work that sub-national governments undertake to accelerate action on climate change. South Australia has an important role in the Alliance as the Premier holds one of three Co-Chair positions. The other Co-Chair positions are held by Premier Pauline Marios of Quebec and President Iñigo Renteria of the Basque Country. The Alliance meets regularly at a high profile summit to share best practice and make and report on commitments to take action.

The Minister for Sustainability, Environment and Conservation was a member of the Australian Government delegation to the United Nations Conference on Sustainable Development (Rio+20) was held in Rio de Janeiro, Brazil between 20-22 June 2012. The Conference was held to mark the 20th anniversary of the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. The Minister also represented the Premier, at the Climate Group Clean Revolution Leadership Summit, which was held in Rio de Janeiro to coincide with United Nations Conference and the World Summit of States and Regions. At these meetings the Minister signed the following documents on behalf of the Government of South Australia:

- States and Regions Commitments to the Clean Revolution and the Green Economy
- Federated States and Regional Governments Committed to a New Paradigm for Sustainable Development and Poverty Eradication: The Declaration of Rio de Janeiro 2012.

The first of these was the States and Regions Commitments to the Clean Revolution and the Green Economy which sets out broad areas where Alliance members intend to develop specific policies and/or financial mechanisms within our remit to reduce greenhouse gas emissions, stimulate green jobs, promote sustainable transport and energy efficiency, and accelerate the deployment of renewable energy. The commitments are framed as aims rather than absolute commitments. South Australia will implement the actions through existing initiatives and programmes. Some of the main initiatives in response to these commitments include:

- implementation of the *Low Emission Vehicle Strategy*, which was released on 21 June 2012
- implementation of the *National Strategy on Energy Efficiency*
- work being undertaken to achieve SASP target 61 to improving the energy efficiency of government buildings by 30 per cent by 2020
- work on the development of the proposal for introduction of the Building Upgrade Finance in South Australia.

The second document on the declaration for Rio de Janeiro includes subjects covering governance and leadership and the development of roadmaps to facilitate sustainable development and poverty eradication. The document is aspirational in nature and intended to encourage action by UN member states that are participating in the United Nations Conference on Sustainable Development. The commitments from the regional governments are being met through implementation of SASP.

# 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.

The 2006 report by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), *Climate change under enhanced greenhouse conditions in South Australia*, remains the primary source of modelling and impacts scenarios for South Australia. The report analysed climate conditions and outlined climate projections for 2030 and 2070 for South Australia, including:

- higher temperatures, including more extreme hot days with spring and summer warming more than winter and autumn
- associated health and mortality impacts on an ageing population, and increasing energy demand for air-conditioning
- decreased rainfall in agricultural regions (especially in winter and spring)
- greater frequency and severity of drought
- decreased flows in water supply catchments including the Murray-Darling
- increased flood risk (despite drier average conditions)
- shifts in conditions affecting viability of crops and biodiversity
- increased incidence or severity of bushfires
- coastal hazards related to the effect of ocean warming on sea levels combined with storms of possibly increased intensity
- damage to infrastructure, for example from coastal erosion, flooding and extreme heat.

The full report can be accessed at http://www.sa.gov.au/upload/franchise/Water,%20energy%20and%20environment/climate_change/documents/what_is_cc/CSIRO_FullReport_CCgreenhouse_conditions_2006.pdf

In September 2010, the CSIRO report was supplemented by the report: *Regional Climate Change Projections, South Australia*, which was produced by the Government of South Australia. This report provides climate change projections for eight South Australian regions. This report can be accessed at: http://www.sa.gov.au/subject/Water%2C+energy+and+environment/Climate+change/Climate+change+in+South+Australia/Regional+Climate+Change+Projections

The Intergovernmental Panel on Climate Change Working Group 1 Summary for Policy Makers, was released in September 2013 and concluded that the warming of the earth is unequivocal and that human activity is the most likely cause and that the changes in the physical world are likely, if anything, to be more harmful than the earlier science had suggested.

A copy of this report can be downloaded from: http://www.climatechange2013.org/

**South Australian impacts**

Scientific research relevant to South Australia is increasingly being carried out in specific sectors or relating to specific impacts. South Australia's Climate Change Adaptation Framework establishes the basis for regional climate action planning. It encourages regional leadership organisations to undertake integrated vulnerability assessments in each region which will draw on much of the specific research that is ongoing. Detailed reporting on adaptation activities is outlined in Section 5 of this Report and is also covered in Appendix A for greater detail on South Australia's Climate Change Adaptation Framework.

The Climate Change Adaptation Framework can be accessed at: http://www.sa.gov.au/subject/Water%2C+energy+and+environment/Climate+change/Adapting+to+climate+change/Adapting+to+climate+change+in+South+Australia

The below climate change research projects and publications identify noteworthy research relating to impacts in South Australia that has been undertaken in the past two years.

National Climate Change Adaptation Research Facility

A significant amount of South Australian specific research was funded through the National Climate Change Adaptation Research Facility:

- *"Development of tools that allow local governments to translate climate change impacts on assets into strategic and operational financial and asset management plans"*. This project was undertaken by Jacqueline Balston through the University of South Australia. The project report was completed in September 2012.
- *"A framework for adaptation of Australian households to heat waves"*. This project was undertaken by Wasim Saman through the University of South Australia. The project report was completed in March 2013.
- *"Adapted future landscapes – from aspiration to implementation"*. This project was undertaken by Wayne Meyer through the University of Adelaide. The project report was completed in March 2013.
- "*Water trade, climate change and irrigator adaptability in the Murray-Darling Basin*". This project was undertaken by Sarah Wheeler through the University of South Australia. The project report was completed in March 2013.
- *"Australia's country towns 2050: What will a climate adapted settlement pattern look like?"* This project was undertaken by Andrew Beer through the Flinders University. The project report was completed in March 2013.
- *"Cognitive and affective barriers to climate change adaptation: Exploring the risk and adaptation appraisals of South Australians to different climate risks"* and "*Extreme heat and climate change: Adaptation in culturally and linguistically diverse communities"*. Both projects were undertaken by Peng Bi through the University of Adelaide. Both project reports were completed in March 2013.
- "*Impact of climate change on disadvantaged groups: Issues and interventions"*. This project was undertaken by Graeme Hugo through the University of Adelaide. The project report was completed in March 2013.
- *"Community based adaptation to climate change: the Arabunna, South Australia"*. This project was undertaken by Melissa Nursey-Bray through the University of Adelaide. The project report was completed in May 2013.

Additionally, a significant amount of research relating to South Australia was funded through the National Climate Change Adaptation Research Facility:

- *"Climate change adaptation in the Coorong and Lower Lakes"*. This project was undertaken by Catherine Gross through Charles Sturt University. The project report was completed in December 2011.
- *"Adaptation and mitigation: Identifying low risk climate change mitigation and adaptation in catchment management while avoiding unintended consequences"*. This project was undertaken by Max Finlayson through Charles Sturt University. The project report was completed in March 2013.
- *"EverFarm - Design of climate adapted perennial-based farming systems for dryland agriculture in southern Australia"*. This project was undertaken by Amir Abadi through the Future Farm Industries Cooperative Research Centre. The project report was completed in March 2013.
- *"Novel methods for managing freshwater refuges against climate change in southern Australia"*. This project was undertaken by Belinda Robson through Murdoch University. The project report was completed in March 2013.
- "*Supporting evidence-based adaptation decision-making in Australia's States and Territories: Synthesis and learning from research to date*". This project was undertaken by Jennifer Cane through AECOM. The project report was completed in April 2013.

- *"Understanding urban and peri-urban Indigenous people's vulnerability and adaptive capacity to climate change"*. This project was undertaken by Darryl Low Choy through Griffith University. The project report was completed in May 2013.

Further information on these projects is available from the National Climate Change Adaptation Research Facility's website at: http://www.nccarf.edu.au/publications/research-portfolio-factsheet-south-australia.

South Australian Research and Development Institute

The South Australian Research and Development Institute's (SARDI) Sustainable Systems group undertakes research projects that focuses on adaptation to climate change in providing future sustainable agriculture. A number of agricultural specific studies conducted by SARDI are listed below.

- *"Reducing the impact of climate variability"*. This project has been initiated to work with grain growers to identify key risks to grain production, calibrate decision support tools such as a Flowering Calculator and Potential Yield Calculator for South Australia and Victoria and to develop a framework to compare the trade-off in sowing time between drought risk and frost risk. The project is funded by the Grains Research and Development Corporation and the lead researcher is Melissa Rebbeck.

- *"Bridging the gap between seasonal climate forecasts and decision makers"*. This project was initiated to distil key practical and methodological features of economic and psychological approaches to valuing seasonal climate forecasts, estimate the potential economic value of seasonal climate forecasts for farm and policy or industry level case studies in the Philippines and Australia, identify those factors leading to a gap between actual and potential values of seasonal climate forecasts and develop and implement strategies to better match forecasts with decision maker's needs. The project is funded by the Australian Centre for International Agricultural Research and the lead researchers are Peter Hayman and Bronya Alexander. Other research providers include the New South Wales Department of Primary Industries and Sydney University.

- *"Climate support"*. This project aims to conduct and develop climate risk workshops and provide a fee for service information to farmers and advisers in South Australia. The project is self-funding and led by Melissa Rebbeck.

- *"Managing the Risk of Climate Change in the South East Region"*. This project aims to generate climate change scenarios from the CSIRO MK3 global climate model, link the output from the model to the wheat simulation model APSIM and conduct a risk analysis of drought and crop failure. This project is funded through an Australian Research Council Linkage Grant with University of Adelaide. The project is led by Peter Hayman.

- *"Seasonal Climate Forecasts for the SA Grains"*. The aim of this project is to evaluate the usefulness of seasonal climate forecast trigger points for grain growers in South Australia and produce a booklet and workshop to deliver outcomes and evaluate the impact of climate change and its impact on grain production in South Australia and produce a workshop to deliver outcomes. The project is funded by the South Australian Grains Industry Trust and led by Melissa Rebbeck.

- *"Oceans to Grains: a new approach to targeted seasonal forecasts"*. This project aims to characterise synoptic rainfall mechanisms in south-eastern Australia, establish a relationship between synoptic rainfall mechanisms and the large space-scale atmospheric and ocean circulation and understand seasonal climate drivers. The project will also collate and update information about management responses to climate information for three rainfall regions in south-eastern Australia relevant to the grains industry. This will be achieved through ongoing engagement with farmer groups in the three rainfall regions throughout the project. The project is jointly funded by SARDI and the CSIRO and led by Melissa Rebbeck.

- *"Improved climate risk management in the South Australian wool pastoral zone"*. This project aims to identify the times of the year that seasonal forecasts of rainfall and pasture production have statistical skill, work with wool growers to identify the key decision nodes that have an impact on production and degradation risk and produce a seasonal climate forecast pocket guide for wool growers. The project is funded by Land, Water and Wool and led by Melissa Rebbeck.

- *"Communication and evaluation of the Managing Climate Variability Programme grain projects"*. An outcome of this project is to develop a sub-programme level (across four projects) communication plan at regional and national level

together with the Managing Climate Variability Programme and the Grains Research and Development Corporation. The project is funded by the Managing Climate Variability Programme and the Grains Research and Development Corporation. The lead researcher is Peter Hayman who is working with Peter Carberry from CSIRO Sustainable Ecosystems.

- *"Tools to reduce the climate impact on south-eastern Australia".* This project is a collaborative effort between Victorian Department of Primary Industries, New South Wales Department of Primary Industries and SARDI. The project aims to achieve an increased and more stable economic performance of south-eastern Australian farming systems through the development of tools that integrate seasonal climate forecasts, climate variability and management options. The project is funded by SARDI and the Grains Research and Development Corporation and led by Peter Hayman.

- *"Linking climate risk to the research, development and management of National Action Plan goals for the SA Murray Darling Basin".* This project addresses natural resources management decision-making and planning in an uncertain climate. The project is funded by the National Action Plan through the Centre for Natural Resource Management and led by Peter Hayman.

- *"Enabling Natural Resources Management decision makers to make better use of climate science"* and *"Water Use Efficiency of dryland and irrigated cropping systems".* These are collaborative projects between SARDI, CSIRO Sustainable Ecosystems and University of Western Australia. The projects aim to detail a range of specific climatically risky decisions, develop and apply a framework for thinking about uncertainty based on Bayesian revision and real options that enable natural resources management decision makers to better manage climate risk. These projects are funded through the Managing Climate Variability Programme and led by Peter Hayman.

Further details on SARDI research can be found at: http://www.sardi.sa.gov.au/climate/research_projects.

Goyder Institute for Water Research

One of the Goyder Institute for Water Research's strategic research themes focuses on climate change. The climate change theme supports the incorporation of climate adaptation policy into research outcomes from the urban water, environmental water and water for industry research:

- *'Downscaled Climate Projections for SA'.* The varying influence of climate drivers on rainfall across the eight Natural Resources Management Regions has been published in a leading scientific journal and an initial set of downscaled climate projections has been developed for the Onkaparinga test case catchment. A set of diagnostic tools have been developed to measure model performance and suggest possible actions which can be taken to improve model weaknesses. Peer reviewed journal publications have been prepared, including an article in Nature and an article in a book commissioned by the International Water Association on climate change impacts. The project is led by Professor Simon Beecham from the University of South Australia. The project partners are the University of South Australia, CSIRO, Flinders University, Adelaide University, SA Water, SARDI and the Department of Environment, Water and Natural Resources. The project commenced in October 2010. Further information on the Institute's climate change strategic research theme can be found at: http://goyderinstitute.org/index.php?id=14

The Goyder Institute for Water Research supports a total of 25 PhD students, providing $10,000 per student per annum over three years. Eight PhD students commenced in 2011, nine in 2012 and the remaining eight in 2013. A total of seven of these projects have climate related elements and are listed below:

- *'Climate change and stormwater quality effects from green roof design in Adelaide'.* Goyder Institute project funding commenced in 2011. The research is led by PhD student Mostafa Razzaghmanesh at the University of South Australia.

- *'Methods for the reduction of greenhouse gas emissions associated with water distribution systems.'* The project focuses on water engineering and climate change mitigation. Goyder Institute project funding commenced in 2011. The research is led by PhD student Chris Stokes at the University of Adelaide.

- *'Effect of climate change and groundwater management approaches on the Uley South Basin, Eyre Peninsula'.* This project assesses the vulnerability of seawater intrusion in the Uley South basin under potential climate change scenarios and water resource management strategies. Goyder Institute project funding commenced in 2012. The research is led by PhD student Matthew Knowling at Flinders University.

- *'Synergistic effects of nutrients and climate change on cyanobacteria'*. The project seeks to determine the combined *impacts* of high temperatures and nutrients on blue-green algal blooms at a global scale and to assess whether nutrient reductions can modulate the predicted increase in blooms due to climate change. Goyder Institute project funding commenced in 2012. The research is led by PhD student Chaturangi Wickramaratne at the University of Adelaide.

- *'Assessment of climate change impacts on the spatial variability of rainfall and its influence on runoff generation'*. Goyder Institute project funding commenced in 2012. The research is led by PhD student Mamunur Rashid at University of South Australia.

- *'Optimisation of natural and managed cooling effects in the Adelaide metropolitan areas'*. The main focus of this project is to investigate the optimal irrigation of the Adelaide parklands to reduce summer heat in the Adelaide metropolitan area and enhance the parklands' cooling potential. The research also seeks to determine how the sea breeze cooling effect influences the Adelaide metropolitan area. This includes how the cooling effect varies with weather systems and how the effect will change with future climate. Goyder Institute project funding commenced in 2013. The project is led by PhD student Saeedeh Gharib Choobary at Flinders University.

- '*Impacts of catchment conditions, climate and seasonality on water quality*'. Goyder Institute project funding commenced in 2013. The project is led by PhD student Jonathan Cohen at the University of South Australia.

Further information on the Goyder Institute for Water Research's PhD student projects can be found at http://goyderinstitute.org/index.php?id=15

Commonwealth Scientific and Industrial Research Organisation

The Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Flagship Collaboration Fund supports large-scale multidisciplinary research partnerships with Australian Universities and publicly funded research institutions, the private sector and international organisations. The CSIRO's National Research Flagships Programme aims to deliver scientific solutions to advance Australia's most vital national objectives. Climate change adaptation is one of eleven flagship programmes that has been established to provide policy makers, industries and communities practical and effective adaptation options to climate change and variability and to inform national planning, regulation and investment decisions. The four research themes include:

- *'Pathways to adaptation: positioning Australia to deal effectively with climate change'*. This research aims to ensure that Australia is positioned to deal effectively with the impacts of climate change by improving the scientific knowledge required to enhance our capacity to adapt.

- *'Sustainable cities and coasts'*. The research focuses on solving planning, design, infrastructure and management problems to assist Australia's cities and coasts adapt to a changing climate.

- *'Managing species and natural ecosystems in a changing climate'*. The research aims to provide adaptation options to minimise the impact of climate change on Australia's marine and terrestrial species, ecosystems and the services they afford.

- *'Primary industries, enterprises and communities adapting to climate change'*. The research aims to develop adaptation options for Australia's primary industry and resource sectors to minimise the vulnerabilities and maximise opportunities posed by climate change and variability.

Further information on the National Research Flagships Programme – Climate Adaptation can be found on the CSIRO's website at http://www.csiro.au/org/ClimateAdaptationFlagshipOverview.

Department of the Environment

The Australian Government's Department of the Environment has invested $4.5 million into 13 projects as part of the coastal adaptation decision pathways programme. The projects aim to develop leading practice approaches to better manage future climate risk to coastal assets and communities. The projects were due for completion in June 2012. One of these projects was undertaken in South Australia:

- *'Climate change decision support framework and software for coastal councils'.* The project was led by the Local Government Association of South Australia and was completed in August 2012. The final report can be accessed at: www.lga.sa.gov.au/webdata/resources/files/FINAL%20CADSP%20Report%20Published%2013%20May%202013-1.pdf

Further information on the coastal adaptation decision pathways projects can be found on the Department of the Environment's website at: www.climatechange.gov.au/climate-change/adapting-climate-change/climate-change-adaptation-program/coastal-adaptation-decision

Australian Government's Natural Resources Management (NRM) Fund

The Climate Change Impacts and Adaptation Research Grants Programme is part of Stream 2 of the Regional NRM Planning for Climate Change Fund, which has been developed as part of the Australian Government's Clean Energy Future plan. South Australian projects include:

- *'Planning for climate change in the Murray Basin NRM Cluster'.* This project is led by CSIRO and will work with regional NRM organisations to understand current planning approaches, and refine the integration of climate change information and planning processes. The project team works with NRM planners to develop a framework for adaptive decision-making processes and provides ongoing guidance and support.

- *'Integrating climate change science into Rangelands natural resource management'.* This project is led by Ninti One Ltd and aims to enable regional NRM organisations to make better-informed decisions and strategic investments in relation to climate change.

- *'Facilitating NRM planning for climate change: baseline climate change knowledge for the Southern and South-western Flatlands'.* The project is led by the University of Western Australia and aims to deliver climate change impacts data to regional NRM organisations.

- *'AdaptNRM: delivering regionally-relevant cross-regional information for NRM adaptation planning'.* This is a national project led by CSIRO which aims to support NRM organisations in climate adaptation planning by delivering tailored knowledge, processes and tools.

Victorian Centre for Climate Change Adaptation

The Victorian Centre for Climate Change Adaptation Research was established in September 2009 at the University of Melbourne. The Centre was set up as a centre of excellence in developing solutions to the impacts of climate change in Victoria. The Centre has produced an extensive publication list and whilst the research is not undertaken within South Australia, much of this work informs adaptation planning in our state. Further information on the research undertaken by the Centre is available at: http://www.vcccar.org.au/publications.

Other research

- *"The City of Adelaide Urban Heat Island Micro Climate Study".* This project assessed the Adelaide urban heat island affect, which is the enhanced temperature in the city caused by buildings and surface conditions when compared to the surrounding non-urban environment. The project was a collaborative effort between Flinders University, the Adelaide City Council, The University of Adelaide and the National Centre for Ground Water Research and Training. Researchers included Cäcilia Ewenz, Marnie Hope, John Bennett, Huade Guan, Simon Benger, Vinodkumar, Shanyou Zhu, Roger Clay, Veronica Soebarto and Kathryn Bellette. A research paper was completed in June 2013. Further information can be found at: http://www.iken.net.au/sites/iken.net.au/files/LGA_conference_June2013_final.pdf.

# 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. The CSIRO 2013 report is attached in Appendix C.

The report:

- summarises CSIRO's assessment of the extent to which any determination or target made or set under Part 2 of the Act is being achieved and, if it appears relevant, should be revised; and
- provides advice on the method for calculating the 1990 baseline for the greenhouse gas target consistent with Sections 5 (4) (b) and Section 5 (4) (c) of the Act.

The key findings of the CSIRO report are summarised below.

**Meeting the 2050 greenhouse gas emissions reduction target of 60% below 1990 levels**

South Australia's emissions have fallen nearly nine per cent since 1990. Much of this decrease has been achieved in the emissions category of Land Use, Land Use Change and Forestry (LULUCF). This is a result of South Australia moving from an era of net vegetation clearance in 1990, to the present era, which is characterised by revegetation and new forestry plantings. Without the contribution of LULUCF, emissions in 2011 were six per cent above 1990 levels. This increase is in the context of both growing energy use and a growing economy however, with South Australia's Gross State Product rising by 65 per cent between 1990 and 2011. In assessing progress toward South Australia's 2050 greenhouse gas emission target, the CSIRO concluded that there is considerable uncertainty and estimation risk in predicting changes so far into the future. Technological change, policy decisions, investment behaviour and consumer demand are all cited as sources of uncertainty. Given the influence of the federal policy context on South Australian emissions, the national 2020 target becomes a key milestone toward 2050 and progress toward the five per cent reduction target at a national level remains unclear as the Coalition Government moves to replace the carbon tax with its Direct Action Plan.

Nevertheless, electricity generation constitutes 24 per cent of South Australia's emissions and progress toward the 33.3 per cent 2020 target will have a positive impact on the ability of South Australia to meet its 2050 target.

The CSIRO highlights that the South Australian target of 60 per cent by 2050 is inconsistent with the national target of 80 per cent below 2000 levels by 2050. It indicates that South Australia should consider calibration with the national target but should also be aware that this would potentially be a more onerous obligation. It is important to note that the national target can partly be met by the purchase of eligible emission reductions from overseas and interstate or overseas trading would need to be considered in the South Australian context.

**Meeting renewable energy targets**

The Act includes targets for 20 per cent renewable energy generation and consumption in 2014. The CSIRO conclude that these targets have already been met. South Australia is on track to meet its 2020 target of 33.3 per cent renewable energy generation providing the current and announced wind farm generation projects proceed, with the CSIRO reporting that 31.7 per cent was met in 2011-12.

The CSIRO report identifies some potential risks in achieving the 2020 target and the targets need to be monitored with regard to the Federal Government's policies. In particular, the review of the Renewable Energy Target, falling wholesale prices due to both high penetration of renewable energy and the repeal of the carbon tax and lastly, land planning or local transmission constraints.

The CSIRO suggest that South Australia consider a renewable energy consumption target as an alternate to the renewable energy generation target because it is better aligned to South Australia's internal electricity demand regardless of fluctuations in imports and exports of electricity. In this sense, a consumption target aligns more with a focus on emission reductions.

**Methodology for calculating greenhouse gas emissions**

CSIRO advises that they are satisfied with the 1990 methodology baseline and that South Australia will have a sufficiently reliable baseline to provide for the assessment of progress towards its greenhouse gas emissions target. Both the data and the baseline are provided through the Australian Government Emission Inventory System (AGEIS) and updated annually. The data is based on emissions directly from South Australian activities (Scope 1) plus indirect emissions associated with the use of electricity in South Australia for imported electricity (Scope 2).

The CSIRO suggest that it would be consistent with the inclusion of imported electricity to consider including fugitive emissions of natural gas sourced interstate. This would lead to a more holistic picture of South Australia's emissions based on economic activity. The CSIRO acknowledge that such emissions are typically classified as Scope 3 emissions.

**Methodology for calculating renewable electricity generation and consumption**

CSIRO agrees with a target methodology for evaluating renewable electricity values based on calculation of values at the National Electricity Market (NEM) Regional Reference Node as a locational proxy. This gives generation and consumption targets a similar locational basis and the targets converge when imports and exports of electricity tend toward zero. The data to construct the renewable electricity figures comes from a range of sources but increasingly the Australian Energy Market Operator (AEMO) is providing most data sets.

For the purposes of reporting against the SASP target, the Government of South Australia continues to use its own methodology on the basis that it is less complex and, therefore, more easily understood. The state-based approach takes into account in-house energy use and maintains a consistent methodology across the timeframe. As a result, the CSIRO outcomes differ slightly in terms of the percentage of renewable energy generated in South Australia in a given year.

For comparison, using state-based methodology for 2011-12, South Australia's renewable energy production of the state's total energy generation amounted to 29.8 per cent compared to a CSIRO result of 31.7%. Given achievement of the renewable energy consumption target in 2010-11, the Government of South Australia has only measured progress towards its renewable energy generation target since this time.

# Appendices

## A. Effectiveness of South Australia's climate change initiatives progress report covering 2012 and 2013

This appendix outlines the state's achievements in progressing the climate change initiatives for the reporting period covering 2012 and 2013. Its purpose is to meet the reporting requirements of the *Climate Change and Greenhouse Emissions Reduction Act 2007*. The report also demonstrates progress towards the *South Australia's Strategic Plan* (SASP Targets) commitments for greenhouse and energy efficiency in line with the targets in the Strategy.

This report identifies the key actions and achievements against each strategic objective, under the eight key 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 of South Australia'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).

The Australian Government has reported that South Australia's net greenhouse gas emissions were 30.8 million tonnes of $CO_2$-e in 2011, almost nine per cent lower than in the baseline year of 1990.

Over the same period South Australia's Gross State Product rose by 65 per cent.

This can largely be attributed to a substantial increase in renewable energy production and the increase in the absorption of greenhouse gas by vegetation in the state.

## 1. GOVERNMENT LEADERSHIP

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

South Australia has been recognised as a national leader for its approach to climate change adaptation. This community driven adaptation planning process has received several state and national awards.

South Australia has built a national and international reputation for climate change leadership, through involvement in the Climate Group's States and Regions Alliance, the Intergovernmental Panel for Climate Change's Renewable Energy Report, and the United Nations Conference on Sustainable Development (Rio+20).

The Government of South Australia leads state-wide initiatives and policy development for tackling climate change through its continued support of climate change science based policy solutions. The state has provided international leadership through its investment in wind and geothermal energy, and support for household uptake of solar photovoltaic.

South Australia is a party to a number of high-level intergovernmental agreements on climate change which are outlined in Section 8 of this report. Detailed reporting on adaptation activities is outlined in section 5 and below under the key area 'Adaptation' as identified in the *Tackling Climate Change* strategy.

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

**Premier's Climate Change Council**

- The Premier's Climate Change Council has provided advice to the Minister regarding:
    - facilitating Climate Smart Precincts in South Australia
    - establishing Building Upgrade Finance in South Australia
    - conducted consultation forums with South Australian businesses and local government on facilitating a low carbon economy, adaptation to sea level rise and renewable energy.

**Leadership for geothermal energy**

- The Government of South Australia has supported South Australia's embryonic geothermal industry by leading national coordination of the industry, which in turn presents a coordinated and active presence in international industry and policy development. Further leadership has been provided by the government by:
    - representing Australia on the Executive Committee to the International Energy Agency's geothermal cluster under the Geothermal Implementing Agreement
    - providing information to support geothermal research, demonstration, development and deployment across Australia and reducing information asymmetries
    - being Australia's only Coordinating Lead Author for the Renewable Energy Report published by the Intergovernmental Panel for Climate Change, with a focus on chapters for policy makers and geothermal energy.

**State of the Environment reporting**

- The South Australian *State of the Environment Report 2013* includes a chapter dedicated to climate change incorporating information on current status of knowledge, key drivers and pressures, main responses and future priorities. The State of Environment Report promotes public discussion and understanding of the possible consequences of climate change, with an emphasis on what South Australians can do to reduce their emissions and adapt to climate change.

**Objective 1.2: To demonstrate best practice in reducing emissions**

**Government energy efficiency – SASP Target 61**

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

- In 2011-12, the energy efficiency of government owned and leased buildings improved by 21.1 per cent compared to the 2000-01 baseline. Progress to date is ahead of the annualised linear path towards SASP Target 61 which required a 17.4 per cent improvement by 2011-12.
- Some of the major energy efficiency projects completed during the reporting period include an extensive installation programme of gas boosted solar water heaters at the Modbury Hospital and an efficient lighting retrofit at the Port Augusta TAFE campus. SA Police also moved into a new 5-star National Australian Built Environment Rating System rated headquarters, which uses significantly less energy than the previous headquarters.

**GreenPower purchasing – SASP Target 65**

- The Government of South Australia has continually reviewed and adjusted its policy in response to the changing national carbon policy framework to ensure the South Australian response is environmentally sound and cost-effective.
- The Government of South Australia meets its general government electricity requirements under its two across government electricity contracts. The GreenPower™ purchases under the contracts are in accordance with the government's policy that prevailed at the time the contracts were established.
- The Across Government Small Market Electricity Contract applies to government sites consuming up to 160 megawatt hours per annum and unmetered lighting assets (street and traffic lighting). The State Government purchase of a minimum of 20 per cent accredited GreenPower™ will continue until the contract ends on 31 December 2013. The Across Government Large Market Electricity Contract applies to Government sites consuming greater than 160 megawatt hours per annum. The contract specifies that GreenPower™ is to comprise 20 per cent of the total electricity requirements until 30 June 2014, after which it increases to 50 per cent of the total electricity requirement until the contract expires on 31 December 2014.

**Water efficient fixtures for Government buildings**

- From 1 July 2011, the Government mandated the installation of water efficient taps and showerheads in new government owned buildings and substantial refurbishments. The policy has resulted in 4 star WELS2 rated showerheads and 5 star WELS rated basin and sink taps being installed in the majority of new building works.

**Solar panels for Government buildings**

- Solar panels continued to be installed on all new and substantially refurbished Government of South Australia's owned and operated buildings in accordance with the *Solar Panels for Government Buildings Policy*.
- Annually, each 5 kW system installed is estimated to produce approximately 7.6 MWh of electricity which is estimated to offset around 4 tonnes of $CO_2$-e emissions.

**Objective 1.3: To build capacity to tackle climate change**

**South Australia's international leadership and engagement**

- The Government of South Australia has been actively engaged in international deliberations on climate change and sustainable development issues:
    - The Premier of South Australia is one of the Co-Chairs of The Climate Group's[3] States and Regions Alliance, a group of sub-national governments that are committed to accelerating action on climate change. The Alliance was formed following the signing of the *Montreal Declaration of the Federated States and Regional Governments on Climate Change* in 2005.
    - The Government of South Australia leads the following Alliance working groups:

[2] Water Efficiency Labelling and Standards.

[3] The Climate Group is an international not-for-profit working with leading businesses, governments and individuals.

        - The Energy Efficiency Financing Working Group, which assists sub-national governments to increase their knowledge of innovative financing instruments to promote energy efficiency investments in their constituencies.
        - The Adaptation Working Group, which encourages global best practice in strategic climate change adaptation by actively monitoring and promoting innovative adaptation actions as they occur.
    - The Government of South Australia had formal representation at the United Nations Conference on Sustainable Development (Rio+20), which took place on 20-22 June 2012 in Rio de Janeiro, Brazil.

**Climate Change Adaptation awards**

- South Australia's Climate Change Adaptation Framework received national recognition through state and national awards in 2013. Awards included:
    - National Adaptation Research Facility Climate Adaptation Champion Award Winner – Government Category. The South Australian Government and South Australian Local Government Association won the award for their partnership in the South Australia Climate Adaptation programme which has shown long-term commitment to implement climate adaptation policies for South Australia
    - National Adaptation Research Facility Climate Adaptation Champion Award Winner – Individual Category. Brian Foster, an Eyre Peninsula farmer won the award for his substantial contribution in raising climate change awareness and championing adaptation planning within his community
    - Resilient Australia Award – State Winner. The adaptation programme won the award for being an effective collaboration between state and local government that has enabled the "ground up" implementation of the 2012 South Australia Climate Change Adaptation Framework
    - Resilient Australia Award – State Winner. The Central Local Government Region of South Australia was recognised for innovation in the development of the Integrated Vulnerability Assessment methodology that now forms the basis of adaptation planning in the state
    - Resilient Australia Award – National Winner. The South Australian Climate Change Adaptation Programme won the award for being an effective collaboration between the Government of South Australia and the Local Government Association of South Australia to drive communities to build their resilience to the impacts of climate change. This project was recognised as best practice due to the collaboration and unique approach to drive the community to build resilience to the impacts of climate change
    - Resilient Australia Award – National Highly Commended. The Central Local Government Region of South Australia was recognised for innovation in the development of the Integrated Vulnerability Assessment methodology that now forms the basis of adaptation planning in the state.

**Sector agreement programme**

- Under section 16 of the *Climate Change and Greenhouse Emissions Reduction Act 2007* the Minister is able to enter into Sector Agreements 'for the purpose of recognising, promoting or facilitating strategies to meet any target set under the Act'. A sector can be defined as a 'person or entity or industry or business group'.
- There are currently 11 sector agreements in operation with industries and community groups as diverse as steel, community services, local government and regional development.
- New sector agreements were entered into with the Local Government Association of South Australia, Southern Adelaide Region (comprising of the cities of Holdfast Bay, Marion, Mitcham and Onkaparinga), and Western Adelaide Region (comprising of the cities of Port Adelaide Enfield, West Torrens and Charles Sturt).
- Refer to section 5 of the Report on the operation of the *Climate Change and Greenhouse Emissions Reduction Act 2007* for a full list of agreements.

## 2. CLIMATE CHANGE ADAPTATION

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

The *Climate Change Adaptation Framework* and the accompanying Government Action Plan were adopted and launched in August 2012. The Framework facilitates the involvement of local communities and experts in regional climate change planning. The Action Plan will ensure relevant Government of South Australia's agencies take climate change into account in service delivery planning.

Our natural resources face some of the most immediate challenges from climatic variations. The focus of government activity in this area is on climate research and the development of strategies to improve adaptation and resilience. Climate change adaptation strategies are being developed in the key areas of public health, landscapes future, primary industry development, coastal management, and the government emergency risk management programs.

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

**South Australia's Climate Change Adaptation Framework**

- The *Climate Change Adaptation Framework* 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.
- The *Climate Change Adaptation Framework* and the accompanying *Government Action Plan*, were adopted and launched in August 2012.
- The implementation of the *Climate Change Adaptation Framework* is based on three principles.
    1. Partnerships and co-investment: The Framework guides the development of regional adaptation action plans for each of the twelve State Government Planning Regions. These are delivered through partnerships between state and local government, regional development, natural resources management and industry
    2. Integrating climate information into existing decision making processes: Climate adaptation will be most effective when existing decision making processes effectively integrate climate information. 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
    3. 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.
- Two rounds of the Prospering in a Changing Climate Grants Scheme occurred in October 2012 and April 2013. The grants provide for:
    - 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
    - the development and testing of innovative community engagement tools.
- The first round of grants were awarded to the following organisations:
    - South Australian Local Government Association
    - Adelaide and Mount Lofty Ranges Natural Resources Management Board
    - Yorke and Mid North Regional Alliance (through the Central Local Government Region of South Australia)
    - Horse SA.

- The second round of grants were awarded to:
    - Green Cross Australia
    - Regional Development Australia Barossa
    - The University of Adelaide, Public Health
    - The University of Adelaide, Australian Workplace Innovation and Social Research Centre.
- The South Australian Climate Change Adaptation Showcase was held in March 2013. More than 170 delegates from business, government, universities and community organisations shared leading edge adaptation research and practical knowledge from across the state.
- In June 2013, the Climate Change Adaptation Programme received the prestigious National Climate Change Adaptation Research Facility (NCCARF) Climate Adaptation Champions Award in the 'Government' category. This award was nationally recognised and shared between programme partners, the Government of South Australia and the Local Government Association of South Australia. An Eyre Peninsula farmer Brian Foster was also recognised with an Adaptation Champions Award for his individual efforts in promoting climate action.
- The State Government and the Local Government Association of South Australia have also been named the South Australian winners in the State and Territory Government category of the 2013 Resilient Australia Awards. The Central Local Government Region of South Australia has been recognised as the state winner in the Local Government category, in partnership with local government, Regional Development Australia (Yorke and Mid North) and the Northern and Yorke NRM Board.

**Regional Climate Change Adaptation Plans – SASP Target 62**

- SASP includes a Target 62: *Climate change adaptation: Develop regional climate change adaptation plans in all state government regions by 2016 (baseline: 2011.)*
- The SASP Target aims for adaptation plans in all 12 regions by 2016. One region has completed their adaptation plan, a further seven have commenced the adaptation planning process and preliminary discussions have commenced in each of the remaining four regions with a view to commencing these projects in the next 12 months.
- Regional Adaptation Planning Projects include:
    - The Yorke and Mid North Region's completed adaptation plan released on 8 October 2013
    - Climate change adaptation planning projects in Murray and Mallee, Western Adelaide, Southern Adelaide, Eyre and Western, Barossa, Adelaide Hills, Fleurieu and Kangaroo Island (two regions) currently underway.

**Primary Industry Adaptation**

- Primary Industries and Regions SA (PIRSA)'s *Climate Change Management Framework* (2011) identifies strategies and proposed action in South Australia's primary industries (agriculture, fisheries, aquaculture and forestry sectors) to support ecologically and economically sustainable development under changing climatic conditions.
- The following projects are some of the programmes and trials led by PIRSA to improve the resilience and sustainability of this sector:

    *Land use planning*

    - PIRSA has undertaken a mapping programme that will assist implementation of policies in the *30-Year Plan for Greater Adelaide* that seeks to incorporate "areas of primary production significance" into local government development plans.
    - Identification and agreement on these areas will enable state and local government to consider limiting development that restricts access to primary production land and/or compromise scope for climate change adaptation.

*Drought response*

- Planning for the implementation of the reform to National Drought Policy continued with jurisdictions participating in development of the new approach with a suite of programmes that accepts that droughts will become more severe and frequent. This will assist farm businesses to be better prepared for and resilient to the impacts of droughts.

- Building risk management skills through flexible and tailored training is a component of the new approach. Funding opportunities through the government's "Skills in the Workplace" programme is being investigated as the key delivery platform.

*Climate change impact on various fish species*

- South Australian Research and Development Institute (SARDI), a research division of PIRSA has been investigating effects of climate change on Snapper, Rock Lobster, Abalone and Blue Grenadier in South Eastern Australian waters. The likely impacts and adaptation options have been identified for consideration by stakeholders.

*Biodiversity corridors*

- This 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. Planning is underway for the development of further corridors linking the network of core habitat areas while continuing fauna monitoring. The community, including schools, continues to be heavily involved in the biodiversity corridor programme by helping to plant and maintain the corridors. School involvement provides opportunities for students to learn about connectivity, climate change, adaptation and forests - covering many curriculum areas and providing students with hands-on outdoor activities.

*Forests - weed control*

- The South East Natural Resources Management (SE NRM) Board and Forests Pest Management network, instigated in 2010, has improved industry and SE NRM Board liaison to allow better coordination of pest management efforts at the landscape scale. It has also improved responsiveness to changes in pest management problems arising from changes in climate.

**Objective 2.2: To build resilient and healthy communities**

**Climate Change and Public Health**

*Public health risk assessment and research*

- Public Health risk assessment and research into adaptation to climate change concentrates on the health risks and risk factors of the South Australian population during extreme hot weather. The Department of Health and Ageing undertakes the research collaboratively with researchers from the University of Adelaide.

- Research in 2012-13 focused on risk factors (environmental, social and economic, personal) of people who either died during the 2009 heatwave or were admitted to hospital for heat-related problems.

- Research also continues to focus on the older population and their attitudes, beliefs and health problems during hot weather. Studies that have been completed and are available on the National Climate Change Adaptation Research Facility website are in support of "Culturally and Linguistically Diverse Communities" (CALD) and have investigated "Cognitive and affective barriers to climate change adaptation in South Australia." Research into the concerns of heat-related health issues in the rural community continues.

- A further study into the needs of the CALD community and relevant emergency communication issues is continuing.

*The Department of Health's Emergency Management Unit*

- The Department of Health's Emergency Management Unit has developed a number of strategies to inform the public regarding extreme heat events. This includes a booklet, *Extreme Heat Guide* which describes heat related conditions, what to do if people have any symptoms, as well as providing practical tips on preparing for, and coping during periods of

extreme heat. The guide and topic specific fact sheets are available on the SA Health website. In addition a fact sheet has been developed specifically for non-English speaking communities and translated into 11 of the most common languages for South Australia. This information complements a media campaign targeted at periods of extreme heat to inform the public of how to be resilient. SA Health has also developed an Extreme Heat Action Plan for public health service providers. It includes both preparedness and response strategies.

- The Office of the Chief Psychiatrist (Department of Health) developed a mandatory compliance directive (High and Extreme Heat-Vulnerable Mental Health Consumers) 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.

*Partnering with local government*

- In partnership with local government, SA Health has produced a *State Public Health Plan* under the provisions of the *South Australian Public Health Act 2011*. The Public Health Plan sets out a new system for planning for and securing the health and wellbeing of communities. The Public Health Plan provides a framework for action across State Government and sets the scene for further local government planning for public health. Local Councils are required to plan in ways which are consistent with and have regard to the Public Health Plan when developing their public health plans.

- The Public Health Plan identifies four key action priorities, one of which is preparing for climate change. It encourages councils to more specifically incorporate public health considerations in their climate change adaptation planning. Other aspects of the Public Health Plan are aimed at building stronger healthier communities. In this action area, councils are encouraged to consider adopting green infrastructure strategies as well as more generally increasing opportunities for healthy living healthy eating and physical activity, which has a positive collateral impact on greenhouse gas reduction.

**Water resource management**

- Addressing climate change risk and developing adaptation responses is supported by the *Water for Good*'s actions of managing our water resources. *Water for Good* is South Australia's strategy to ensure safe, reliable water supplies to 2050, and to prepare for the future impacts of climate change.

- Since the release of the *Water for Good* strategy in June 2009, significant progress is being made implementing *Water for Good*'s 94 actions. This is reported in the *Water for Good Annual Statement 2012* and *Progress Report Card 2012*.

- During 2012, 14 actions were completed, bringing the total number of completed actions (including from past years) to 30. Of the remainder, 50 are on track, 13 are reported as experiencing some minor delays, and one action is no longer applicable (Action 57, construction of a temporary weir at Pomanda Island). No actions are significantly behind schedule.

- The *Water for Good Annual Statement 2012* highlights a number of key milestones achieved during the *Water for Good* annual reporting period, including:

    - The adoption of the *Water Act 2007* – Murray-Darling Basin Plan 2012 on 22 November 2012, which marks a historic milestone for the River Murray and the communities and industries which rely upon it. South Australia successfully achieved a water recovery target of 3,200 gigalitres through the Basin Plan, which will address over-allocation of water resources, the management of salinity issues, and restore the health of the River Murray.

    - The Adelaide Desalination Plant produced desalinated water and is fully commissioned.

    - The continuing construction of stormwater harvesting and re-use projects in Adelaide ensures that we remain a national leader in stormwater recycling.

    - Continued development of regional demand and supply statements across the state accounts for available drinking and non-drinking water supplies and future demand and supply requirements.

    - The passing of the South Australian *Water Industry Act 2012*, enshrines an open, transparent and collaborative approach to water demand and supply planning and a more contemporary regulatory system.

    - Adoption and commencement of operation of the *Safe Drinking Water Regulations 2012*.

- In June 2013, the Government of South Australia reaffirmed its commitment to implement the Basin Plan by signing a landmark Inter-governmental Agreement with the Australian Government and other Basin States.
- The Government of South Australia has also released the *Murray-Darling Basin Plan: South Australian Implementation Strategy 2013 – 2019* which was developed by DEWNR to help guide what the department and other government agencies will do to integrate the Basin Plan into the state's ongoing water management arrangements. This will include implementation of environmental works and measures, supporting strategic water recovery and undertaking monitoring and evaluation.

**Landscape futures analysis**

- The Eyre Peninsula and South Australian Murray Darling Basin Natural Resource Management (NRM) regions, the University of Adelaide and CSIRO developed a process of science based 'optioneering' to help regional resource managers to plan for and facilitate land use changes. The process was implemented in 2011-12 and continued in 2012-13.
- 'Optioneering' enables projections to be made about what land use might best occur where, providing options that will help adaptation and the planning of NRM and development programmes for regions and their industries.

**Objective 2.3: To improve hazard management and minimise risks**

**Coastal management**

- DEWNR has integrated climate change considerations into its coastal management programme. The department provides direct support to the Coast Protection Board, including funding projects that are aligned to the Board's strategic priorities.
- Programme priorities include:
    - Vulnerability assessments and protection strategies
    - Responding to development applications referred by planning authorities under the *Development Regulations 2008*
    - A coastal survey programme to monitor erosion where development is vulnerable, involving precise measurement of beach and seabed levels, to inform ongoing activities, such as sand management along Adelaide's beaches
    - Grants programme for local councils for coastal protection works, hazard identification and investigations. Coastal protection works incorporate adaptation for climate change induced sea level rise.

**South Australian emergency risk management programmes**

- The *National Partnership Agreement on Natural Disaster Resilience (NPA) 2009-2013* was a joint funded programme of the Commonwealth, Territory and South Australian governments. The NPA provides funds for the Natural Disaster Resilience Programme (NDRP) which then funds projects that enhance South Australia's resilience to natural disasters through mitigation works and related activities to better withstand the effects of disasters, including those arising from exacerbated by the impact of climate change.
- The Natural Disaster Resilience Programme (NDRP) supported the development of regional Climate Change Adaptation Plans and Integrated Vulnerability Assessments (IVAs), which are encouraged under the *Climate Change Adaptation Framework*.
- The NDRP also supported the completion of a Land Use Planning Investment and Capability Plan for South Australia.
- To meet the requirement of the NPA, the State Emergency Management Committee (SEMC) established Emergency Risk Management (ERM) programmes at both state and Emergency Management Zone levels. Outputs from the ERM programmes will inform the next iteration of State Hazard Plans and Zone Emergency Management Plans. Following a joint project between the South Australian Fire and Emergency Services Commission and Department of Environment, Water and Natural Resources, data from IVAs can now be considered in the risk assessment process. Risk assessment and

risk treatment processes will enable hazard leaders to better understand the hazards they are responsible for, the risks arising from those hazards, including the potential impact of climate change, and ways to mitigate risks.

- The Government of South Australia has now completed National Emergency Risk Assessment Guidelines (NERAG) and consistent state-level risk assessments. These include: flood, earthquake, riverbank collapse, rural fire, extreme weather, human disease, urban fire, animal disease, plant disease and escape of hazardous materials. Risk treatment processes have been conducted or are planned for the majority of hazards.
- The new National Partnership Agreement on Natural Disaster Resilience 2013-2015 was due to commence on 1 July 2013 but was not signed before the caretaker period commenced prior to the recent Federal election. It is anticipated that the new NPA will be signed in early 2014.
- In February 2013, the Australian Government announced funding of $47 million, to be matched by jurisdictions, to establish a new Bushfire and Natural Hazards Cooperative Research Centre.

## 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 Residential Energy Efficiency Scheme in its first three years (2002-2011) has saved 645,000 thousand tonnes of $CO_2$-e and 4.1 petajoules of energy. According to an independent evaluation of the scheme, it has saved households $100 million in energy costs and delivered a private benefit of $3.50 for every $1.00 spent on energy efficiency equipment.

The Solar Feed-in Scheme has been successful in promoting the uptake and community acceptance of rooftop solar photovoltaic installations.

As at 31 October 2013, there were nearly 181,500 customers approved to connect a solar system to the grid. Approximately 150,681 of these solar customers had their solar system installed and operating.

South Australia's recycling efforts in 2011-12 saved approximately 1.28 million tonnes of $CO_2$-e.

Strategies to guide greenhouse friendly communities by promoting good design, resource efficiency and low-waste practices into operations of community providers and building practices continued. Community level urban development is a key component in reducing South Australia's non-industrial emissions. A range of sustainable programmes have been supported by local government, non-government organisations and community involvement to build low emission and well-adapted greenhouse communities.

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

#### Awareness and behaviour change programme

- The Government of South Australia has continued to innovate in its delivery of awareness and behaviour change projects. In 2013, the inaugural South Australian Adaptation Showcase had over a 170 delegates. There were more than 30 presentations from scientists, practitioners and industry on climate change adaptation programmes underway in the state.
- The implementation of the South Australian Climate Change Adaptation Framework is focused on empowering leaders from across industry and the community to understand the impacts of climate change and how they can address it. This programme has worked with leadership bodies in local government, regional development and community in all areas of the state. Eight of the twelve government planning regions have active adaptation planning projects underway.

  In 2013 the Prospering in a Changing Climate Grants Scheme was launched. This grant scheme has sponsored a number of engagement projects such as an Adaptation Plan for the Horse Industry, to help ensure climate change is discussed in over 600 separate organisations.
- Regional NRM plans are undergoing substantial review to better integrate climate information as part of the Commonwealth funded NRM Planning for Climate Change Programme. Extensive community consultation and engagement is being undertaken during the development of these climate ready plans.

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

**Solar Feed-in Scheme**

- The Solar Feed-in Scheme introduced in 2008 has been very successful in promoting the uptake and community acceptance of rooftop solar photovoltaic installations. As of 31 October 2013, there has been 150,681 solar systems installed and connected to the grid in South Australia.
- The Scheme is administered through the electricity distribution network operator, SA Power Networks, and funded by all electricity customers via network charges passed through to their bills.
- Amendments were made to the Solar Feed-in Scheme in 2011 in order to limit the cost impacts on all solar customers and provide the solar industry and consumers with a transition away from public support.
- As a result of a review, the 44c/kWh feed-in tariff category closed to new entrants at the end of September 2011 and a range of additional eligibility criteria was implemented. Those in the 44c/kWh feed-in tariff category will be eligible to receive it until 30 June 2028.
- New customers who joined the Solar Feed-in Scheme by 30 September 2013 are eligible to receive a 16c/kWh feed-in tariff for electricity exported to the grid up to 30 September 2016.

**Solar Hot Water Rebate Programme**

- Since July 2008, the South Australian solar hot water rebate scheme has focused on assisting low income households to meet the cost of installing a new hot water system. The scheme ended on 30 June 2013.
- Since programme inception in 2001, approximately $15.4 million has been paid in rebates for about 24,000 solar hot water units saving about 65,000 tonnes per annum of greenhouse gas emissions.
- Approximately 550 rebates were granted in 2012-13 at a cost of $278,000.

**SA Water $H_2OME$ rebate programmes**

- Since the rebate scheme began in November 2007, more than 209,200 rebates, worth $43.7 million, have been granted on water efficient products.
- South Australians are estimated to have saved hundreds of millions of litres of water around the home through the State Government's $H_2OME$ Rebates.
- The $H_2OME$ Rebate scheme has helped the public purchase more water-efficient products for both inside and outside their homes and also encouraged manufacturers and retailers to develop and promote products with higher levels of water efficiency.
- Rebates are available for the stand alone rainwater tanks for up to $200 (a tank not required to be connected to the house).

**Irrigated Public Open Space Programme**

- This programme was launched in 2007 as an initiative stemming from Water Proofing Adelaide to encourage best practice irrigation management.
- The programme was initially developed to support water efficiency during recent drought conditions and water restrictions and gave SA Water customers an option to irrigate open space during restrictions by conforming to best practice principles.
- The programme continues today under Water Wise Measures where SA Water customers irrigating greater than 5000sqm are required to subscribe to the programme. Councils and schools across the state also utilise the programme.
- The programme offers tools and support which provide a guideline on efficient public open space irrigation to help monitor and manage irrigation use against current climate conditions.

**Waste avoidance, reduction and recycling programmes**

- Through its grant programmes and activities, Zero Waste SA offers a range of financial incentives to local government, businesses, schools and community groups and waste and recycling enterprises to encourage diversion of materials from landfill to recycling.
- Annual Recycling Activity Survey's indicate that South Australia's recycling efforts in 2011-12 saved approximately 1.28 million tonnes of $CO_2$-e.

**Australian Service Excellence Standards for Community Organisations**

- The Department for Communities and Social Inclusion (DCSI) supports the community services sector in improving quality of services and organisational systems through the Australian Service Excellence Standards.
- To gain accreditation under the Australian Service Excellence Standards, community organisations are required to show evidence that they have implemented environmental initiatives within their organisation.
- There are currently 202 organisations engaged and working through the standards, with a further 92 organisations accredited.

**Objective 3.3: To build greenhouse friendly communities**

**Housing SA Design Guidelines for Sustainable Housing and Liveable Neighbourhoods**

- The *Design Guidelines for Sustainable Housing and Liveable Neighbourhoods* are updated annually to reflect changes to available information and/or legislative amendments.
- The Design Guidelines are publicly available from the DCSI website.

**Off-grid remote area energy efficiency programme**

- The final stage of the Federally funded Renewable Remote Power Generation programme ended on 30 June 2013.
- Under this final stage, about $0.9 million has been spent on energy efficiency measures for commercial customers in Coober Pedy and solar hot water, principally installed in Aboriginal community housing across a number of remote communities, in collaboration with the DCSI.

**Safer, Greener and More Active Travel Community Programmes**

- The Department of Planning, Transport and Infrastructure (DPTI) continues to partner with South Australian communities to achieve and sustain safer, greener and more active travel. This is achieved through implementation of workplace specific initiatives and small scale projects over a two year timeframe, including:
    - The *Local Government Partnership Programme* which collaboratively works with councils to deliver projects that reduce car use through safer, greener and more active travel.
    - The *TravelSMART Households Programme* which engages residents in a specific target area to identify some of their specific transport issues and work collaboratively to develop a possible solution through reducing car use and making safer, greener and more active travel choices. These householders are also provided with feedback and follow-up assistance to further support and extend their chosen travel changes.
    - The *Way2Go Programme* which is a safer, greener and more active travel programme for primary school students and their communities. This aims to get more students safely walking, riding and using public transport for school travel. Way2Go provides schools and councils with resources, strategies and ideas to make school travel safer, greener and more active.
    - The *Smarter travel @ work Programme* works with local councils and workplaces to achieve a reduction in car use for travel to/from work and/or for workday travel, while contributing to targets on safer, greener and more active.
    - In partnership with the Motor Accident Commission provides Community grants for groups and organisations to deliver small scale projects that support safer, greener and more active travel choices. Projects can focus on

improving road safety, getting people cycling, walking or catching public transport, replacing car journeys with technology, doing things locally, or using the car smarter.

- Implementing the *Adelaide Carpool* trial for employees at workplaces within the Adelaide CBD. *Adelaide Carpool* is a free, web based service for city based organisations that want to support their staff to share their drive to work travel.

## 4. INDUSTRY

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

Government programmes provided support and information for key industries such as primary producers, tourism and the cleantech sector to actively improve business resource efficiency.

A survey of members of the Zero Waste SA Industry Programme in 2012 indicated annual savings of 8,435 tonnes of $CO_2$-e through reductions in electricity and gas consumption and waste diverted from landfill.

The Government of South Australia worked with industry to secure their commitment through collaboration and voluntary participation providing opportunities for improved energy efficiency in large operations, commercial buildings and small businesses.

In conjunction with the Vocational Education Sector and the University Sector, the Department of Further Education, Employment, Science and Technology (DFEEST) is leading a major initiative to deliver a green skills and sustainability training agenda.

**Objective 4.1: To manage business risk associated with climate change.**

**Primary industry development under changing climatic conditions – mitigation**

- Primary Industries and Regions SA (PIRSA) manages a range of programmes to improve the resilience of South Australia's primary industries in the face of climate change and support industries to adapt their businesses. These programmes support the *Climate Change Management Framework* (2011) outlined in Objective 2.1, under 'Primary Industry Adaptation'. Both reports also contribute to the key area, 'Natural Resources'.
- PIRSA 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 led by PIRSA continued across a range of sites and tree species to determine which South Australian native tree species can adapt to low rainfall and produce carbon absorbing dense timber.
- Oil mallee trials 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.
- PIRSA has datasets derived from climate change research trials and species trials across a range of sites. The first of these commenced 20 years ago in the Mount Lofty Ranges and measurement and thinning has continued.
- PIRSA has participated in the National Interim Climate Change Response Plan for Fisheries and Aquaculture with other state government counterparts to increase the resilience of fisheries and aquaculture industries and build adaptive regulatory governance processes for industry management.
- PIRSA has developed the Chief Executive's Climate Change Advisory Working Group – Climate Change Management Framework, which will contribute to building resilience to climate change in South Australia's primary industries.
- PIRSA and the South Australian Oyster Industry participated in research conducted by NCCARF's 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.

**South Australian Tourism Commission**

- The South Australian Tourism Commission (SATC) has been a member of the National Industry Resilience Working Group established under the National Tourism 2020 Strategy. The Group prepared a *Don't Risk It!* kit to enable small and medium sized tourism businesses and regional tourism organisations to be better prepared for risk and crises, including long-term impacts of climate change and associated extreme events such as bushfires and floods. The kit has been provided to the South Australian Tourism Industry Council and is available for use by tourism organisations in South Australia. The Group has since ceased as its work programme is complete.

- In 2008 the SATC, together with the Great Barrier Reef Marine Park Authority provided funds for the development of a new Climate Action Certification programme for tourist operators. The programme allows the travelling public to identify operators who are committed to reducing their carbon emissions. The programme is administered by the South Australian Tourism Industry Council on an ongoing basis. There are three levels of certification. Currently three businesses are certified as 'Climate Action Leaders, six businesses are certified as 'Climate Action Innovators' and seven businesses are certified as 'Climate Action Businesses'.

**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.

- The Programme has successfully engaged with a wide range of small, medium and large organisations. Since its inception in 2007, a total of 222 organisations across 521 sites have been directly involved in Industry Programme funded projects, with a further 355 organisations attending one or more of the 39 sustainability business training sessions offered.

- The programme's effectiveness is enhanced through working at a geographical cluster and industry association level in areas as diverse as the advanced manufacturing, print, wine, food, tourism, hospitality, defence, and health and community services sectors, in addition to several key government clients. The Industry Programme is working with other jurisdictions and the Australian Government in establishing a national approach to industrial symbiosis and ecology.

**Final tranche of landfill bans**

- New landfill bans came into effect on 1 September 2012 under the Environment Protection (Waste to Resources) Policy 2010 for fluorescent lighting, televisions and computers in metropolitan Adelaide, and whole earthmover tyres across the state. The Policy prohibits these waste types from being disposed of directly to landfill, as well as vegetative matter that would otherwise contribute to methane gas emissions.

- From 1 September 2012, the Environment Protection (Waste to Resources) Policy 2010 requires suitable waste produced in metropolitan Adelaide to be subject to resource recovery processes prior to being disposed to landfill.

- In October 2012, the Environment Protection Authority commenced a waste reform project to assist in reducing the climate impacts of industrial waste. The programme involves actively engaging with industry to assess perceived waste problems then identify and implement solutions.

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

**Premier's Research and Industry Fund**

- The Premier's Research and Industry Fund (PRIF) is an initiative of the Government of South Australia and the Premier's Science and Industry Council. The Fund 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 2011-12, $7.1 million was awarded to projects that focus on climate change or renewable energy. In 2012-13, the $4.2m per annum programme awarded $966,000 to four renewable energy projects and one climate change related project.

- The Government of South Australia either invests or participates in a number of national Cooperative Research Centres (CRC) that have relevance to climate change/sustainability including: CRC for Contamination Assessment and Remediation of Environment; eWater CRC; and most recently the new CRC for Low Carbon Living and the Auto 2020 CRC. Additionally, the state is a significant partner with the CSIRO in the Goyder Institute in research regarding better water management and a member of the new CRC for Water Sensitive Cities.

**TAFE SA Sustainable Industries Education Centre**

- The $120 million Sustainable Industries Education Centre (SIEC) for Tonsley Park is a crucial element of South Australia's sustainability commitment. The Centre will specialise in new green technologies training associated with the construction industry.
- The purpose of building this new Centre within the Precinct is to improve links between green technology, research and design amongst universities, education and training services, and the industry that relies on both sectors.
- The new SIEC 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 43,000sqm of world class, energy efficient, trade training infrastructure and the divestment of over 80,000sqm of inefficient and unfit for purpose training spaces in the metropolitan area.
- TAFE SA is the anchor tenant of SIEC which is a foundation occupant of the Tonsley Redevelopment. TAFE SA through its training programmes at SIEC will embed sustainability skills in building services and construction, water and renewable energy industries.
- The SIEC is on schedule for training delivery to commence at Tonsley from early 2014.

**Green skills and vocational training**

- *Skills For All* is a Government of South Australia initiative that subsidises vocational training courses from Certificate I to advanced Diploma levels.
- For training to meet current industry standards there is a need to upgrade and provide infrastructure that meets specialised training needs to provide flexible learning, e-learning and increased training in new skill areas such as sustainable technologies.
- *Skills For All* subsidises a range of training courses related to environmental sustainability in areas such as: Environmental Monitoring and Technology; Conservation and Land Management; Forest Industry Sustainability; Renewable Energy and Photovoltaic systems.
- Many higher level vocational courses map directly to a relevant university degree.
- *Skills For All* also provides a vehicle to meet the Commonwealths *Green Skills* sustainable training agenda, as well as South Australia's future sustainable training needs delivered through the new $120 million TAFE SA Sustainable Industries Education Centre.

**Environmental Sustainability Action Forum**

- (DFEEST has established an Environmental Sustainability Action Forum to inform and coordinate DFEEST activity and investment in environmental sustainability through skill development and innovation in South Australia.
- The Forum is chaired by the Deputy Chief Executive DFEEST, and has representatives from vocational education, tertiary education, industry programmes, digital economy and intergovernmental relations.

**Cleantech industry development**

- The 'cleantech' industry sector covers viable products, services and processes with a positive environmental impact in areas such as sustainable energy, waste, water, green buildings and transport.

- *Manufacturing Works*, a strategy for delivering high value manufacturing in South Australia, was released in October 2012. It outlines strategies and actions to transition the manufacturing industry from predominantly low value-added activities competing on cost, through medium value-added to high value-added activities competing on value for money in global markets. The strategy identifies the clean technology sector providing an opportunity for industry growth in South Australia. The strategy provides for a number of programmes to assist manufacturers to innovate, including those manufacturers that supply low carbon and clean technologies. Innovation programmes include the Innovation Voucher Programme, Small Business Innovation Research Pilot, Business Model Innovation Series, Building Design Competence Pilot, Manufacturing Services Series, Photonics Catalyst Programme and the NanoConnect Programme.

- During 2012 and 2013 the DMITRE led a number of initiatives to support the development of South Australia's clean technology sector, including:

    - the three year Cleantech Partnering Programme, which provided assistance to small and medium enterprises with the commercialisation of new cleantech ideas and projects. Funding totaling nearly $1.5 million was awarded across 30 projects

    - the Business Sustainability Alliance Energy Efficiency Programme, which assisted South Australian manufacturers to undertake energy audits to identify energy efficiency initiatives within their operations as a means of reducing costs and improving environmental performance. Audits of 36 manufacturing facilities collectively identified more than $24 million worth of energy efficiency initiatives, which if implemented would generate nearly $7.5 million of annual savings and annual reductions of 49,000 tonnes of $CO_2$-e. To date, approximately $5.6 million worth of projects have been implemented, which have collectively leveraged nearly $2.8 million in Australian Government funding support

    - the CleverGreen™ Eco-Innovation Programme, which supported South Australian manufacturers to collaborate to develop innovative solutions that promote resource efficiency as a means of improving economic and environmental performance. A total of 11 collaborative projects were funded covering a wide range of resource efficiency activities.

**Water efficiency plan programme**

- During 2007, Water Efficiency Plans became a mandatory requirement for large water users sourcing 50 megalitres (ML) or more per annum from the River Murray, either directly or indirectly through the SA Water reticulated network. The Water Efficiency Plans outline water efficiency improvement opportunities within an operation. In 2010, as part of the Water for Good strategy, development of a Water Efficiency Plan became a mandatory requirement for customers using more than 25 ML per annum.

- SA Water provided assistance to customers in developing Water Efficiency Plans throughout the implementation of these mandatory requirements including assistance on site in identifying water efficiency opportunities, providing templates to develop their Water Efficiency Plans, and providing follow up review and support to water efficiency projects.

- When the Water Industry Act was introduced in 2012, Water Efficiency Plans were no longer a mandatory requirement.

- SA Water continues to provide a tool kit for businesses that includes a guide to the first crucial steps in planning for water efficiency. The plan will automatically generate a water efficiency report and action plan for the business. Use of the toolkit and support is no longer limited to customers using more than 25 ML per annum, with support being available to all non-residential businesses requiring assistance.

**National business water efficiency benchmarking programme**

- SA Water has partnered in the national project with other water utilities across Australia along with the Water Services Association of Australia. The primary objective of this project 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.

- Industry benchmarks promote continuous improvement by helping organisations understand their relative performance in water efficiency. This is done by setting targets that encourage people to use water more efficiently.

## 5. ENERGY

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

2011-12 was the first year in which wind generation overtook coal to become the second most predominant fuel source for electricity generation (after gas).

This performance was replicated in 2012-13 when wind contributed 27 per cent of the state's total electricity generation. Rooftop photovoltaic systems are estimated to have generated 600 gigawatt hours in South Australia, equivalent to approximately 4 per cent of the state's total energy generation for that period.

South Australia is leading the way in the provision of renewable energy with abundant wind resourcing supporting in wind turbine generation compared with other states. Renewable energy is also enhanced by having in place best practice land use planning rules for construction of wind farms and a unique regulatory framework for geothermal energy and take-up of renewable and low emission technologies.

**Objective 5.1: To improve the efficiency of energy use**

**Residential Energy Efficiency – SASP Target 60**

- SASP includes a Target 60: *Energy efficiency – dwellings* to improve the energy efficiency of dwellings by 15 per cent by 2020 (milestone of 10% by 2014).
- An important contribution towards SASP Target 60 will come from the Residential Energy Efficiency Scheme (REES) which mandates the delivery of energy efficient activities by larger electricity and gas retailers. In November 2013, the Minister for Mineral Resources and Energy announced that the Government will extend the scheme to 2020 and expand it to include small businesses.
- The Energy Markets and Programmes Division within DMITRE also participates, with other jurisdictions on a national programme to set energy performance standards and labelling schemes for appliances and equipment.
- Other initiatives that contribute towards attaining the residential energy efficiency target include South Australia's water heater installation requirements and DMITRE's Energy Advisory Service and Energy Partners programme.
- The energy efficiency index describes the number of residential dwellings that can have their annual energy needs met by 1 terajoule of energy. Results for 2011–12 (25.71) exceeded the 2014 milestone (23.9) and 2020 target (24.98) for SASP Target 60, which may be partially due to a mild winter and summer during this period.
- The Essential Services Commission has advised, in its report on the performance of the Residential Energy Efficiency Scheme in 2012 that all energy audit and greenhouse gas reduction (energy efficiency) targets have been met in aggregate for 2012.
- There has been a significant take-up of photovoltaic generation in households, which has resulted in a reduction in grid-supplied energy in nearly 140,000 homes.
- Strengthened national Minimum Energy Performance Standards (MEPS) for televisions commenced on 1 April 2013 and new MEPS for computers and MEPS and energy labelling for computer monitors on 1 October 2013. The MEPS specifies the minimum level of energy performance that appliances, lighting and electrical equipment must meet or exceed before they can be offered for sale or used for commercial purposes.

**Energy Efficiency Opportunities Programme**

- SA Water is an active participant of the Australian Government's Energy Efficiency Opportunities (EEO) Programme. The EEO Programme is a business improvement framework that encourages large energy-using organisations to increase energy productivity.

- Through a whole-of-business approach, SA Water identifies, evaluates and implements cost effective energy saving opportunities. SA Water's EEO Programme is a key strategic initiative for achieving energy and emission reduction targets. SA Water completed three comprehensive assessments during the first assessment cycle and SA Water's EEO Public Reports provide a summary of achievements.
- A further four detailed energy assessments are planned for the second assessment cycle on activities consuming more than 90 per cent of SA Water's total energy usage for:
    - water transmission
    - wastewater treatment plants
    - water distribution
    - fuels.

**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.
- SA Water has achieved the renewable energy target in its sector agreement with the Minister for Sustainability, Environment and Conservation through:
    - self-generating renewable energy from the wastewater treatment process
    - purchasing Renewable Energy Certificates from GreenPower™ accredited electricity generators.
- SA Water is an active participant in the Australian Government's mandatory Energy Efficiency Opportunities Programme and has continued to demonstrate full compliance, leadership and savings in energy, cost and emissions.

**SA Water co-digestion trial**

- SA Water's Sewage Treatment Plants (STP) at Glenelg, Bolivar, Christies Beach and some regional STP's 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 used to produce electricity, offsetting some of the STP's energy demand.
- In 2010, SA Water conducted a research project to assess the potential benefits from adding various high strength industrial organic waste (HSOW) products for "co-digestion" with the regular sludge. Many of the tested products significantly increased methane yields.
- The project indicated that co-digestion offers the potential to maximise performance of anaerobic digesters, reduce energy demand of STPs and provide an alternative disposal method for these trade wastes.
- A full scale SA Water co-digestion trial is underway and is now accepting high strength waste directly from customers.
- The Glenelg STP trial has resulted in a 35 per cent increase in the production of methane, which is estimated to be equivalent to 1390 MWH per annum. Another 'product' for commencing delivery in 2012-13 will add another 900 MWH per annum. The addition of this product will equate to the spare capacity of the existing digesters. This will provide a total of 2290 MWH per annum from the addition of HSOW to the GSTP digesters.
- Expansion of this system to other SA Water STP's is being investigated as there are significant volumes of other types of HSOW being generated by industry in South Australia that could be utilised in this way.

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

**RenewablesSA**

- RenewablesSA is the Government of South Australia's investment and industry development agency for the renewable energy sector in South Australia.

- RenewablesSA achieves its purpose to attract investment through the following means:
    - Primary architect for new policies and regulatory processes which have established South Australia as having the nation's most competitive policy and regulatory environment for renewable energy investment
    - Provision of specialist advice
    - Leveraging Federal funding and support mechanisms to benefit South Australian projects
    - Publishing commercially relevant information to inform investment decisions.
- RenewablesSA worked to develop a whole-of-government low carbon investment strategy which will have an economic development focus.
- RenewablesSA worked to reduce barriers for renewable energy investment on Crown land, subject to pastoral lease requirements, by further progressing work to amend the *Pastoral Land Management and Conservation Act 1989*.
- In October 2012, land use planning schemes were updated by a state-wide Development Plan Amendment for wind farms which provides greater clarity for developers and communities on wind farm development approval processes.
- In October 2013, new data and a report was released on existing diesel power generators used by off-grid mines, pastoral stations, businesses and towns in South Australia to encourage more industry use of renewable energy .
- Section 6 of this report provides detailed reporting on the RenewablesSA renewable energy programme and outlines highlights for the reporting period covering 2012 and 2013.

**Geothermal Energy**

- Work has been 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 state has provided targeted grants totalling $5.8 million in the term 2005-13 for co-funded (by industry and research institutions), pre-competitive research focused on critical challenges to the commercialisation of geothermal energy in South Australia.
- Funding of $1.6 million was initially awarded by the Government of South Australia in 2009 to establish the South Australian Centre for Geothermal Energy Research at The University of Adelaide. Additional support of $2 million to support research into establishing permeability for specific geothermal reservoirs was awarded in June 2011 and continues to be applied to the current 2013-14 financial year.
- The number of South Australian geothermal licences has grown from 3 in 2002 to 135 as of 20 September 2013.
- South Australia attracted 75 per cent (an estimated $885 million of $1187 million total) of all investment in Australian geothermal energy exploration projects from 2002 to 2013.
- As of 1 December 2012, South Australian geothermal projects have been offered 90 per cent ($159 million of $172 million total) of all Australian Government grants for geothermal projects across the nation.
- South Australia is home to the two most advanced geothermal projects in Australia; Geodynamics in the Cooper Basin and Petratherm in the Flinders.

**Mini Wind Turbine Trial**

- In February 2013, the South Australian Government in partnership with the West Beach Trust completed a 12-month trial of four residential-scale mini wind turbines at the West Beach Boating Precinct. The purpose of the trial was to increase South Australians' awareness and understanding of mini wind turbine technology through generating comprehensive and objective performance data. It also provides South Australians with an opportunity to experience a range of mini wind turbine technologies first hand. The trial was the first of its kind in Australia.
- All performance data from the turbines was published on the trial website.

- The West Beach Trust have formed a partnership with the Royal Institution of Australia (RiAus) and the West Beach and Districts Community Bank to develop a professional development package for primary and secondary school science teachers regarding wind energy. The package was launched on 16 May 2012 and consists of professional development training sessions and online learning materials.

**Unconventional gas as a transition fuel**

- In 2010, the Government of South Australia established the Roundtable for Unconventional Gas Projects in South Australia (Roundtable) 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.
- DMITRE leads the Roundtable which involves more than 350 member organisations, and focusses on resource development and environmental protection. The Roundtable includes agencies from every state, the Northern Territory, Australian Government, as well as industry representatives.
- Industry memberships include:
    - petroleum exploration and production companies
    - petroleum pipeline companies
    - companies providing services to the petroleum industry
    - banks and finance sector companies
    - peak representative bodies for minerals and energy resources, farming, public health, environmental protection, and for the protection of Aboriginal peoples rights and heritage
    - universities and research institutes.
- The Roundtable informed the *Roadmap for Unconventional Gas Projects in South Australia*, released by DMITRE 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. Gas is well recognised as the most cost-effective transition fuel to a low carbon economy.
- The Roundtable has formed five working groups that focus on skills, infrastructure, water, reduction of red tape and measuring and monitoring greenhouse gas emissions.
- Each is developing cost effective solutions to foster fast progress in the environmentally and economically sustainable development of unconventional gas in South Australia.

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

**Carbon capture and storage**

- The Energy Resources Division within DMITRE actively 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.
- DMITRE is the South Australian representative for upstream energy issues addressed through the International Energy Agency, Carbon Storage Taskforce, the Global Carbon Capture and Storage Institute and Ministerial Council on Mineral and Petroleum Resources subcommittees and working groups. This provides a mechanism for dealing with the regulation of, and investment attraction for greenhouse gas storage projects.
- DMITRE's Energy Resources Division also chairs the Australian Mirror Committee for ISO/TC 265, and the international standards organisational technical committee through Standards Australian for the development of an ISO (*International Organization for Standardization*) for the capture, transport and storage of carbon dioxide.
- DMITRE provides funding and in-kind support towards the Cooperative Research Centre for greenhouse gas technologies (CO2CRC) at The University of Adelaide.

- One gas storage retention licence exists in the Otway Basin and 26 gas storage exploration licences have been granted for areas in the Officer and Simpson Basins. A further 38 gas storage exploration licence applications are pending determination over lands in the 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, (such as the user of lasers and airborne hyperspectral instrumentation), 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.***

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 has been extended from around 480 kilometres in 2002 to 1,120 kilometres in 2013. Annual Adelaide City Cordon Counts indicate that people cycling to and from the city on a typical day increased by 46 per cent from 2007 to 2012.

South Australia's commitment of $2.6 billion investment in public transport infrastructure over the next decade is aimed at delivering a public transport level of 10 per cent of metropolitan weekday passenger vehicle kilometres by 2018. Cycling and walking infrastructure also provide a key contribution to this sector.

A range of sustainable behaviour programmes have supported travel behaviour change and have often been delivered through community groups.

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

**Public Transport – SASP Target 63**

- SASP includes Target 63: *Use of public transport: Increase the use of public transport to 10% of metropolitan weekday passenger vehicle kilometres travelled by 2018.*
- In 2008 and 2009, the Government of South Australia committed to a decade long, $2.6 billion investment in public transport that will see the electrification of the rail system, extension of the Noarlunga rail line to Seaford, extension of the tram line, and the integration of all public transport modes into a seamless public transport system.
- Investment was announced in 2012-13 to increase the capacity of park-and-rides at Paradise, Tonsley and Mount Barker, and to construct new bus 'super stops' in Grenfell Street. Project funding for the electrification of the Gawler line was withdrawn following the Australian Government's Mid-Year Budget Review.

**Objective 6.2: To achieve more sustainable travel behaviour**

**Cycling and Walking – SASP Target 2**

- A number of bicycle projects across the state were developed which support SASP Target 2*: Cycling: Double the number of people cycling in South Australia by 2020*.
- Subsidy funding to local councils was provided to encourage them to improve local networks and further developed the Amy Gillett Bikeway and the Adelaide Greenways network. Current projects included Marino Rocks, Outer Harbor, Gawler and Tonsley Greenways.
- Adelaide's network of bicycle lanes and paths has been extended from around 480 kilometres in 2002 to about 1120 kilometres in 2013.

- ABS Census data indicates cycling as a mode of travel for work in South Australia decreased slightly in the 2011 census to 1.3 per cent of trips. Walking as a mode of travel also declined slightly to 2.8 per cent of trips in the 2011 census.

- Annual Adelaide City Bike Cordon Counts indicate that people cycling to and from the city on a typical day have held steady between 2011 and 2012. Routes with the most intensive infrastructure improvements show the greatest gains in use. The Mike Turtur Bikeway (route that parallels the Glenelg Tramway) had an average annual weekday traffic (AAWT) of 344 cyclists in 2010. This increased by 66 per cent to an AAWT of 570 in 2012. In summer, this route carries over 1000 cyclists through Unley and is now the busiest route into the City of Adelaide, overtaking the River Torrens Linear Path in Hackney for the numbers of weekday bicyclists.

**Objective 6.3: To improve emissions performance of vehicles and fuels**

**South Australia's Low Emissions Vehicle Strategy 2012-2016**

- In June 2012, the Government of South Australia released *South Australia's Low Emission Vehicle Strategy 2012-16*. The Strategy was developed in response to the advice of the Premier's Climate Change Council tabled in Parliament in September 2009 and aims to remove barriers to the uptake of low emission vehicles in South Australia.

- Light and heavy motor vehicle fleets currently contribute 20 per cent of the state's greenhouse gas emissions as well as significant levels of toxic gases that can affect public health particularly in urban areas. The Strategy aims over time to significantly reduce these vehicle emissions. Key initiatives include supporting better vehicle choices by fleets and individuals, the promotion of new vehicle technologies including electric vehicles; the promotion of biofuels; support for ongoing research and industry support for the commercialisation of new lower emissions vehicles, components or support products.

- On the 10 October 2013, the Government released a website that provides fleet managers and consumers with extensive information on low emission vehicles (http://www.lowemissionvehicles.sa.gov.au/). The website also contains a comprehensive map of South Australian service stations that sell lower emission bio-fuels and points where electric vehicles can be recharged.

- DPTI and Government of South Australia fleet vehicles will be used to evaluate new technologies and driver behaviours that can reduce emissions. This includes the full adoption of biodiesel blends within the metropolitan Adelaide bus fleet and the evaluation of 2 Mitsubishi i-MiEV electric vehicles.

**Automotive Australia 2020 CRC (AutoCRC)**

- The Government of South Australia is currently providing $300,000 over three years from 2012-13 to the AutoCRC for two projects which will deliver outcomes that will enhance the viability and sustainability of the automotive industry in South Australia through increased product and process innovation that takes into account economic, social and environmental impacts. The two projects are:

    - Next Generation Automotive Coatings: through a combination of applied and strategic fundamental research (involving the application of thin film coatings to polymers). The University of South Australia will deliver high value add, advanced manufacturing technologies and products to SMR – one of Adelaide's key auto component manufacturers.

    - Stars for Cars: The University of South Australia will develop a new rating scheme for vehicles to apply Life Cycle Analysis techniques to determine the relative costs during the manufacturing, use and disposal phases of a vehicle's life.

- The Government of South Australia, through DMITRE, previously provided the AutoCRC with $700,000 over seven years (2005-06 to 2011-12) for projects which included:

    - $200,000 for the establishment of Australia's first Ergonomics Laboratory at the University of South Australia (UniSA);

    - $200,000 in support of two electric vehicle research projects at UniSA; and

- $50,000 in support of the development of magnesium automotive components by the South Australian automotive firm T-Mag, in collaboration with GM Holden, CSIRO and AutoCRC.

**Reducing emissions from the State Government fleet**

- The Government of South Australia's passenger and light commercial motor vehicle fleet will contribute to the South Australia's Strategic Plan Target 59, by reducing greenhouse gas emissions per kilometre travelled by 10 per cent by 2014-15 over the 2009-10 level. As of 2012-13, emissions have been reduced by 4 per cent from 2009-10 levels.
- The reduction in fleet emissions will be achieved by a combination of downsizing to smaller vehicles provided that they are fit for purpose, greater use of diesel and alternative fuel vehicles, and improved driver practices.

**Objective 6.4: To shift transport to low greenhouse emission modes**

**Electric vehicle recharging**

- During 2012-13, the Government of South Australia implemented an Electric Vehicle Recharging Infrastructure Programme (EVRI) which offered grants to encourage the establishment of electric vehicle charge points in key strategic locations. In total, 7 grants of $4,000 each were awarded to private organisations to assist in the cost of providing publicly available recharging points in the Adelaide CBD (three), Stirling (one), Unley (one), Burnside (one) and Edwardstown (one).
- The grants were rated by assessing: population density in the vicinity of the proposed site, the site's servicing of a significant retail precinct, and its contribution to establishing a geographically-distributed EVRI network.
- The EVRI grant scheme tripled the number of public recharge facilities available for electric vehicles in the state.

**Trialling of electric vehicles in the State Government fleets**

- Two Mitsubishi iMiEVs electric vehicles are being trialed by the DPTI and DCSI. An evaluation of the experiences of DPTI staff found that more than 85 per cent of people who have driven the vehicle considered its performance and ease of use to be good or excellent. Ninety per cent said they would recommend it to others.

## 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.***

South Australia is actively 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.

In 2012-13, the State Government worked with local government to explore the potential for introduction of a Building Upgrade Finance mechanism in South Australia. Consultation on enabling amendments to the *Local Government Act 1999* is anticipated to commence in 2012-13.

The work of Renewal SA and the Building Innovation Fund provided practical demonstrations that allow the South Australian community to experience the benefits of integrated design and sustainable urban development.

A state-wide policy on Water Sensitive Urban Design (WSUD) was released in October 2013 which outlines 14 actions the State Government will pursue collaboratively with industry, local government, and others to encourage cost effective water sensitive approaches in urban developments and redevelopments. The policy was developed using the best available science from the Goyder Institute for Water Research, as well as significant consultation with local government, industries, and communities.

At a precinct or neighbourhood level, the South Australian Planning Strategy, including *The 30-Year Plan for Greater Adelaide*, provides an important vision of a shift toward a low carbon society, a more compact urban form and transit oriented development. The National Strategy on Energy Efficiency (NSEE) also provides an important policy context for progress in this sector.

The Building Innovation Fund, Building Upgrade Finance and the Cool Roofs initiative seek to improve the performance of commercial buildings.

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

**South Australian Planning Strategy**

- The Government of South Australia has continued to progress implementation of the South Australian Planning Strategy, including *The 30-Year Plan for Greater Adelaide*. The 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 and transit oriented development as well as support for green technologies and industry.
- The 30-Year Plan focuses on reducing reliance on private vehicles, encouraging development of new carbon-efficient industries and green technologies, and encouraging a denser urban form (i.e. 70 per cent of new development to be infill).
- 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.
- Structure Plans are being developed for growth areas identified in the Planning Strategy. The Inner Metro Rim Structure Plan, providing for higher density, mixed use developments around key sites on transit corridors and activity nodes, was released in September 2012. The draft Playford Growth Area Structure Plan provides for appropriate infrastructure and services to be progressively implemented to complement new housing developments and employment.
- The Government of South Australia has completed work to introduce new zones and policies to enable mixed use development and higher densities along transit corridors and in key activity centres.
- Within regional areas, several local councils have commenced 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.

**Cool Roofs**

- The Cool Roofs programme assessed the merits of a mandate for the installation of cooler roofing systems on South Australian buildings. Analysis indicated that cool roofs installed on flat roofed commercial buildings in warmer parts of South Australia can on average reduce the energy demand for space conditioning by around 10 per cent per year.
- To facilitate consultation with the industry, a *Cool Roofs Discussion Paper* that outlines the results of the analysis and evaluates the costs and benefits of cool roofs was released in December 2010. Industry consultation was carried out in early 2011 and amendments to the Building Code of Australia, as a state variation, came into operation from May 2012.

**CRC For Low Carbon Living (CRC4LCL)**

- In 2012, a number of State Government agencies became members of the Cooperative Research Centre (CRC) for Low Carbon Living. The CRC brings together leading researchers and key end-users to become a knowledge hub for leading social and technological innovation and developing integrated products, materials and tools to deliver low carbon outcomes.
- The initiative contributes to a number of the Government of South Australia's strategic priorities, such as advanced manufacturing, a vibrant city, safe and active neighbourhoods and affordable living.

**Building policy**

- The DPTI aims to increase the energy efficiency of buildings by mandating minimum requirements for all new building work. Where possible, this is achieved through the adoption of national measures in the Building Code of Australia (BCA). State-based requirements are used where the BCA provisions are either non-existent or are not appropriate for meeting

South Australian policy targets. Additionally, *The 30-Year Plan for Greater Adelaide* promotes more energy efficient building design, increasing densities, and locating jobs and housing closer to public transport to reduce the need for private car travel.

- In September 2010, South Australia was one of the first jurisdictions to increase requirements for the energy efficiency of both residential and commercial buildings in line with the National Strategy on Energy Efficiency (NSEE) endorsed by the Council of Australian Governments (COAG). This included a minimum energy efficiency requirement of 6 stars and increased requirements for lighting in houses. A concession was provided for transportable houses in recognition of their contribution to affordable housing in remote areas.
- Requirements for commercial buildings to be built with roofs with low absorption of energy, for example light colour roofs, were incorporated into the South Australian provisions of the BCA on 1 May 2012.

**Sustainable development through integrated design**

- The Office for Design and Architecture SA (ODASA), led by the Government of South Australia Architect, provides design leadership across South Australia. ODASA advises state departments, agencies, local government, and industry on how to improve design outcomes for capital works programmes, individual projects and broader planning initiatives which help to ensure the quality and sustainability of the built environment. Initiatives that deliver on this responsibility include:

*Design Review Programme*

- The Capital City Design Review Panel was introduced in 2012 as part of a range of policy reforms which also included the Capital City Development Plan Amendment (DPA). The DPA supports the South Australian Government's strategic priority to create a vibrant city and a more sustainable urban form.
- The new policy framework introduced a performance based planning regime to promote and improve design quality in the City of Adelaide. The Capital City Design Review Panel informs the South Australian Government Architect in his role as a statutory referral body to provide independent advice to the Development Assessment Commission on the design quality of projects, with a capital value over $10 million. The Design Review Panel programme has been extended to the key areas for urban renewal for proposals over five storeys in the inner metropolitan area.
- ODASA has also developed focused Design Review panels for major projects, such as Tonsley.

*Zero Carbon Challenge*

- The Zero Carbon Challenge was an innovative competitive approach that promoted a more sustainable, energy efficient and adaptable housing model for South Australia. The winning team was announced in early 2012, and the project is now completed at Lochiel Park, Campbelltown. The Zero Carbon Challenge aimed to reduce the total carbon footprint of South Australian housing through next generation design, material use, construction processes, and building operation.

*Royal Adelaide Hospital (RAH) Site Open Ideas Design Competition*

- The RAH Site Open Ideas International Design Competition (from 18 July to 10 December 2013) openly explores wide-ranging and innovative design solutions for the RAH site.
- 'Delivering best practice in sustainable design' was a key project objective. Competitors were required to consider and respond to environmental sustainable design in all aspects of planning, design, construction and operation in their submissions.
- Next steps – Renewal SA will be the lead agency for the development of the RAH site with ODASA continuing to provide strategic advice for the project. A feasibility study will commence in 2014.

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

**Building Innovation Fund**

- The four-year, $2 million Building Innovation Fund was announced in 2008. The Fund offered grants to owners of commercial buildings for initiatives that demonstrated new and leading edge approaches to retrofitting existing buildings, which significantly reduced the building's energy use and greenhouse gas emissions.
- In the final round of the Fund, $453,000 was awarded for the installation of a sustainable energy system at 1 King William Street, Adelaide. It consisted of a tri-generation plant, a contemporarily-designed large scale solar photovoltaic installation and a façade protection and insulation system.
- In total, eleven projects were funded during the life of the initiative with the final round of funding occurring within this reporting period. Refer to Section 6 of the Report.
- Reports relating to all completed projects are available at www.sa.gov.au\climatechange.

**Building Upgrade Finance**

- On 30 April 2012, the Premier's Climate Change Council endorsed advice to the former Minister for Sustainability, Environment and Conservation regarding Building Upgrade Finance (BUF)[4] and made a series of recommendations relating to the establishment of BUF mechanism in South Australia.
- Building Upgrade Finance is a voluntary mechanism 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.
- The Government of South Australia sought the views from the property, finance and local government sectors regarding the potential for BUF mechanism in South Australia; and engaged with the Sustainable Melbourne Fund and the NSW State Government who have implemented similar schemes in their jurisdictions.
- In parallel to the external consultation process, the Government of South Australia in partnership with the Adelaide City Council, commissioned a study by Arup to estimate a scale of retrofitting opportunity in South Australia.
- In a response to advice received from the Premier's Climate Change Council, the former Minister for Sustainability, Environment and Conservation, committed to work with key stakeholders from the local government, property and finance sectors, to develop the business model and business case for establishing Building Upgrade Finance for commercial buildings in South Australia.
- In December 2012, DEWNR partnered with the South Australian Division of the Property Council of Australia and the Adelaide City Council (ACC) to host an industry briefing on Building Upgrade Finance. The event featured presentations from Australia's leading experts and was attended by approximately 80 people from the property, finance and local government sectors.
- The Government of South Australia partnered with the ACC and the Local Government Association to develop the business model and business case for establishing BUF in South Australia. The business case and business model were completed in February 2013.
- In October 2013, the State Government approved that enabling amendments to the *Local Government Act 1999* be drafted for consultation with stakeholders. Consultation is likely to commence in December 2013.

**National Energy Efficient Building Project**

- On behalf of all states and territories, the South Australia Government is leading the National Energy Efficient Building Project (NEEBP), an initiative under COAG's National Strategy on Energy Efficiency.

[4] Formerly referred to as Environmental Upgrade Finance.

- The NEEBP will occur in several phases. The first phase is underway and involves three sub-projects:
    - a national review of systemic or process weaknesses, or common points of non-compliance, with the energy performance requirements in the National Construction Code
    - a national review of the uniformity and effectiveness of current standards or regulations to deliver energy efficient renovations, including alterations, additions and retrofits
    - a national needs and gap analysis leading to a strategy to develop and support the knowledge and capacity of key professions and trades to deliver best practice energy efficiency to the building industry.
- Phase 2 of the project will develop and trial practical strategies to address problems wherever they occur in the construction cycle. These strategies will be identified in Phase 1 and could include activities as broad as industry capacity building, voluntary guidelines and standards, or recommended changes to policy or regulations.

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

**Sustainable design in urban renewal**

- Renewal SA is responsible for completing Lochiel Park, a green village which includes energy efficient building design, solar energy systems and improved waste management to minimise the impact on the environment.
- Renewal SA is delivering the Bowden project with a range of sustainability initiatives influenced by the project's One Plant Living targets. These include:
    - 5 Green Star rated buildings across the entire project and advice for developers
    - Alternative energy system, energy monitoring and rebates for developers
    - Sustainability incentive rebate scheme for residential and retail customers.
- Renewal SA will seek 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.
- A dedicated Sustainability Manager has been appointed for the Tonsley Park redevelopment project, as a response to advice from the Premier's Climate Change Council on climate smart precincts. The aim is to create opportunities for sustainability to be integrated into all elements of project design and implementation.

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

**Urban heat island research study**

- A research project into the urban heat island (UHI) effect in Adelaide was completed by a team led by Flinders University. The project was supported by ACC and the Government of South Australia through the University Sector Agreement Climate Change Research Fund.
- The research identified implications for urban planning and building design in Adelaide. In particular, the urban heat island is clearly observed in the Adelaide CBD and hot spots vary between day time and night time and within the City of Adelaide (particularly north west of the City). It also identified that the Adelaide Park Lands and sea breezes help to reduce CBD air temperatures.
- There is a strong correlation between weather conditions, in particular air temperature, and energy use in buildings and sensitivity to heat waves.
- UHI intensity is influenced by a range of factors including:
    - building height, orientation, morphology (e.g. glazing)
    - surrounding buildings
    - materials (e.g. asphalt)

- anthropogenic heat release (e.g. air conditioning units)
- vegetation and hydrological conditions (evapotranspiration).

- In addition to the final report, the outcomes of the research were presented by the ACC and Flinders University at a national research conference and information is being incorporated as part of planning policy consideration for the City.
- Further reporting on the City of Adelaide Urban Heat Island Micro Climate Study is outlined in Section 10 of the Report.

**Water sensitive urban design**

- A Water Sensitive Urban Design (WSUD) policy prepared for the Government of South Australia's consideration, was approved in June 2013. The policy outlines objectives for WSUD across South Australia and includes state-wide WSUD performance principles and performance targets to enhance clarity of WSUD in a South Australian context and to facilitate monitoring of the extent to which WSUD is being incorporated into urban areas.
- The policy also includes state commitments to provide for consideration of WSUD in state infrastructure projects; leveraging existing state regulatory mechanisms to support water sensitive design; and state support for a capacity building programme with and for stakeholders to facilitate the most appropriate, efficient and effective application of WSUD.
- The policy builds on work that has already been undertaken jointly with local government and the private sector as part of the Institutionalising Water Sensitive Urban Design project. It has been further informed by feedback from consultation with industry groups, local government and other stakeholders that was facilitated by a WSUD consultation statement released in 2012-13, and work undertaken by the Goyder Institute for Water Research.
- As part of the process of formulating possible approaches for facilitating a capacity building programme, DEWNR with others (including the Adelaide and Mount Lofty Ranges Natural Resources Management Board, Environment Protection Authority, and Stormwater Industry Association), funded a WSUD capacity building business case project which provided for engagement with stakeholders to identify issues and options for establishing such a programme.

**Evidence base for green infrastructure**

- There is growing evidence that the network of green spaces and water systems that we describe as green infrastructure are just as vital to a city as the grey or built infrastructure.
- DEWNR has established a cross-agency partnership with DPTI and Renewal SA to promote awareness and capacity across South Australia to incorporate greener infrastructure into urban environments.
- In 2013, the partnership produced an Evidence Base for Green Infrastructure, a review of research into the numerous benefits of green infrastructure. It summarises global based evidence for incorporating nature into urban environments through connecting green corridors which reduce air pollution, result in cooler, green microclimates that reduce the urban heat island affect, and mitigate against the impact of climate change.
- Green infrastructure also shows that attractive, accessible, safe and green outdoor environments increase physical activity, improve mental health and increase economic value of land. The environmental benefits are also broad, ranging from better stormwater management to increased habitat for urban biodiversity.

**Natural Disaster Resilience Programme**

- The Natural Disaster Resilience Programme (NDRP) is a jointly funded grants programme of the Australian and South Australian governments that enables organisations to undertake projects that improve the disaster resilience of communities before, during and after an event.
- Projects undertaken which are supported by the NDRP include:

  *Climate Change*

  - Eyre Peninsula and the South Australian Murray-Darling Basin Natural Resources Management Boards and Regional Development Australia progressed Climate Change Adaptation Plans and Vulnerability Assessments in

their respective geographic areas. These projects have a long term view to establish an in depth understanding of climate change risk and adaptation strategies across the state.

*Flood*

- DEWNR investigated the development of a Total Flood Warning System for South Australia. This work is part of an international research project to determine appropriate technology available to achieve meaningful and effective public notification prior to a flood event.
- Using data and state-wide flood risk assessments, the NDRP also supported DEWNR to commence the development of a flood education website for communicating risk to improve the community's ability to pre-plan, mitigate and recover from the impact of floods as they occur.
- The City of West Torrens received funding to complete the stormwater detention basin, levee banks, pump station and outlet channel to enable the entire package of Outfall Drain works to become active and provide effective flood mitigation protection to West Beach area.
- The City of Unley received funds to complete the final design for a sustainable system of detention basins to mitigate flood risk in the Brown Hill Keswick Creek area, maximising storm water reuse potential and allowing for desirable planning outcomes including recreation and amenity improvements.
- The City of Tumby Bay will investigate and quantify the capacity of current stormwater infrastructure and consider the effects of future proposed development to finalise a strategic 10 year stormwater management plan.
- The South Australian State Emergency Service will develop and disseminate StormSafe resources that inform the community of storm related risks and what they can do to prepare for and minimise the impact of severe weather events.
- Renmark Paringa Council will undertake a flood risk assessment and undertake early approvals for the rehabilitation of existing levee banks to address inundation risks and increase the communities resilience to future events through education initiatives.

*Bushfire*

- Data has been developed for the Adelaide Hills and Mount Lofty Ranges to enable DEWNR better understand how bushfires behave in these areas. The data will be used in conjunction with Phoenix modelling to assist in prescribed burn planning to further reduce the impact of bushfires in these areas.

*Coast protection*

- The District Council of Mount Remarkable undertook a feasibility study to determine the optimal solution for the upgrade of the Port Germein Levee Bank to reduce the impacts of climate change and coastal inundation.
- The City of Onkaparinga received funds to construct a rock revetment wall to significantly improve public safety and reduce the risk of damage to infrastructure through cliff collapse.
- The City of Victor Harbor received funds to develop a Coastal Management Study that identifies and evaluates management strategies for current and potential future coastal management issues, including sea level rise and storm surge events for sections of coastline adjacent to The Esplanade and Franklin Parade.

*Land use planning*

- A Land Use Planning Capability and Investment Plan Report was completed for consideration by the Government of South Australia. This report will objectively inform consideration of the most appropriate land use options and planning required to reduce risk to communities in built environments across the state and complement the National Roadmap initiative.

*Bushfire and Natural Hazards Cooperative Research Centre (CRC)*

- In February 2013, the former Prime Minister, Julie Gillard announced Commonwealth funding of $47 million over eight years, to be matched by jurisdictions, to establish a new Bushfire and Natural Hazards Cooperative Research Centre (CRC). The CRC enables the valuable work done by the Bushfire CRC to continue while developing a complementary natural hazards research programme.

## 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***

Eight NRM regions have received a total of $3.9 million to ensure their plans guide climate change mitigation and adaptation in the landscape. Funding was provided through the Commonwealth Regional Natural Resources Management Planning for Climate Change Fund.

Revegetation projects create carbon storage and support ecosystem resilience. By December 2013, 1.1 million trees, shrubs, grasses and sedges were planted by the Coorong, Lower Lakes and Murray Mouth (CLLMM) Vegetation Programme. More than 1,000 hectares of plantings have been established with over 2 million trees and associated understorey species planted under the Million Trees Programme.

The Government of South Australia 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.

The Government of South Australia is exploring opportunities to benefit from carbon markets and improve carbon sequestration. This includes protecting the state's forest assets from the threats of climate change.

DEWNR has integrated climate change considerations into its public lands programme, its natural resource management agenda, and its various planting programmes for biodiversity outcomes.

**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*' includes a guiding target to "improve capacity of individuals and community to respond to climate change".
- The Natural Resources Management (NRM) Reporting Framework trial has progressed the drafting of report cards on the scientific understanding of the causes and potential impacts of climate change.
- The regional NRM Boards have received funding from the Australian Government to develop 'climate change ready' NRM plans. This will assist regions to examine and respond to potential impacts of climate change, including directing investment through initiatives such as the Biodiversity Fund and the Carbon Farming Initiative. The regions are currently planning how to deliver the Commonwealth requirements. Some regions are actively working with the adaptation planning coordinating bodies in each region, and exploring how they can collaborate.
- NRM planning is undergoing a change in approach in South Australia, with both the Adelaide Mount Lofty Ranges and South Australian Murray-Darling Basin regions applying concepts of 'resilience and systems thinking' to develop their recently revised plans. Resilience theory assumes that human and ecological systems are intimately linked and co-evolving. This approach is a way of integrating the complex issues associated with the management of natural resources and aligns well with a 'community facing' emphasis in NRM. A framework to guide the new planning practice is being developed.

**Soils and land management**

- Under the *State Natural Resources Management Plan*, DEWNR supports a landscape scale approach to conservation and sustainable land use and management in response to the challenges of climate change.

- The department developed modelling and analytical tools to improve its understanding of the impacts of climate change and adaptation strategies on natural resources within cropping areas.
- Key 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 our knowledge of carbon sequestration in soils and through revegetation
    - landscape analysis of the potential impacts, both positive and negative, of large-scale tree planting on natural resources in response to a national carbon market.
    - collaboration with two Premier's Science Research Fund projects namely:
        - Transects for Environmental Monitoring and Decision Making (TREND) and Climate Change
        - Communities and Environment: Building research capability to identify climate change vulnerability and adaptation options for South Australian landscapes.

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

**Recycled water**

- Investment in recycled water and stormwater projects that are economically viable support the SASP Target 74: *Recycled wastewater: South Australia has the system capacity to recycle up to 50 GL of wastewater per annum by 2025 (baseline: 2009.)*
- SA Water owns and is responsible for the operation and/or supply of the majority of recycled water used in South Australia. Whilst a firm state target for reuse has not yet been established, there are a number of drivers that dictate the target for reuse from individual wastewater treatment plants.
- SA Water has started capital projects to enable a further 50 hectares of SA Water land to be irrigated with recycled water, with projects to be completed in the next 12 months.
- SA Water has identified an opportunity to significantly increase the volume of reuse from the Glenelg to Adelaide Parklands Recycled Water Scheme and is developing a trial to test the feasibility of this proposal.
- The Government of South Australia 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.

**Impacts of Climate Change on Water Resources Project**

- The *Impacts of Climate Change on Water Resources* is an ongoing project, conducted by DEWNR. This project 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.
- The collection of reports from this project will be used as information sources in various aspects of water planning in South Australia. For example, they have been referred to when Regional Supply and Demand Statements for water resources are being prepared. These studies are primarily an analysis of risks and potential rates of change of the water resources under future climate conditions however, and do not seek to address water planning directly. The science and policy sections of DEWNR are currently working together to determine how to incorporate climate change into water policy and planning.

- The Impacts of Climate Change on Water Resources project has four 'phases' as follows:
    - Phase 1: First order risk assessment and prioritisation
    - Phase 2: Selection of future climate projections and downscaling methodology
    - Phase 3: Climate change impacts modelling for key water resources of each of South Australia's natural resources management regions
    - Phase 4: Assessment of risks and vulnerabilities of water dependent ecosystems
- Phases 1 and 2 were completed in 2011 and the technical reports of these components are available on DEWNR's WaterConnect website at: http://www.waterconnect.sa.gov.au.
- Phase 3 is the largest component of the project and is ongoing. Reports have been completed on assessments of potential climate change impacts on water resources of the Northern and Yorke, Eyre Peninsula, Alinytjara Wilurara, and South Australian Arid Lands NRM regions.
- Phase 4 is also ongoing. One report from this phase has been completed, describing a state-wide assessment of the relative risk of climate change to water dependent ecosystems.

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

**NatureLinks**

- *NatureLinks* is a component of the Government of South Australia's *No Species Loss Nature Conservation Strategy* and South Australia's Strategic Plan Target 72: *Lose no species* of increasing participation in nature conservation.
- Over $20 million of investment was allocated through Round One of the Australian Government's Biodiversity Fund to projects within *NatureLinks* corridors. These projects will support on-ground actions to restore and enhance biodiversity, and establish significant areas of carbon storage. A total of $47 million was allocated within South Australia to a range of organisations including Natural Resources Management Boards, Government of South Australia, non-government organisations (NGOs), community and industry groups.
- *NatureLinks* has been recognised in the Australian Government's National Wildlife Corridors Plan as an existing major corridor initiative that would be an important foundation for the national network. The Corridors Plan will help guide Australian Government investment through the Biodiversity Fund and Caring for our Country funding programme.
- A new *NatureLinks* website and web video were developed in partnership with nine state-wide NGOs to increase participation and investment in the programme. The website creates a 'marketplace' of projects and organisations undertaking nature conservation activities across the state. Since its release in October 2012, 50 new projects and organisations have been listed by NGOs, community groups, landholders and business.

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

- The purpose of the Vegetation Programme is to stabilise the ecological decline of the CLLMM region to deliver a healthy and resilient wetland and community, which is able to adapt to changing water levels. This is being achieved through an integrated programme of natural resource management programmes including revegetation, pest and weed control and fencing along with research and monitoring.
- Two years into the five year programme has seen more than 1.8 million native plants planted. In addition, early indications of increasing community resilience include evidence of several community nurseries successfully tendering for commercial propagation contracts.

**Transects for Environmental Monitoring and Decision Making**

- Strong progress has been made in 2012-2013, with a focus on consolidating and publishing results, and identifying opportunities for preserving Transects for Environmental Monitoring and Decision Making (TREND) infrastructure and data. This programme is funded through the Premier's Science Research Fund.

- Substantial progress has been made in integrating TREND into the newly created Australian Transect Network, a component of the Terrestrial Ecosystem Research Network (TERN).
- TERN is a multi-million dollar commonwealth initiative charged with developing core infrastructure to support ecosystem science within Australia.
- TREND's Citizen Science theme has built on previous successes, producing a second mobile application and further developing image capture and processing technology to support ecosystem monitoring using mobile platforms and community volunteers.
- The terrestrial production theme of TREND has used climate analysis and simulation modelling to further explore spatial patterns in production risk along transects in South Australian agricultural regions.

**Threatened species and ecological communities**

- DEWNR works in partnership with other government agencies, non-government organisations, research institutes, industry, and community groups to provide national, state and regional policy guidance, technical expertise and recovery plans for listed Threatened Species and Ecological Communities (TSECs) in South Australia.
- Identification and prioritisation of objectives and actions for TSECs includes assessment of threatening processes such as climate change. Recovery planning is integrated with landscape-scale conservation projects at state and national levels, implemented through an adaptive management approach. Nevertheless, significant knowledge gaps remain in relation to understanding the impacts of climate change on species and ecosystems and the most effective strategies to mitigate and adapt to those impacts.
- The main actions addressing climate change to date have been three-fold: firstly, a majority of South Australia's threatened plant species have had seeds collected and stored at the State Seed Conservation Centre; secondly, fire management planning incorporates assessments of the risks of population extinctions due to either increased fire frequencies or increased extent of wildfires due to climate change; and thirdly, threatened species demographic and habitat data collected as part of ongoing recovery projects have been used as the basis for several informative climate change modelling projects.

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

**River Murray Forest project**

- The River Murray Forest project is a Government of South Australia initiative to establish local native trees and shrubs along the River Murray corridor, from the state border to the Coorong for biodiversity and carbon sequestration outcomes.
- In 2012 and 2013, monitoring and reporting continued with most of the sites now completed.
- Better climatic conditions experienced since 2010, compared with the extended drought conditions early in the project, have resulted in improved plant survival and growth.
- In 2012 and 2013, infill seeding of over 70 hectares was undertaken at a site at Blanchetown, planting of understorey species was undertaken at a site near Cadell, and 25 hectares of seeding and planting was established on public lands at Pike River near Renmark.
- Ongoing monitoring and remedial infilling will be undertaken over the next few years to ensure that the plantings meet their biodiversity and carbon targets.

**Million Trees Programme**

- The Million Trees Programme continues to progress towards its goal of planting three million local native trees and plants on public land in Greater Adelaide by 2014. More than 2.5 million trees and associated understorey plants have been established to date.
- Over 1500 hectares of plantings have already been established. When completed, the programme will have reconstructed approximately 2000 hectares of predominantly grassy woodland habitat, building the capacity of the urban and peri-urban

environment and ecosystems to respond to climate change. Over its lifetime, this reconstructed habitat will absorb an estimated 600,000 tonnes of $CO_2$-e. Over 2 million trees and associated understorey species have been planted on public land to date under the programme.

**Carbon Farming Initiative**

- The Commonwealth's Carbon Farming Initiative (CFI) came into operation in December 2011. The CFI is an evolving scheme that allows farmers and land managers to earn carbon credits by storing carbon or reducing greenhouse gas emissions on the land. Credits for approved projects can then be sold to people and businesses wishing to offset their emissions.
- The CFI aims to help the environment by reducing greenhouse gas emissions as well as improve agricultural productivity.
- The CFI is a carbon offsets scheme that is part of Australia's carbon market. The development of the CFI is supported by programmes forming part of the Commonwealth's Clean Energy Future land sector package.
- PIRSA consulted key agencies, Aboriginal landowners and representative Aboriginal groups to identify opportunities for Aboriginal South Australians arising from the CFI.

**Seed Conservation Centre – Seed Bank**

- 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. One of the threats to survival of our flora is 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.
- Seed collections are routinely screened for viability and germination capacity and are monitored periodically during storage to maintain viable stock. The seed germination tests provide important information for the restoration of natural landscapes. The seed biology research aims to identify germination triggers for species that are difficult to propagate. This improves the capability of habitat restoration programmes. The SASCC also conducts studies to identify the germination temperature range for species, which assists in determining species at risk from climate change.
- 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 by staff. 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 our state, with an emphasis on seeds and germination methods.

# B. South Australian Emissions and Energy Data report

The information in this Appendix has been prepared by the Department of Environment, Water and Natural Resources (DEWNR) based on information in the Australian Greenhouse Emissions Information System (AGEIS) and supplemented by information from other sources as indicated herein.

All emissions estimates are presented as tonnes of Carbon Dioxide Equivalent ($CO_2$-e) to reflect the different Global Warming Potential (GWP) of the greenhouse gases incorporated in the inventory.

The Australian Government published the *Australian National Greenhouse Accounts State and Territory Greenhouse Gas Inventories (STGGI) 2010-11* in 2013[5]. This represents the most recent data released at the time of preparing this report (December 2013). Where possible, key trends in emissions performance since the 2010-11 Financial Year have been included.

The STGGI data is supplemented by DEWNR to incorporate an estimate of the emissions 'imported' or 'exported' over the state's electricity interconnectors. Future reports will incorporate an estimate of emissions associated with the import and export of Natural Gas via the Moomba Gas Hub and the SEAGas Natural Gas Pipeline.

## B.1. South Australian Emissions Inventory Total

The 2010-11 inventory includes a substantially revised estimate for the baseline year of 1990 for the emissions category Land Use, Land Use Change and Forestry (LULUCF)[6]. LULUCF estimates are only provided for the baseline year and the years since 2008. As a result, the time series of total emissions from 1990 is incomplete. However, all other emissions categories have annual data from 1990 to 2011 (22 data points) and are presented herein.

Including LULUCF, South Australia's total emissions in 2011 were 8.7 per cent below 1990 levels (33.7mega tonnes from 30.8 mega tonnes). Without LULUCF, total emissions from other sectors in 2011 were 6 per cent above 1990 levels (32.5 mega tonnes from 30.7 mega tonnes).

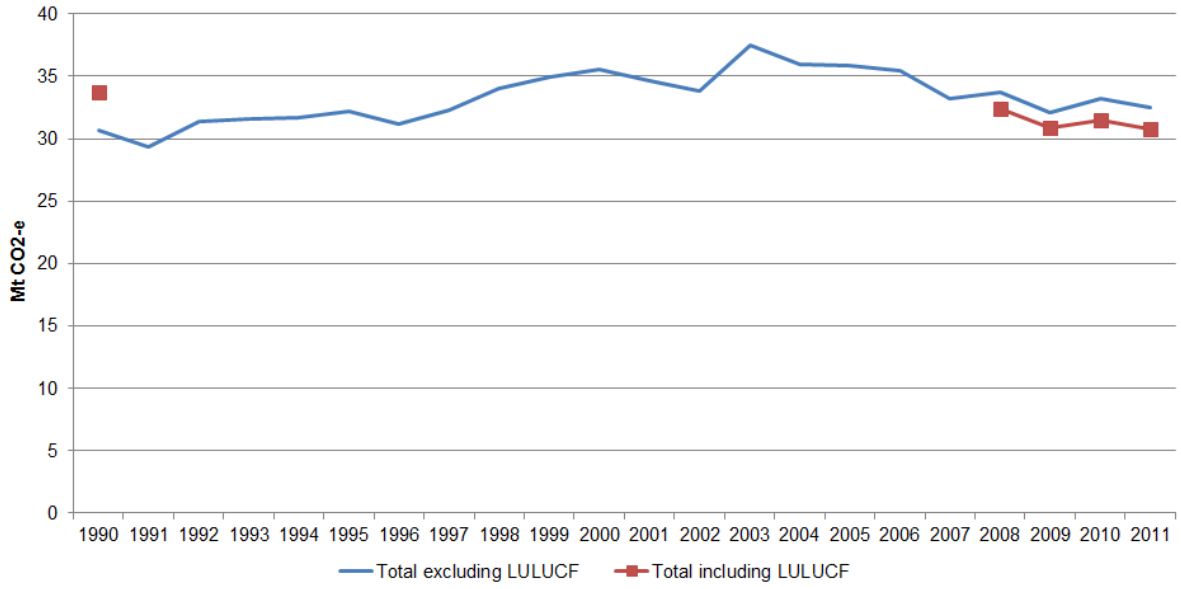



**Figure 1:** South Australian Greenhouse Gas Emission Inventory Totals 1990-2011 (including interconnectors)

[5] Referred to as the STGGI, these inventories draw on a wide range of information sources and take significant time to compile. The two-year gap at publication has been the case since state and territory reporting commenced.

[6] Emissions estimate increased from 1.5Mt to 3.0Mt

The South Australian community and economy has expanded significantly over the period of emissions reporting since 1990. This represents an important context for judging the state's emissions performance.

In terms of population, Figure 2 illustrates emissions per person for South Australia and for Australia[7].

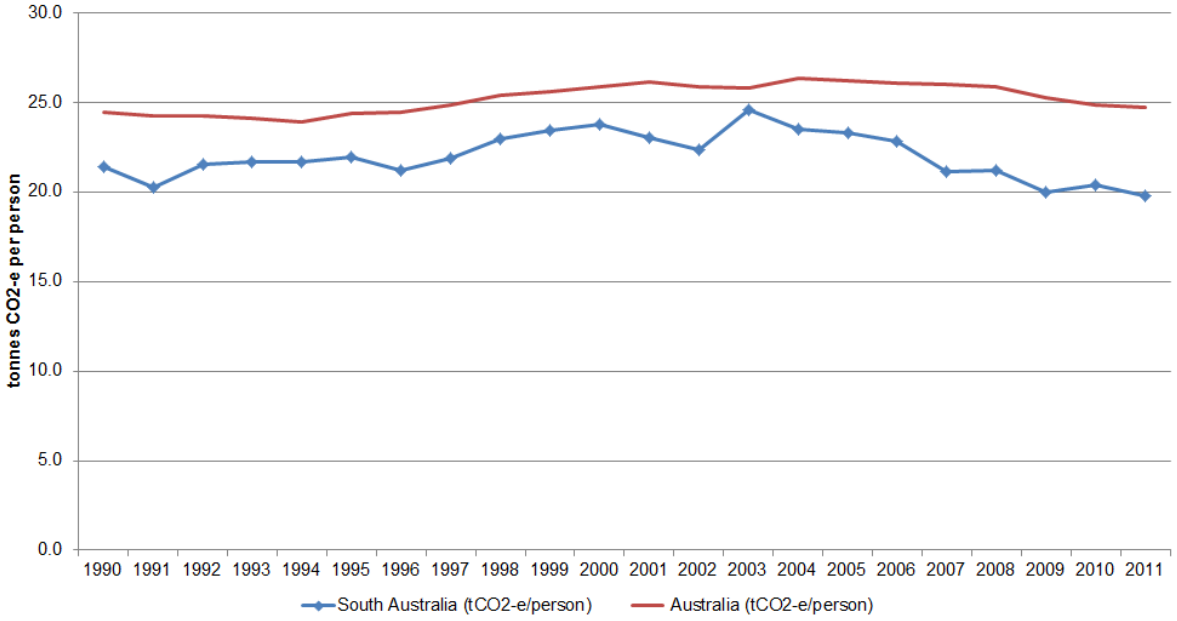



**Figure 2:** Greenhouse Gas Emission Inventory Totals per capita 1990-2011 (excluding LULUCF)

In terms of an expanding economy, Figure 3 illustrates emissions per million dollars of Gross State Product (GSP) for South Australia and per million dollars of Gross domestic Product (GDP) for Australia[8].

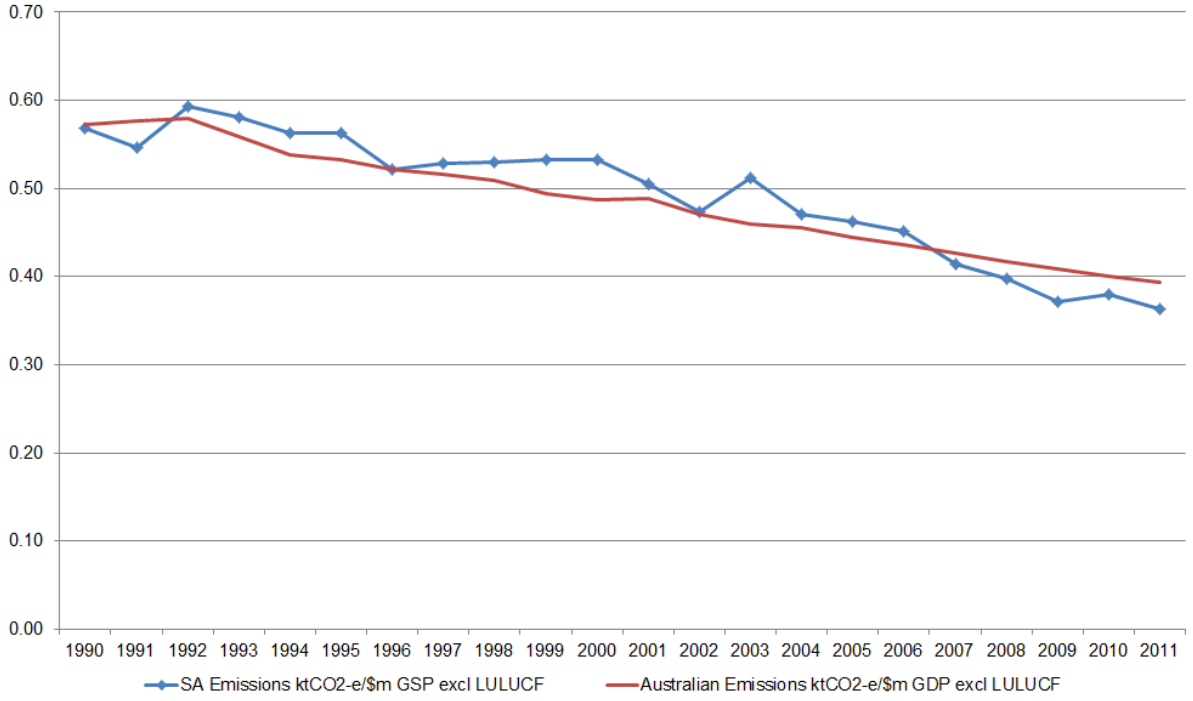



**Figure 3:** Greenhouse Gas Emission Inventory Totals per $m GSP/GDP 1990-2011 (excluding LULUCF)

[7] Population estimates from Australian Bureau of Statistics ABS Cat No. 3101.0 to March 2013

[8] Estimates from Australian Bureau of Statistics ABS Cat No. 5220.0 to Jun 2012

To further understand the reasons behind this apparent '*decarbonising*' of the economy, AGEIS incorporates a breakdown of 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 Gross State Product (GSP). These are shown in **Table 1** and **Table 2**, below.

| (Mt CO2-e) | 1990 | 2007 | 2008 | 2009 | 2010 | 2011 | Change 1990-2011 | | Change 2007-2011 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Div A Agriculture, forestry, fishing | 9.1 | - | 4.5 | 4.3 | 4.0 | 4.3 | -53% | ↓ | -6% | ↓ |
| Div B Mining | 5.2 | 6.1 | 4.9 | 4.9 | 4.8 | 5.3 | 3% | ↑ | -13% | ↓ |
| Div C Manufacturing | 6.8 | 6.8 | 7.6 | 6.7 | 7.7 | 6.7 | -2% | ↓ | -2% | ↓ |
| Div D Electricity, gas, water | 1.7 | 1.9 | 1.8 | 1.8 | 1.9 | 1.7 | -1% | ↓ | -10% | ↓ |
| Div E Construction | 0.6 | 0.6 | 0.5 | 0.6 | 0.5 | 0.6 | 0% | - | -2% | ↓ |
| Div F-H, J-Q Commercial Services | 3.3 | 4.6 | 3.4 | 4.3 | 3.5 | 3.9 | 19% | ↑ | -13% | ↓ |
| Div I Transport & storage | 1.3 | 1.4 | 1.2 | 1.5 | 1.3 | 1.7 | 34% | ↑ | 21% | ↑ |
| Residential | 5.8 | 7.3 | 5.8 | 6.9 | 6.1 | 6.7 | 15% | ↑ | -8% | ↓ |

**Table 1:** Summary Greenhouse Emissions by Economic Sector 1990 and 2007-2011 (Mt $CO_2$-e)

| $bn contribution to GSP ($Jun2013) | 1990 | 2007 | 2008 | 2009 | 2010 | 2011 | Change 1990-2011 | | Change 2007-2011 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Div A Agriculture, forestry, fishing | 2.8 | 3.1 | 4.3 | 4.6 | 5.1 | 5.4 | 90% | ↑ | 73% | ↑ |
| Div B Mining | 2.0 | 2.7 | 3.0 | 3.3 | 3.1 | 3.6 | 79% | ↑ | 31% | ↑ |
| Div C Manufacturing | 6.9 | 7.7 | 8.0 | 7.3 | 7.6 | 7.7 | 11% | ↑ | 0% | - |
| Div D Electricity, gas, water | 2.6 | 3.1 | 3.2 | 3.3 | 3.3 | 3.2 | 23% | ↑ | 4% | ↑ |
| Div E Construction | 2.9 | 5.3 | 5.7 | 6.2 | 6.4 | 6.6 | 126% | ↑ | 24% | ↑ |
| Div F-H, J-Q Commercial Services | 26.4 | 44.8 | 47.1 | 48.4 | 49.2 | 49.7 | 89% | ↑ | 11% | ↑ |
| Div I Transport & storage | 2.2 | 3.7 | 4.0 | 3.9 | 4.0 | 4.1 | 88% | ↑ | 12% | ↑ |
| Gross State Product | 49.4 | 75.5 | 80.7 | 82.5 | 84.0 | 85.7 | 74% | ↑ | 13% | ↑ |

**Table 2:** Summary Contributions to Gross State Product 1990 and 2007-2011 ($billion June 2013)[10]

It is evident that a key contributing factor is the changing composition of the state's economy. Key economic growth sectors such as agriculture, construction and commercial services can also be seen to have relatively low emissions, while the relatively more greenhouse intensive manufacturing sector has a diminished role in the state's economic output.

## B.2. South Australian Emissions Inventory Total by Greenhouse Gas

AGEIS incorporates a breakdown of the contribution to the emissions total by each of the main greenhouse gases. The South Australian Inventory continues to be dominated by carbon dioxide. The 2011 breakdown is shown in Figure 4.

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

[10] 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 November 2013.

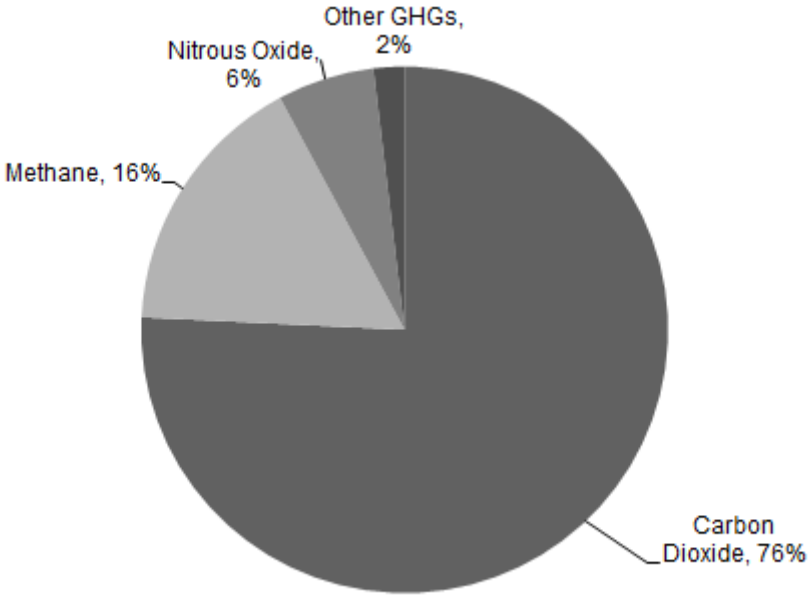



**Figure 4:** Greenhouse Gas Emission Inventory Total, South Australia by greenhouse gas, 2011

## B.3. 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 5 (excluding LULUCF).

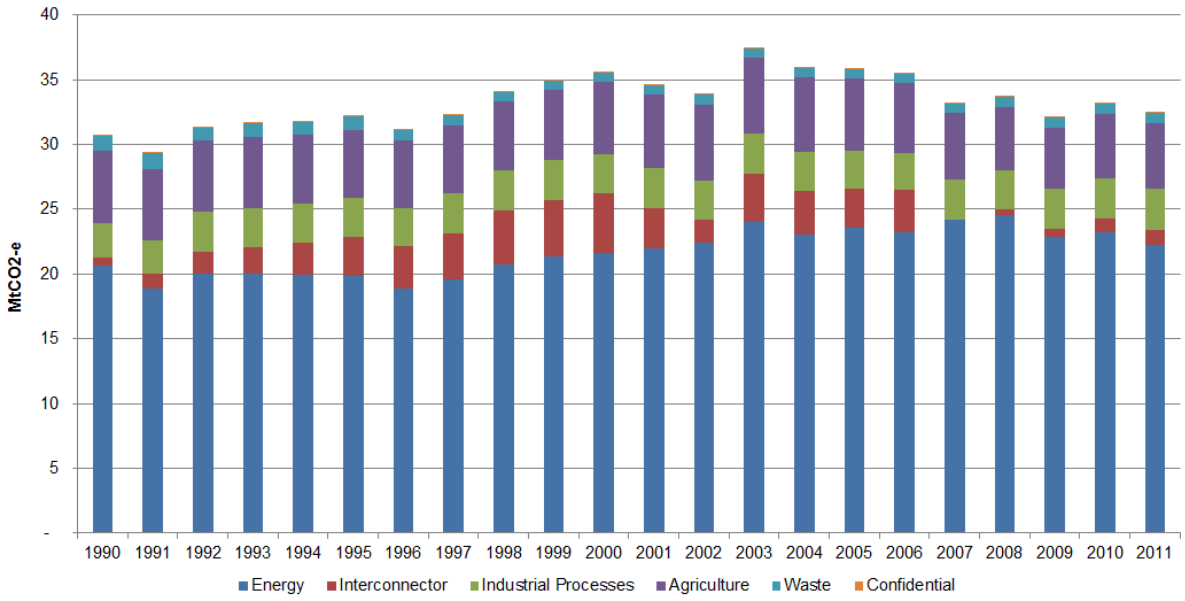



**Figure 5:** Greenhouse Gas Emission Inventory Total, South Australia by key components, 1990-2011

It is clear in Figure 5 that emissions from the production and use of energy dominate the inventory. Energy based emissions remain at 76 per cent of the inventory total and are discussed in more detail later in this report. It is also apparent that a subtle trend of declining emissions has been occurring since the mid-2000's and that this is mainly due to a slow decline in energy based emissions ('Energy' and 'Interconnector' in Figure 5).

The Australian Government's AGEIS allows for the dissection and analysis of the inventory into a number of formats[11].

### B.3.1 South Australian Emissions – Energy Sector

Energy sector emissions are presented in Figure 6 broken down into four key components of:

- Emissions from the combustion of fuel for the production of electricity used in South Australia (including that which is generated interstate and imported into South Australia via the state's two electricity interconnectors).
- Emissions from the combustion of fuel in households, businesses and industry.
- Fugitive Emissions from the extraction and transport of fuels such as natural gas and coal.
- Emissions from transport including road, rail, air and sea.

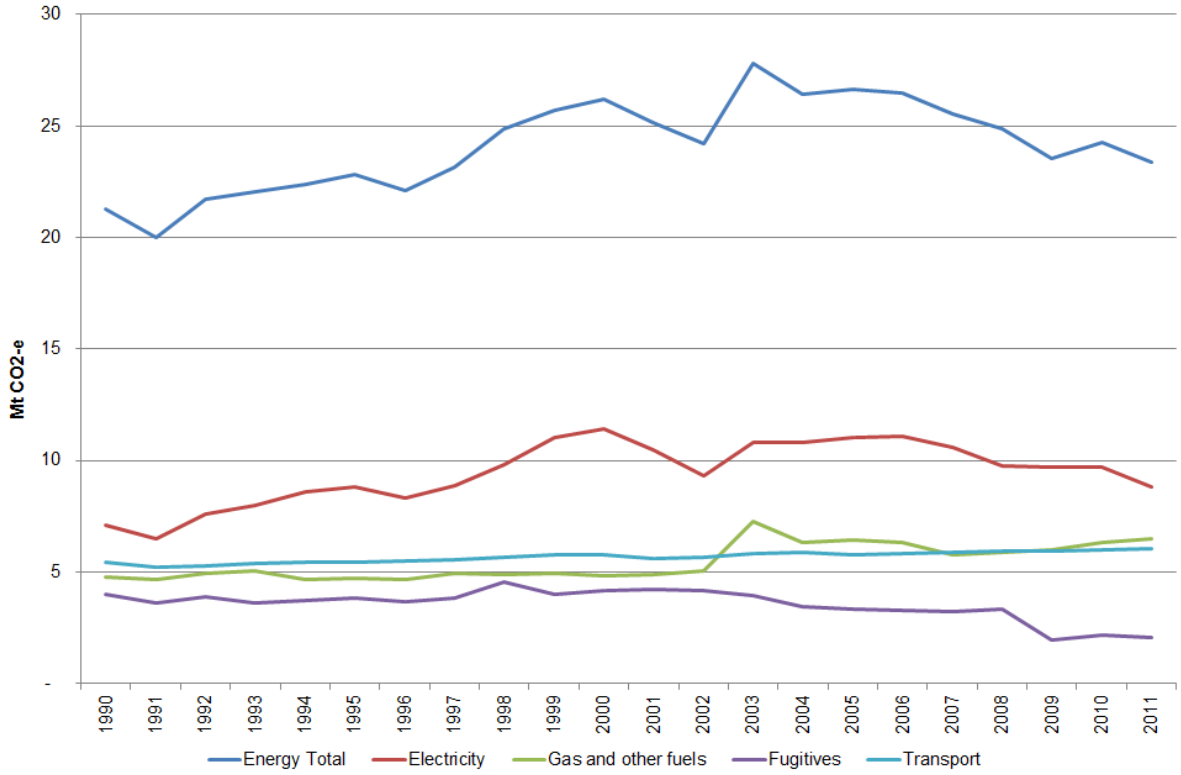



**Figure 6:** Energy sector emissions trend, South Australia, 1990-2011 (Mt $CO_2$-e)

[11] AGEIS is publicly available from http://ageis.climatechange.gov.au/

Table 3 presents the changes in these key components from the emissions reporting baseline year of 1990 to the most recent reporting year of 2011. Since it is apparent that emissions trends in recent years are different to those in the 1990s and early 2000s, the table also presents the changes from 2007, the year the South Australian Parliament passed the *Climate Change and Greenhouse Emissions Reduction Act 2007*.

| (Mt CO2-e) | 1990 | 2007 | 2008 | 2009 | 2010 | 2011 | Change 1990-2011 | | Change 2007-2011 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Electricity | 7.1 | 10.6 | 9.7 | 9.7 | 9.7 | 8.8 | 24% | ↑ | -17% | ↓ |
| Gas and other fuels | 4.8 | 5.8 | 5.9 | 6.0 | 6.3 | 6.5 | 37% | ↑ | 13% | ↑ |
| Fugitives | 4.0 | 3.2 | 3.3 | 2.0 | 2.2 | 2.0 | -49% | ↓ | -37% | ↓ |
| Transport | 5.4 | 5.9 | 5.9 | 5.9 | 6.0 | 6.1 | 12% | ↑ | 3% | ↑ |
| **ENERGY Total** | **21.3** | **25.5** | **24.9** | **23.5** | **24.2** | **23.4** | **10%** | ↑ | **-8%** | ↓ |

**Table 3:** Energy sector emissions 1990 and 2007-2011 (Mt $CO_2$-e)

## Discussion

Energy sector emissions dominate the South Australian inventory, however it is apparent that a trend of declining emissions has been occurring since the mid-2000s. This can be attributed to reductions in fugitive emissions and those from electricity used in the state.

Electricity emissions incorporate an allocation for the importation of electricity from the Victorian region of the National Electricity Market. This amount tends to vary from year to year and imported electricity tends to be more 'greenhouse intensive' than locally produced electricity.

The overall decline in electricity emissions is therefore due to increasing renewable energy generation in the state and, for the residential sector in particular, a slow decline in consumption as consumers respond to higher prices, and climate change messages.

The Australian Energy Market Operator (AEMO) publishes annual estimates of greenhouse emissions for electricity consumption in South Australia[12]. The AEMO approach utilises a different methodology to the Australian Government resulting in different total amounts (in Mt $CO_2$-e per annum). However emissions trends do align and this allows for an estimate of additional two financial years of electricity emissions data. The AEMO data indicates a further reduction in electricity emissions (incorporating imported electricity) of 10 per cent in 2011-12 and another 7 per cent in 2012-13.

The AEMO estimates are subject to confirmation by the Australian Government but significant changes are considered unlikely. This trend can therefore be illustrated as an extension of Figure 6 in Figure 7.

This further reduction in electricity emissions equates to a 30 per cent reduction in emissions since 2007 and to being on track to return electricity emissions to 1990 levels by 2014.

[12] Refer to *South Australian Historical Market Information* reports available from www.aemo.com.au/Electricity/Planning/South-Australian-Advisory-Functions/South-Australian-Historical-Market-Information

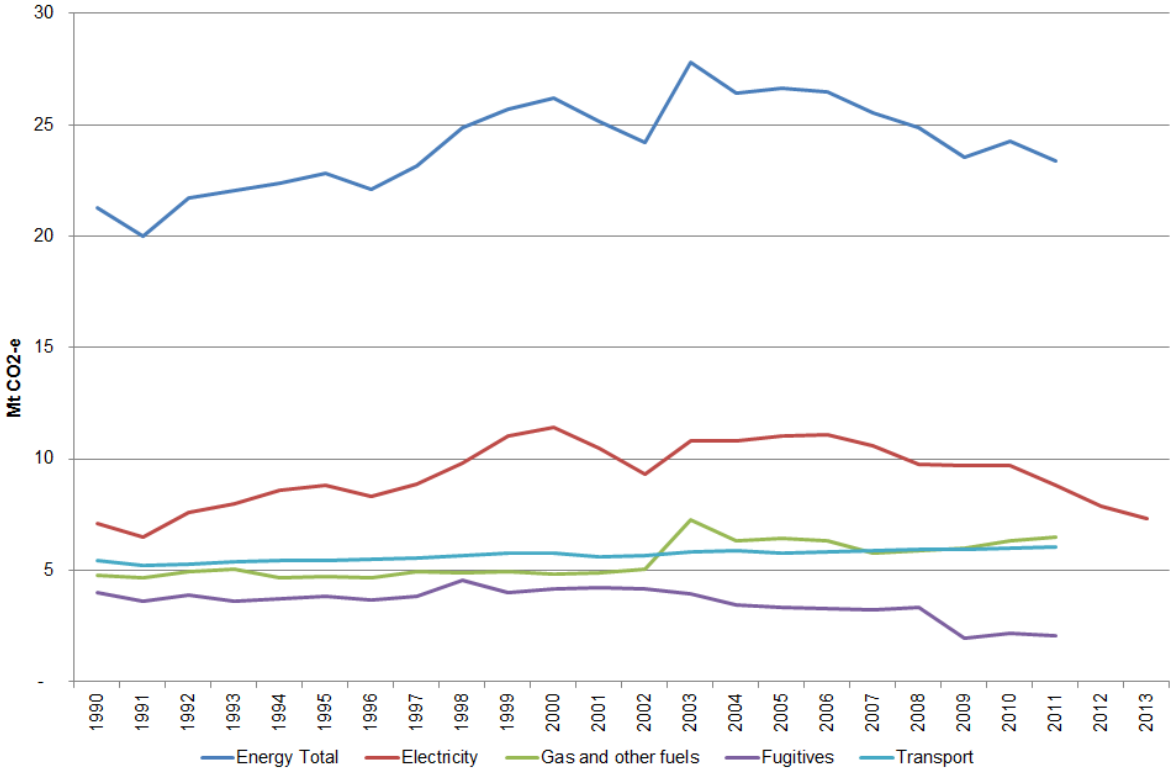



**Figure 7:** Energy sector emissions trend, South Australia, 1990-2011 (Mt $CO_2$-e) with electricity emissions estimate to June 2013

### B.3.2 South Australian Emissions – Community Sector

Community sector emissions represent those emissions largely attributable to households and their transport and are presented in Figure 8 broken down into key components of:

- Emissions from the combustion of fuel for the production of electricity used in South Australian households (including that which is generated interstate and imported into South Australia via the state's two electricity interconnectors).
- Emissions from the combustion of fuel in households.
- Emissions from transport including cars, buses, rail and motorcycles.

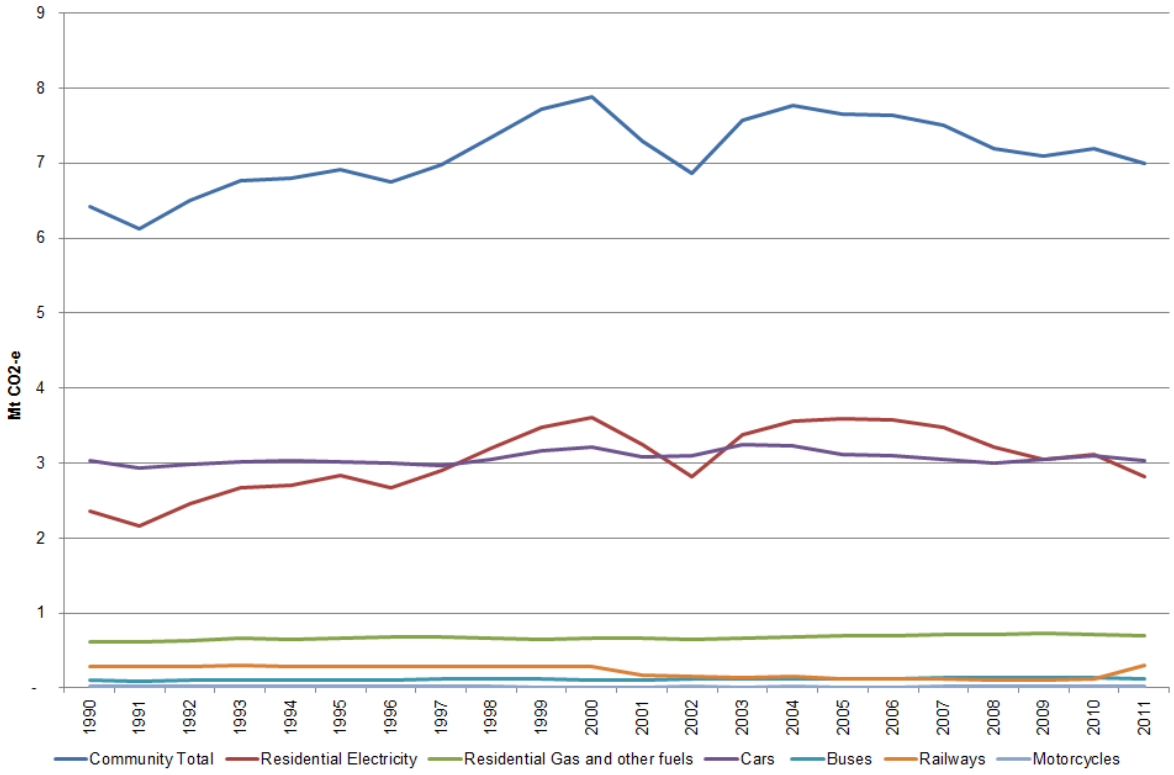



**Figure 8:** Community sector emissions trend, South Australia, 1990-2011 (Mt $CO_2$-e)

Table 4 presents the changes in these key components from the emissions reporting baseline year of 1990 to the most recent reporting year of 2011. Since it is apparent that emissions trends in recent years are different to those in the 1990s and early 2000s, the table also presents the changes from 2007, the year the South Australian Parliament passed the *Climate Change and Greenhouse Emissions Reduction Act 2007*.

| (Mt CO2-e) | 1990 | 2007 | 2008 | 2009 | 2010 | 2011 | Change 1990-2011 | | Change 2007-2011 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Residential Electricity | 2.4 | 3.5 | 2.5 | 3.1 | 2.7 | 2.8 | 19% | ↑ | -19% | ↓ |
| Residential Gas and other fuels | 0.61 | 0.71 | 0.64 | 0.73 | 0.64 | 0.71 | 16% | ↑ | 0% | ↓ |
| Cars | 3.0 | 3.1 | 3.0 | 3.0 | 3.0 | 3.0 | 0% | | -1% | ↓ |
| Buses | 0.10 | 0.14 | 0.10 | 0.13 | 0.10 | 0.13 | 28% | ↑ | -6% | ↓ |
| Railways | 0.29 | 0.12 | 0.29 | 0.11 | 0.29 | 0.30 | 0% | | 149% | ↑ |
| Motorcycles | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 31% | ↑ | 17% | ↑ |
| **COMMUNITY Total** | **6.4** | **7.5** | **6.5** | **7.1** | **6.8** | **7.0** | **9%** | ↑ | **-7%** | ↓ |

**Table 4:** Community Sector emissions 1990 and 2007-2011 (Mt $CO_2$-e)

## Discussion

Community sector emissions are dominated by emissions attributed to electricity use and cars. These can be seen to be generally flat or falling in recent years and, despite increases in the 1990s and early 2000s are now below those in the baseline year of 1990.

As discussed in relation to the energy sector, electricity emissions have fallen further in the two years since 2011. This performance can be judged against a 14 per cent increase in the estimated resident population from 1990 to 2011[13].

[13] Source: ABS Catalogue No. 3101.0 to March 2013

The Essential Services Commission of South Australia (ESCOSA) publishes a time-series of electricity and gas consumption information[14]. The average household consumption of electricity and mains gas can be seen to be either flat or declining in recent years in Figure 9. This combines with the reduction in greenhouse intensity of electricity supplies to drive an overall decline in total emissions.

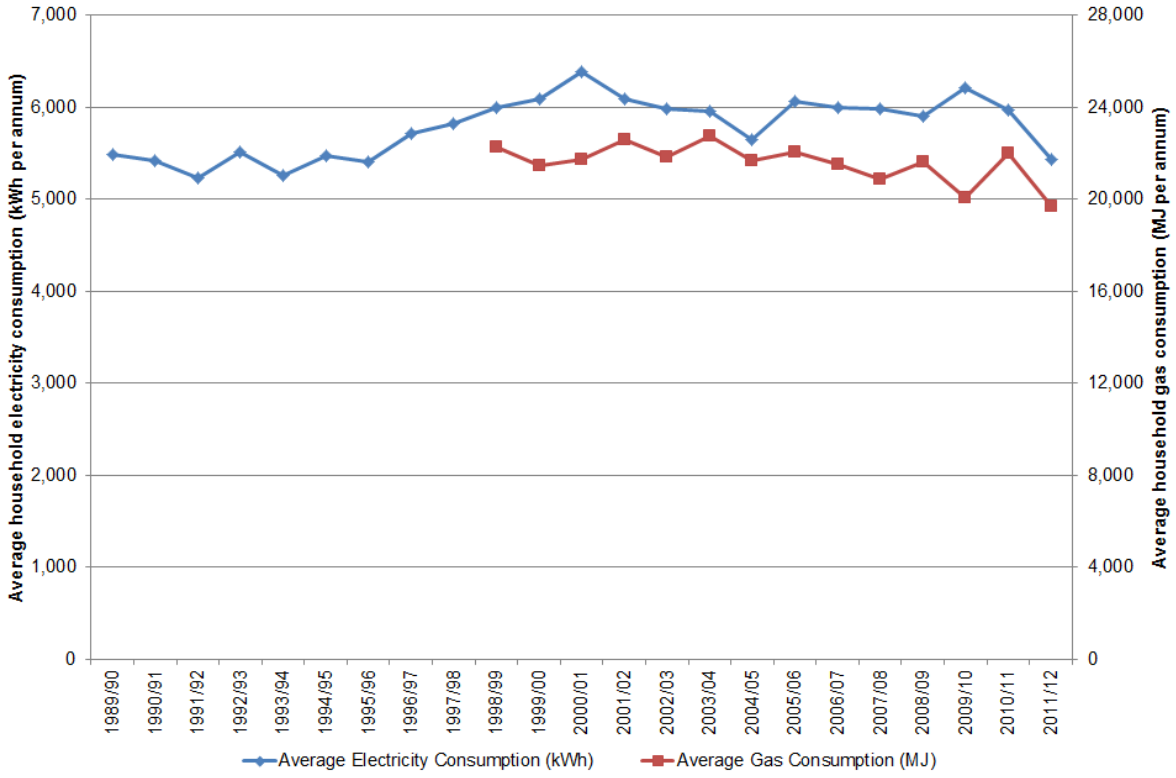



**Figure 9:** Residential stationary energy consumption trends, South Australia, 1990-2012

AEMO's 2013 National Electricity Forecasting Report indicates that residential energy consumption is not expected to increase over the 10-year outlook period (to June 2023)[15]. Combined with observations about the outlook for increased renewable energy production, electricity emissions for the sector are expected to continue to decline over coming years.

### B.3.3 South Australian Emissions – Built Form

This category represents the emissions attributable to our buildings and urban form and is presented in Figure 10 broken down into key components of:

- Emissions from the combustion of fuel in households and commercial businesses (but not industrial facilities).
- Emissions from the combustion of fuel for the production of electricity used in South Australian households and commercial sector (including that which is generated interstate and imported into South Australia via the state's two electricity interconnectors).
- Emissions from transport including planes, cars, buses, rail, commercial vehicles and motorcycles.

[14] Available from www.escosa.sa.gov.au/electricity-overview/reporting-and-compliance/annual-performance-reports.aspx

[15] Available from http://www.aemo.com.au/Electricity/Planning/Forecasting

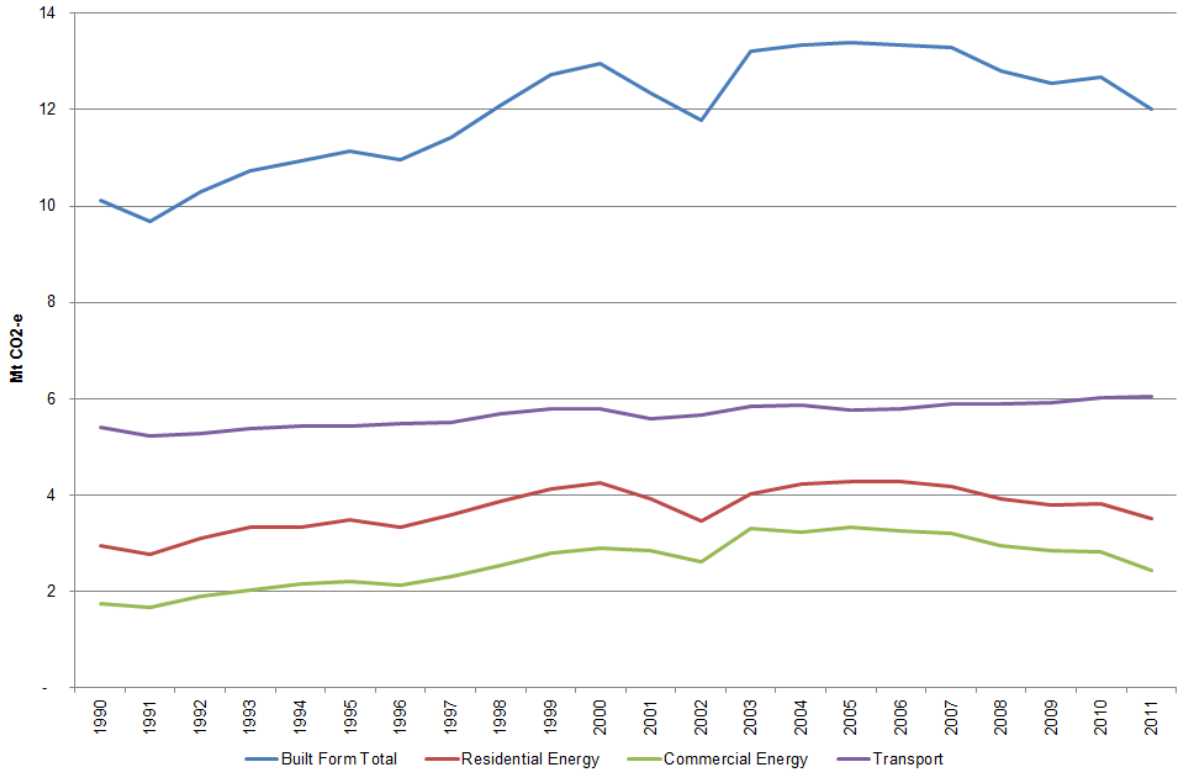



**Figure 10:** Built Form emissions trend, South Australia, 1990-2011 (Mt $CO_2$-e)

Table 5 presents the changes in these key components from the emissions reporting baseline year of 1990 to the most recent reporting year of 2011. Since it is apparent that emissions trends in recent years are different to those in the 1990s and early 2000s, the table also presents the changes from 2007, the year the South Australian Parliament passed the *Climate Change and Greenhouse Emissions Reduction Act 2007*.

| (Mt CO2-e) | 1990 | 2007 | 2008 | 2009 | 2010 | 2011 | Change 1990-2011 | | Change 2007-2011 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Residential Energy | 3.0 | 4.2 | 3.9 | 3.8 | 3.8 | 3.5 | 19% | ↑ | -16% | ↓ |
| Commercial Energy | 1.7 | 3.2 | 3.0 | 2.8 | 2.8 | 2.4 | 40% | ↑ | -24% | ↓ |
| Transport | 5.4 | 5.9 | 5.9 | 5.9 | 6.0 | 6.1 | 12% | ↑ | 3% | ↑ |
| **BUILT FORM Total** | **10.1** | **13.3** | **12.8** | **12.5** | **12.7** | **12.0** | **19%** | ↑ | **-10%** | ↓ |

**Table 5:** Built Form emissions 1990 and 2007-2011 (Mt $CO_2$-e)

## Discussion

The emissions footprint of this sector can be seen to reflect the recent decline in energy sector emissions for the same reasons discussed in previous sectors. The emissions from transport can be seen to have slowly but steadily increased since the baseline year of 1990.

Emissions from transport can be broken down further as shown in Figure 11 and Table 6, below.

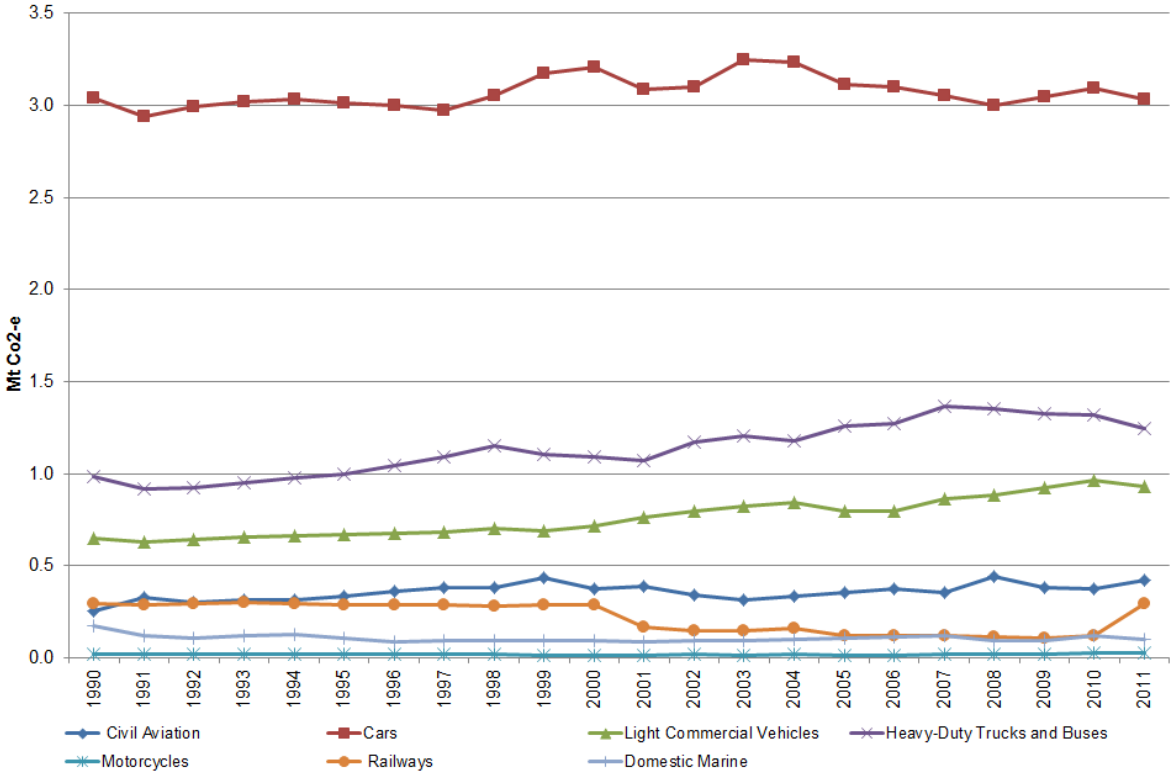



**Figure 11:** Transport sector emissions trend, South Australia, 1990-2011 (Mt $CO_2$-e)

| (Mt CO2-e) | 1990 | 2007 | 2008 | 2009 | 2010 | 2011 | Change 1990-2011 | |
|---|---|---|---|---|---|---|---|---|
| Civil Aviation | 0.3 | 0.4 | 0.3 | 0.4 | 0.3 | 0.4 | 65% | ↑ |
| Cars | 3.0 | 3.1 | 3.0 | 3.0 | 3.0 | 3.0 | 0% | - |
| Licht Commercial Vehicles | 0.6 | 0.9 | 0.6 | 0.9 | 0.7 | 0.9 | 43% | ↑ |
| Heavy-duty Trucks and Buses | 1.0 | 1.4 | 0.9 | 1.3 | 1.0 | 1.2 | 26% | ↑ |
| Other transportation | 0.5 | 0.3 | 0.2 | 0.2 | 0.3 | 0.4 | -14% | ↓ |
| **TRANSPORT Total** | 5.4 | 5.9 | 5.9 | 5.9 | 6.0 | 6.1 | 12% | ↑ |

**Table 6:** Transport emissions 1990 and 2007-2011 (Mt $CO_2$-e)

As can be seen, the slow growth in transport emissions can be attributed to noticeable growth in emissions from aviation and from commercial and freight vehicles.

### B.3.4 South Australian Emissions – Industrial Sector

This category represents the emissions attributable to our industrial sector and is presented in Figure 12 broken down into key components of:

- Emissions directly from the combustion of fuel in industrial facilities.
- Emissions from the combustion of fuel for the production of electricity used in the sector (including that which is generated interstate and imported into South Australia via the state's two electricity interconnectors).
- Emissions released by chemical reactions during industrial process such as steel making and the manufacture of cement.

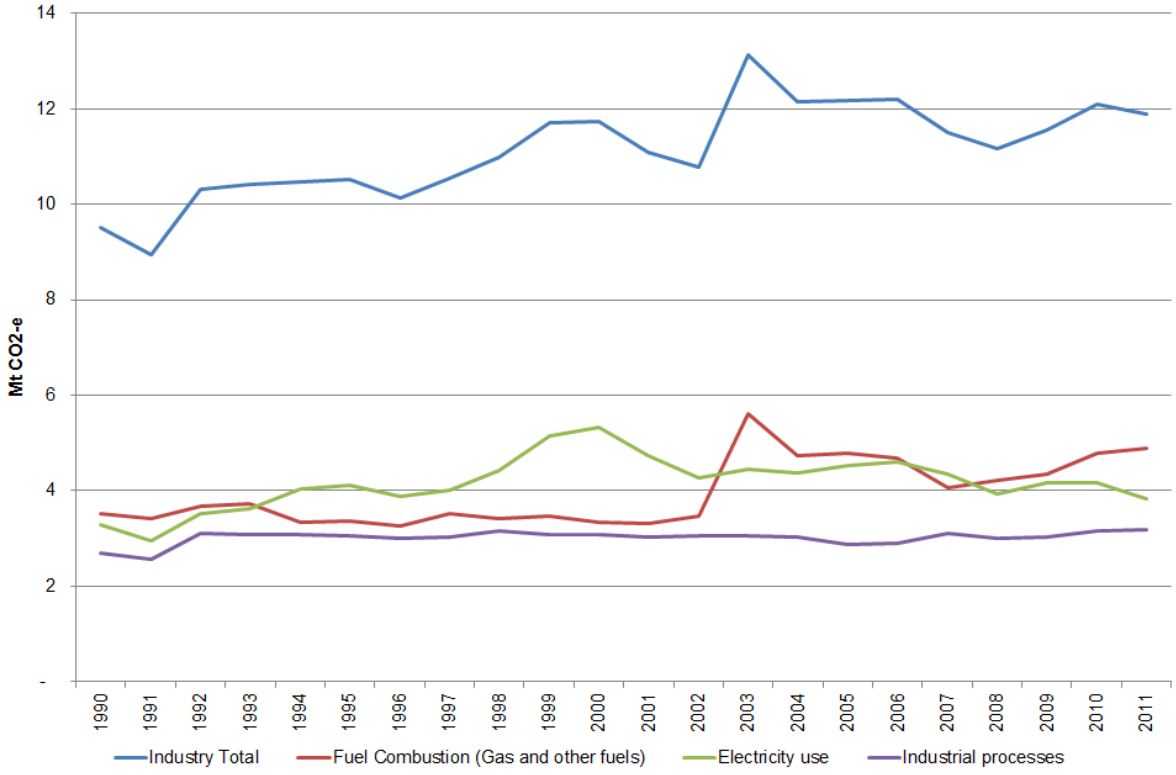



**Figure 12:** Industrial sector emissions trend, South Australia, 1990-2011 (Mt $CO_2$-e)

Table 7 presents the changes in these key components from the emissions reporting baseline year of 1990 to the most recent reporting year of 2011. Since it is apparent that emissions trends in recent years are different to those in the 1990s and early 2000s, the table also presents the changes from 2007, the year the South Australian Parliament passed the *Climate Change and Greenhouse Emissions Reduction Act 2007*.

| (Mt CO2-e) | 1990 | 2007 | 2008 | 2009 | 2010 | 2011 | Change 1990-2011 | | Change 2007-2011 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fuel Combustion (Gas and other fuels) | 3.5 | 4.1 | 4.2 | 4.4 | 4.8 | 4.9 | 38% | ↑ | 20% | ↑ |
| Electricity use | 3.3 | 4.3 | 3.9 | 4.2 | 4.2 | 3.8 | 16% | ↑ | -12% | ↓ |
| Industrial processes | 2.7 | 3.1 | 3.0 | 3.0 | 3.2 | 3.2 | 19% | ↑ | 3% | ↑ |
| **INDUSTRY Total** | **9.5** | **11.5** | **11.2** | **11.6** | **12.1** | **11.9** | **25%** | ↑ | 3% | ↑ |

**Table 7:** Industrial Sector emissions 1990 and 2007-2011 (Mt $CO_2$-e)

## Discussion

Emissions from the sector have been moderated by reductions attributable to electricity use but have otherwise grown over the period since the baseline year of 1990.

### B.3.5 South Australian Emissions – Land Sector

This category represents the emissions attributable to our agricultural sector, forestry and natural resources and is presented in Figure 12 broken down into key components of:

- Emissions from the enteric fermentation (digestion) and manure of livestock.

- Emissions from soils and from the burning of crop residues.
- The emissions released by land clearing and those sequestered by revegetation and forestry.
- The electricity used in agriculture, fisheries and forestry.

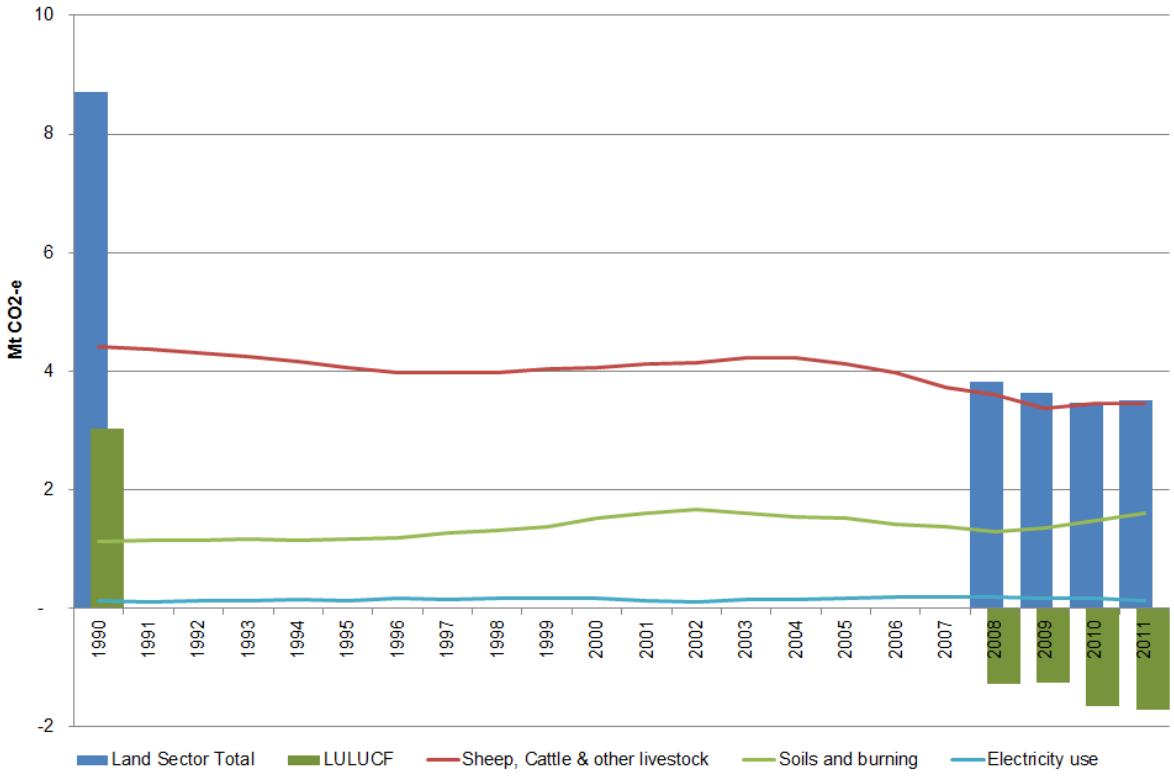



**Figure 13:** Land sector emissions trend, South Australia, 1990-2011 (Mt $CO_2$-e)

Table 7 presents the changes in these key components from the emissions reporting baseline year of 1990 to the most recent reporting year of 2011. Emissions from the sector are heavily influenced by the category *Land Use, Land Use Change and Forestry* (LULUCF). However, the Australian Government only reports these for the key years of the Kyoto Protocol: the baseline year of 1990 and the first commitment period of 2008-12.

| (Mt CO2-e) | 1990 | 2007 | 2008 | 2009 | 2010 | 2011 | Change 1990-2011 | | Change 2008-2011 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sheep, Cattle & other livestock | 4.4 | 3.7 | 3.6 | 3.4 | 3.4 | 3.5 | -22% | ↓ | -4% | ↓ |
| Soils and burning | 1.1 | 1.4 | 1.3 | 1.4 | 1.5 | 1.6 | 43% | ↑ | 24% | ↑ |
| LULUCF | 3.0 | - | - 1.3 | - 1.3 | - 1.6 | - 1.7 | -156% | ↓ | 34% | ↓ |
| Electricity use | 0.13 | 0.20 | 0.19 | 0.17 | 0.18 | 0.14 | 10% | ↑ | -28% | ↓ |
| **LAND Sector Total** | **8.6** | 0.2 | **3.6** | **3.5** | **3.3** | **3.4** | **-60%** | ↓ | **-8%** | ↓ |

**Table 8:** Land Sector emissions 1990 and 2007-2011 (Mt $CO_2$-e)

Readers interested in further information on reporting of Land Sector emissions are directed to the comprehensive technical information published by the Australian Government[16].

[16] www.climatechange.gov.au/climate-change/greenhouse-gas-measurement-and-reporting/tracking-australias-greenhouse-gas-emissions/land-sector-reporting accessed 01DEC2013

## C. CSIRO – Review for the Progress to Achieving Targets Under Section 7 of the *Climate Change and Greenhouse Emissions Reduction Act 2007*