REPORT ON THE OPERATION OF THE CLIMATE CHANGE AND GREENHOUSE EMISSIONS REDUCTION ACT 2007

December 2011

Attachment 1 - South Australian Emissions and Energy Data report

The figures and tables below have been prepared by the Department of Premier and Cabinet, based on the National Greenhouse Gas Inventory.

South Australia Total Emissions

Table 1 and Figures 1 and 2 present South Australia's total emissions with a breakdown. Energy use including the energy imported into South Australia via electricity interconnectors are the dominant source of emissions in the State.

In terms of overall performance, total South Australian Emissions fell by 8% from 1990 to 2009, from 32 Mt to 29.5 Mt when land use, land use change and forestry (LULUCF) is included as well as net emissions from interstate electricity flows. However, if emissions from Land Use, Land Use Change and Forestry (LULUCF) sectors are excluded, an increase in emissions of 3% is recorded, indicating that the major emitting sectors continue to grow.

Table 1: South Australian Greenhouse Gas emissions (Mt of CO_2-e)

	Mt (million tonnes)					Change from 1990 - 2009		
	1990	2000	2007	2008	2009	MT	%	
Energy	20.6	21.6	23.6	24.1	22.4	1.8	9%	↑
Interconnector	0.6	4.5	1.4	0.4	0.7	0.1	9%	↑
Industrial Processes	2.7	3.1	3.3	3.2	2.8	0.2	7%	↑
Agriculture	5.6	5.5	5.1	4.9	4.8	-0.8	-14%	↓
Waste	1.2	0.7	0.7	0.7	0.8	-0.4	-36%	↓
LULUCF	1.5	-2.1		-1.7	-1.9	-3.4	-223%	↓
Total excl LULUCF	30.7	35.5	34.1	33.4	31.4	0.8	3%	↑
Total incl LULUCF	32.2	33.4		31.7	29.5	-2.7	-8%	↓

Figure 1: South Australian Greenhouse Gas emission breakdown (Mt of CO_2-e) without impact of vegetation changes (LULUCF).

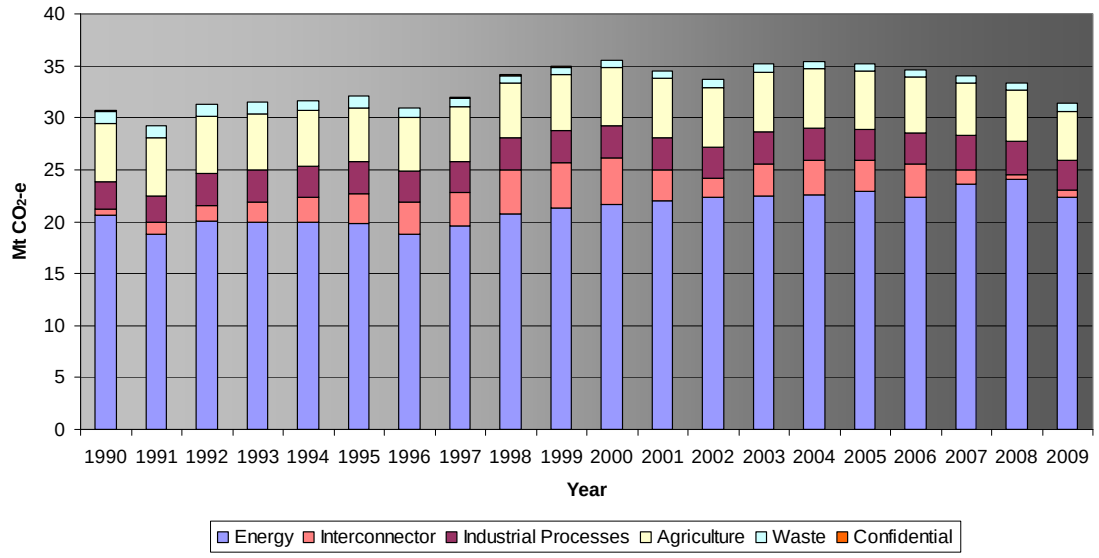


Figure 2: Total South Australian emissions demonstrating the impact of including vegetation changes

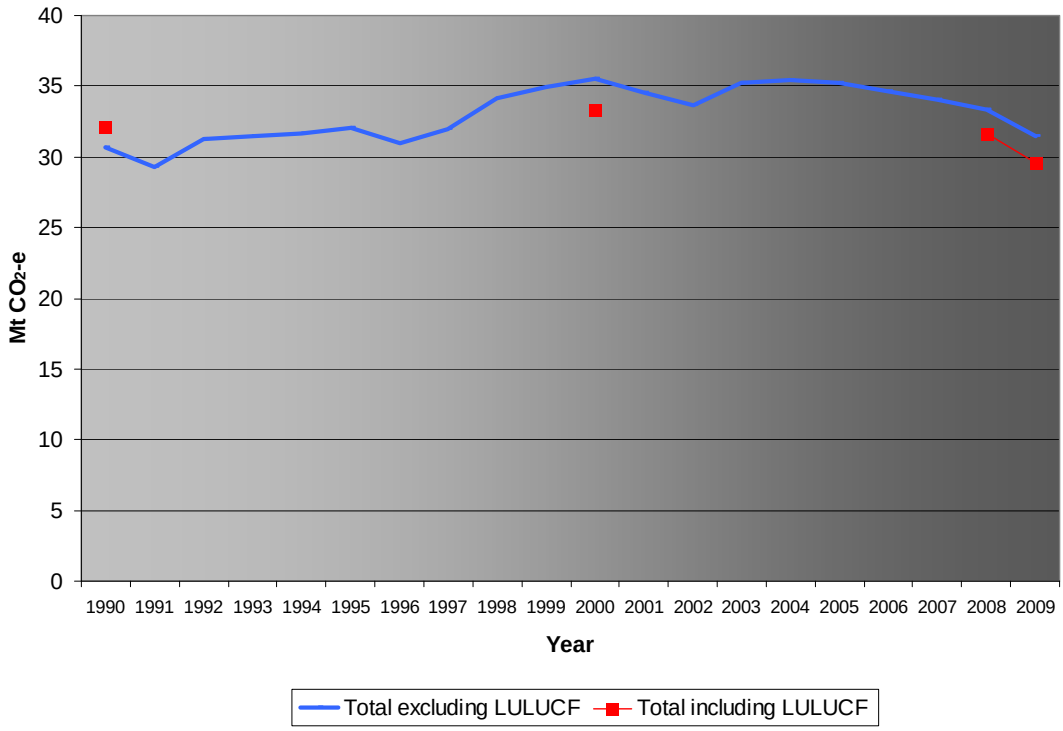


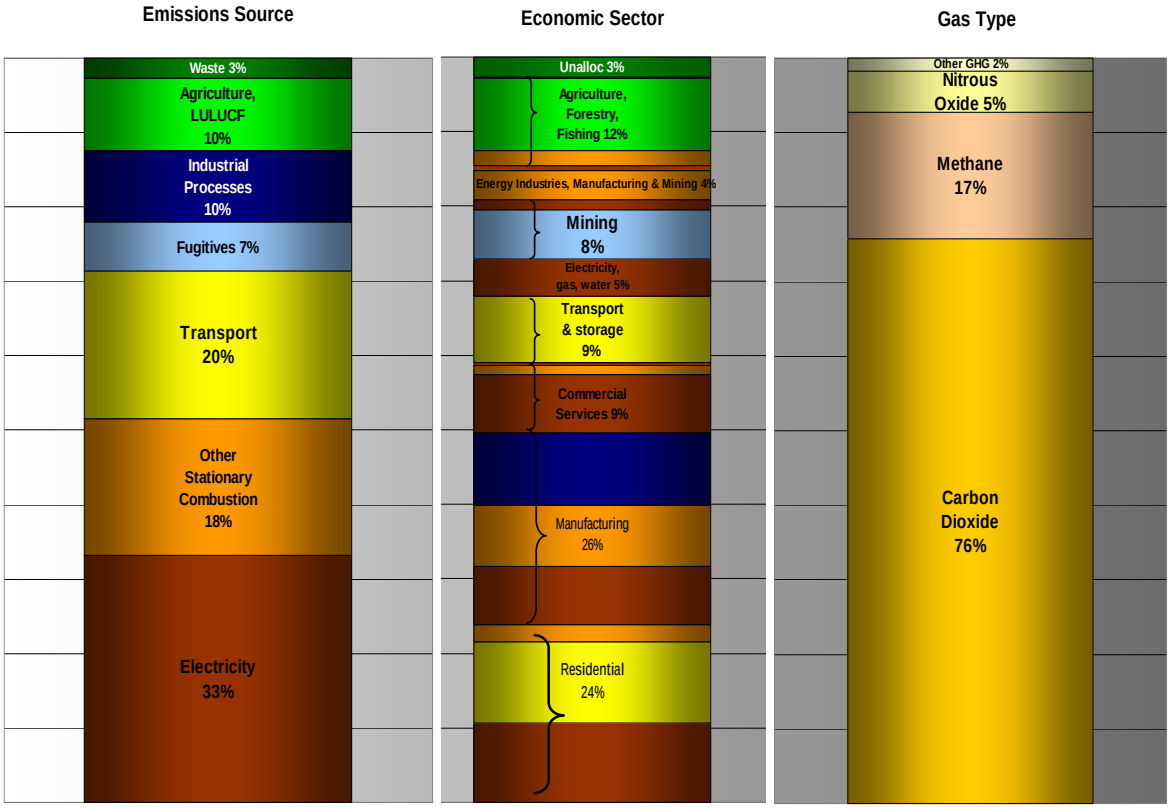
Figure 3 presents a set of more detailed breakdowns to demonstrate the causes and types of emissions in 2009. Breakdowns are provided of emissions by source, by economic sector and by type of gas.

Energy use is the dominant source of emissions with a third of emissions attributed to electricity alone. The residential and manufacturing sectors make the strongest contributions to emissions, both contributing one quarter of the State's emissions, mostly through electricity, gas and fuel use. Over three quarters of emissions 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.

Land Use, Land Use Change and Forestry is only reported in a number of years due to the limited data available when using the Kyoto Protocol methodology adopted by the Commonwealth Government. For South Australia, significant emissions absorption by forestry occurred during the 1990's and contributes a reduction in emissions of around 10%. At a national level, significant reduction in emissions are attributed to the banning of land clearing activities. High rainfall areas in Queensland and northern New South Wales may still contribute further emission reductions if the land is reafforested.

Figure 3: Total South Australian emissions with source, sector and gas breakdowns, 2009



South Australia Key Indicators

Under the 2011 South Australian Strategic Plan it is proposed to include the following four sub-indicators in order to demonstrate how South Australia is performing in relation to its growth:

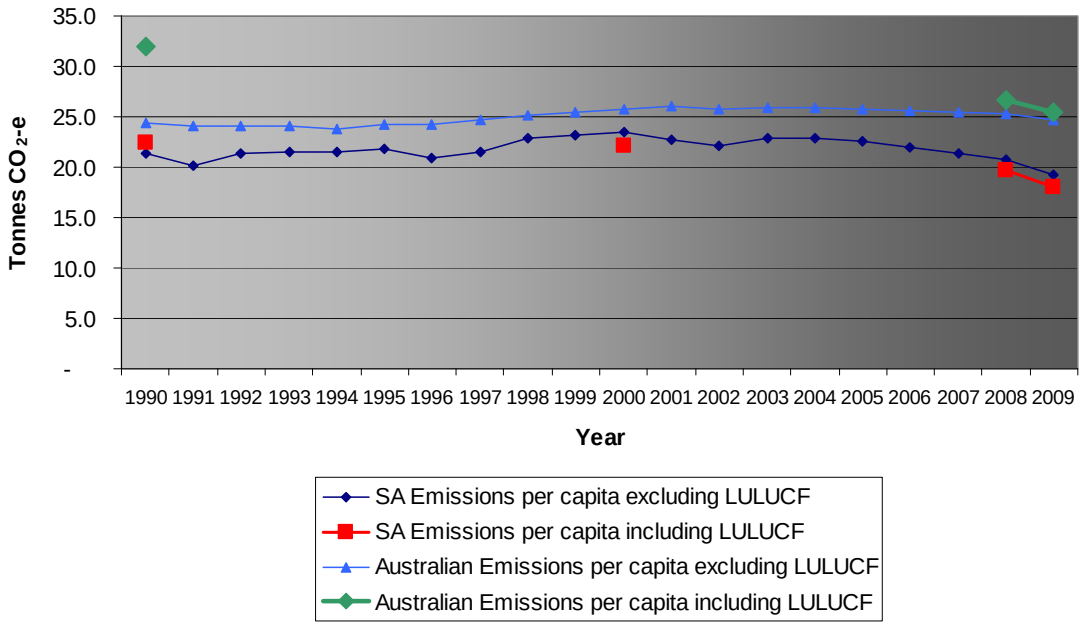
- South Australian emissions in relation to State population
- South Australian emissions in relation to Gross State Product (GSP)
- South Australian residential emissions in relation to State population
- South Australian residential emissions in relation to the number of households.

These indicators are presented in Tables 2 to 5 and Figures 4 to 7, with comparisons to national performance included.

Table 2: South Australian and Australian Emissions per capita

SA Emissions per Capita	1990	2000	2007	2008	2009	1990 to 2009
South Australian Population (no. of million persons)	1.438	1.508	1.593	1.613	1.634	
SA Emissions (tonnes CO_2-e) per capita excl LULUCF	21.3	23.5	21.4	20.7	19.2	↓
SA Emissions (tonnes CO_2-e) per capita incl LULUCF	22.4	22.1		19.6	18.1	↓
Australian Emissions (tonnes CO_2-e) per capita excl LULUCF	24.4	25.7	25.5	25.3	24.7	↑
Australian Emissions (tonnes CO_2-e) per capita incl LULUCF	32			26.7	25.5	↓

Figure 4: South Australian Emissions per capita with national comparison



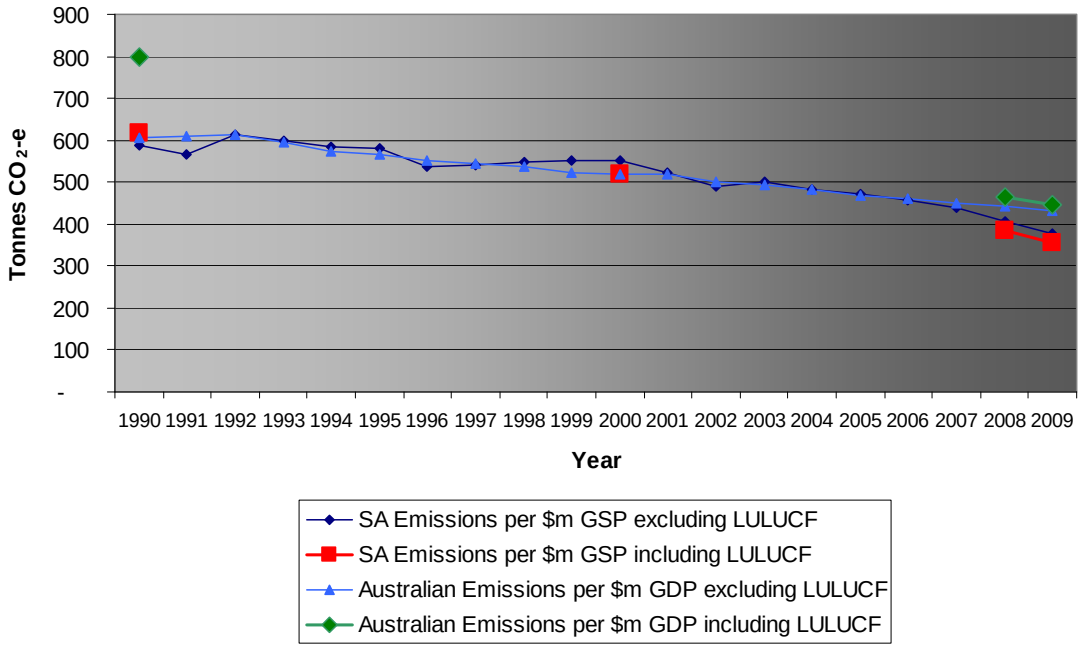
Both state and national emissions per person benefit from the inclusion of vegetation changes to achieve reductions.

In the other sectors combined (energy, industrial processes, agriculture and waste) national emissions per capita have remained relatively steady since 1990 and South Australian emissions per capita have fallen. This means the national emissions performance has grown in line with population growth. South Australia, however, has started to disconnect its emissions performance from population growth, particularly since 2004 and primarily supported by increases in the generation of renewable energy.

Table 3: South Australian and Australian Emissions per $million of GSP & Gross Domestic Product (GDP)

SA Emissions per $million Gross State Product	1990	2000	2007	2008	2009	1990 to 2009
Gross State Product ($million)	52,043	64,473	77,370	81942	83,231	
SA Emissions (tonnes CO_2-e) per $m GSP excl LULUCF	589	551	440	408	378	↓
SA Emissions (tonnes CO_2-e) per $m GSP incl LULUCF	619	518		386	355	↓
Australian Emissions (tonnes CO_2-e) per $m GDP excl LULUCF	607	518	451	442	432	↓
Australian Emissions (tonnes CO_2-e) per $m GDP incl LULUCF	797			465	447	↓

Figure 5: South Australian Emissions per $million GSP with national comparison

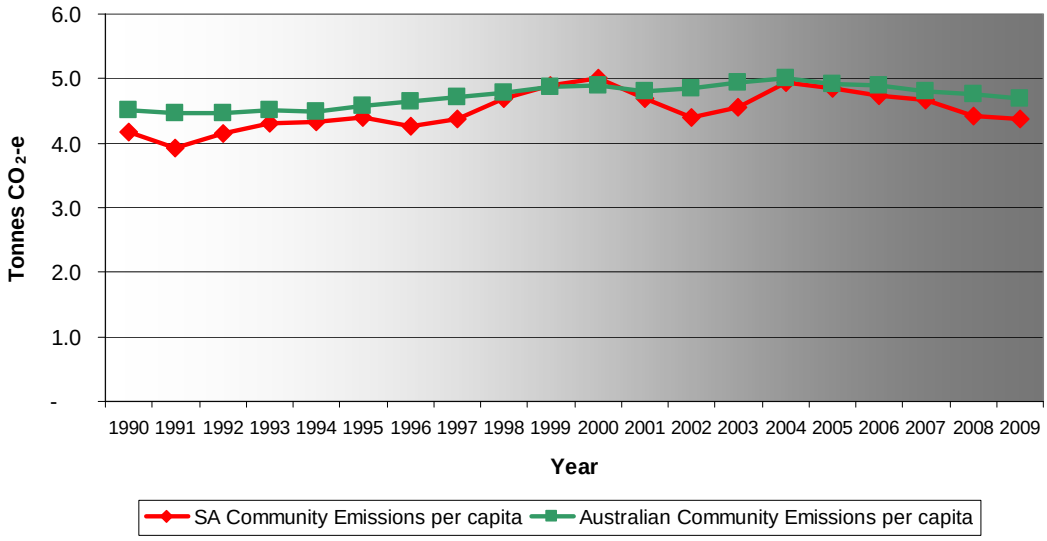


Both the state economy and the national economy are becoming less emissions intensive over time. This means that the expansion of the economy through increases in economic production and productivity gains have not led to a commensurate expansion in greenhouse emissions. New economic activities do tend to add to the State's total emissions but at the same time businesses improve the efficiency of the use of energy and the economy moves to less energy and emission intense activities. South Australia has marginally outperformed the national average over the past few years, due mainly to the State's increase in renewable energy. The challenge for South Australia will be to accommodate new economic growth while maintaining or improving the downward trend. The new Olympic Dam expansion is expected to contribute 4.7 Mt to South Australian emissions.

Table 4: South Australian and Australian Residential Emissions per capita

Residential Emissions per Capita	1990	2000	2007	2008	2009	1990 to 2009
South Australian Population (no. of million persons)	1.438	1.508	1.593	1.613	1.634	
SA Residential Emissions (tonnes CO_2-e) per Person	4.2	5.0	4.7	4.4	4.4	↑
Australian Residential Emissions (tonnes CO_2-e) per Person	4.5	4.9	4.8	4.8	4.7	↑

Figure 6: South Australian Residential Emissions per capita with national comparison

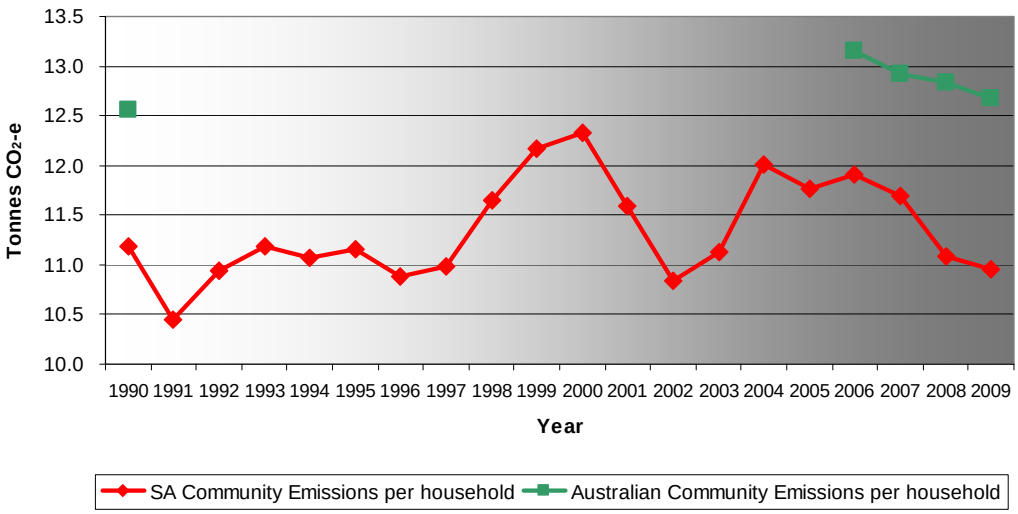


Residential emissions focus on the energy used in housing and passenger transport for the community sector. At both a state and a nationwide level, these emissions increased through the 1990's, with many contributing factors such as increasing sizes and numbers of houses, increasing use of airconditioning and increasing energy using equipment in homes. A significant decline in 2002-03 appears to be related to the reaction to electricity price rises of up to 25% at the time. Since 2004 emissions per capita have declined with South Australia's emissions declining at a stronger rate than the national average.

Table 5: South Australian and Australian Residential Emissions per household

Residential Emissions per Household	1990	2000	2007	2008	2009	1990 to 2009
Number of South Australian Households	537,000	613,146	635,465	644,327	653,503	
Residential Emissions (tonnes CO_2-e) per South Australian Household	11.2	12.3	11.7	11.1	10.9	↓
Residential Emissions (tonnes CO_2-e) per Australian Household	12.6		12.9	12.8	12.7	↑

Figure 7: South Australian Emissions per household with national comparison



While South Australian emissions per capita have risen slightly, emissions per household have declined. This reflects the trend toward smaller households, so while each household may use more energy efficient equipment and lighting, there are more of them and therefore total emissions from this sector are rising. The decline accords with the energy efficiency in dwellings data for SASP Target 60, which records an 8% improvement in household energy efficiency since 2003-04.

Sectoral Trends

This section details the emission trends in the following sectors:

1. Energy
2. Community
3. Buildings
4. Agriculture, Land Use change and Forestry
5. Transport
6. Industry

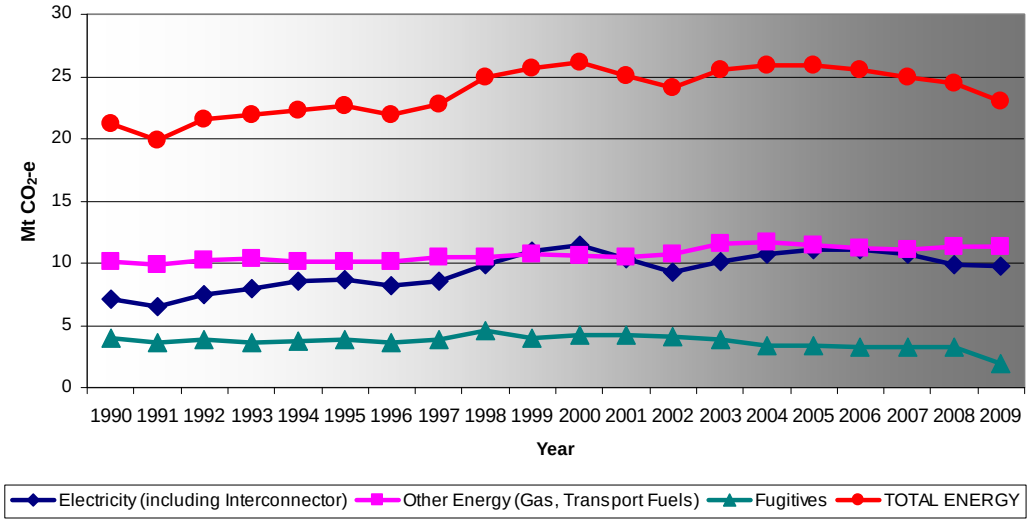
The sectors have been chosen for reporting in order to describe trends in South Australian emissions with breakdowns for understanding how sectoral changes are driving the overall emission profile. There is necessarily some overlap, for example the emissions due to energy use in residential housing is reported in each of energy, buildings and community.

1. Energy

Table 6: Energy Sector Greenhouse Gas Emissions

ENERGY SECTOR	Mt CO_2-e (million tonnes)					Change from 1990 - 2009	
	1990	2000	2007	2008	2009	%	
Electricity (including Interconnector)	7.1	11.4	10.7	9.8	9.8	38%	↑
Other Energy (Gas, Transport Fuels)	10.1	10.6	11.0	11.4	11.3	11%	↑
Fugitives	4.0	4.2	3.2	3.3	2.0	-51%	↓
TOTAL ENERGY	**21.2**	**26.2**	**25.0**	**24.5**	**23.0**	**9%**	↑

Figure 8: Energy Sector trends in emissions (Mt CO_2-e)

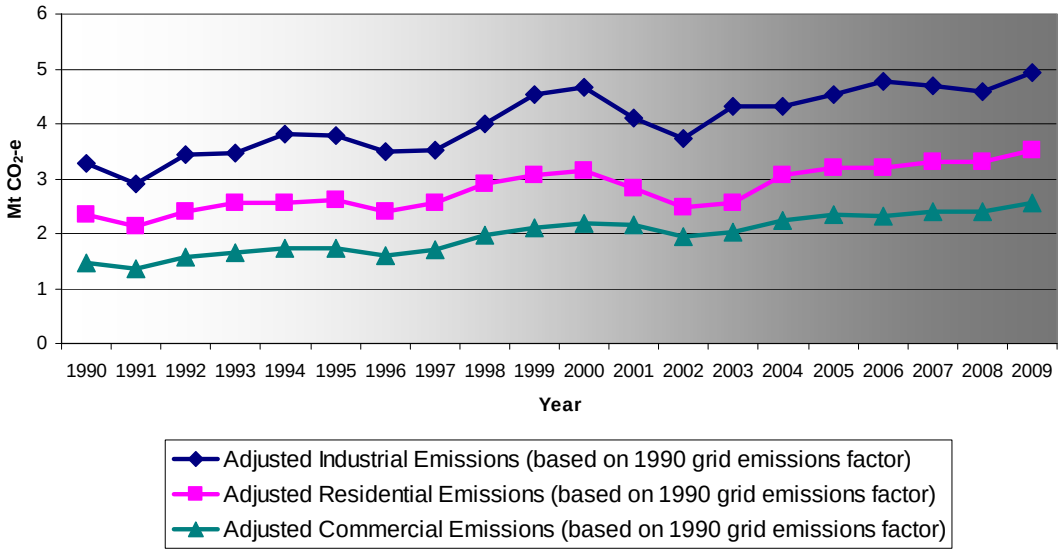


Emissions from the energy sector grew from two thirds (21Mt) to 78% (23Mt) of the total inventory from 1990 to 2009. Emissions from Electricity increased by 38% (3Mt) from 1990 to 2009, however, this would have been a 55% increase without the contribution of substantial renewable energy in recent years. The renewable electricity

component has led to a decline in electricity emissions for each of the previous four years. The underlying growth in electricity consumption is demonstrated in Figure 9 below. The graph demonstrates that the progressive greening of the electricity grid has contributed a 2.2 Mt reduction in emissions.

The growth in gas and fuel use is more modest with an 11% increase over the 1990 – 2009 period. The trend in fugitive emissions cannot be accurately reported due to an improvement in emissions calculation methodology.

Figure 9: Trends in Electricity Consumption, demonstrated by removing the impact of a progressively greener electricity grid.

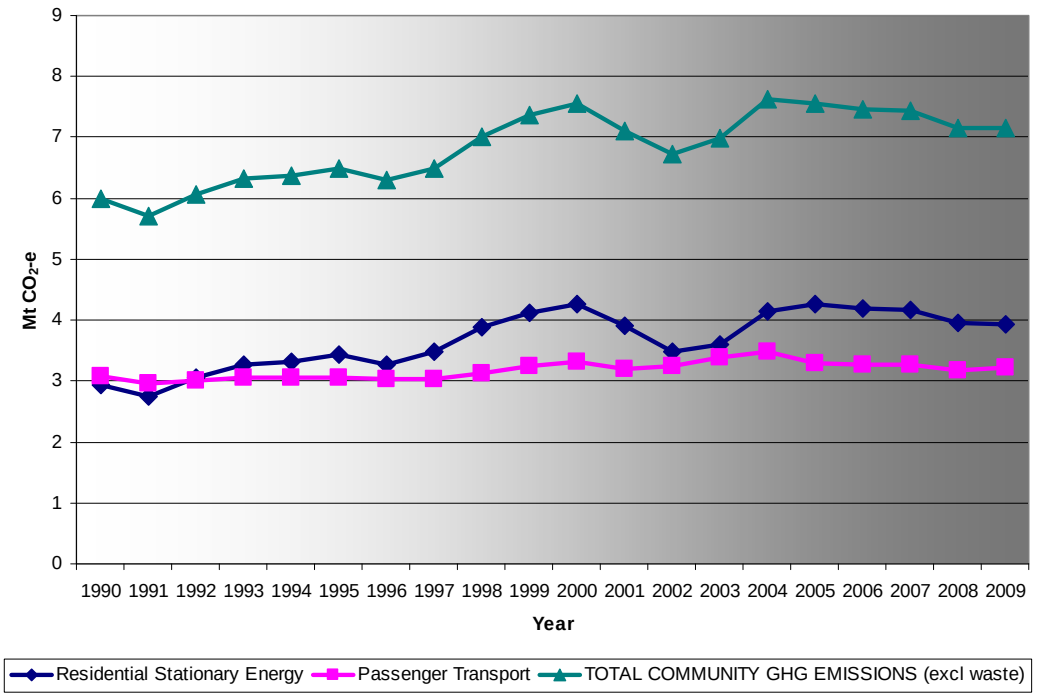


2. Community

Table 7: Community Sector Greenhouse Gas Emissions

COMMUNITY SECTOR	Mt CO_2-e (million tonnes)					Change from 1990 - 2009	
	1990	2000	2007	2008	2009	%	
Residential Stationary Energy	2.9	4.3	4.2	4.0	3.9	34%	↑
Passenger Transport	3.1	3.3	3.3	3.2	3.2	5%	↑
TOTAL RESIDENTIAL GHG EMISSIONS	**6.0**	**7.6**	**7.4**	**7.1**	**7.2**	**19%**	↑

Figure 10: Community Sector trends in emissions (Mt CO_2-e)



Emissions from the community sector represented 6Mt or 19% of the total inventory in 1990 and 24% in 2009. Total community emissions rose 19% between 1990 and 2009.

Emissions from residential stationary energy use (primarily gas and electricity) rose 34% during this time, while population increased by only 14%.

Residential electricity emissions would have risen 50% if the trend is adjusted for the change in grid emissions intensity due to increasing renewable electricity.

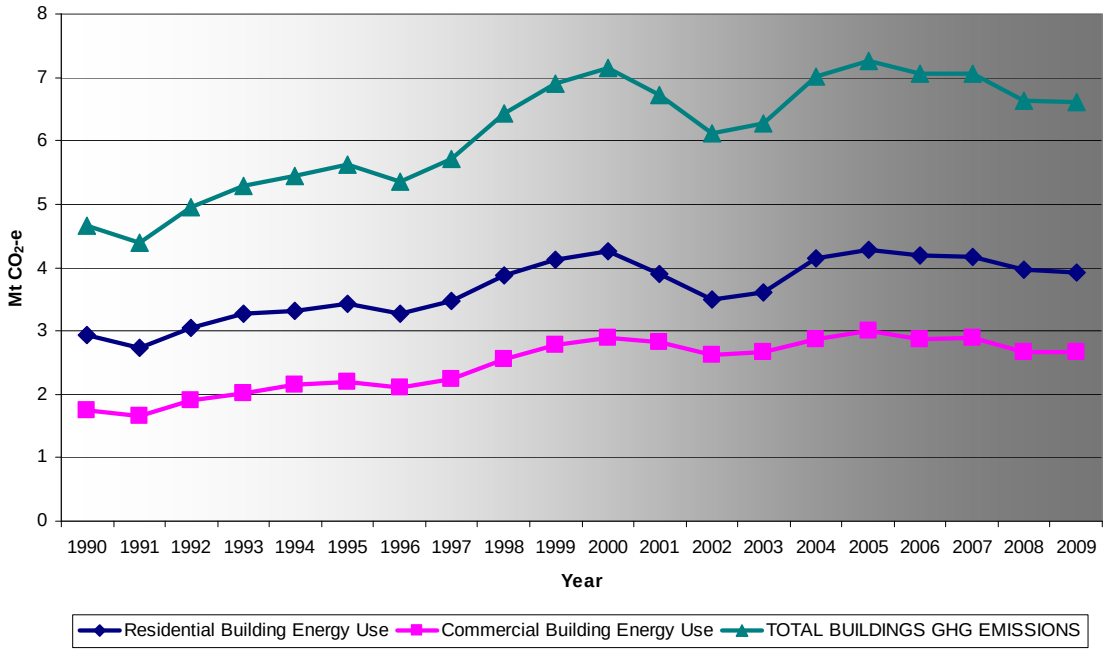
Residential transport emissions rose 5% over the same period.

3. Buildings

Table 8: Buildings Sector Greenhouse Gas Emissions

BUILDINGS SECTOR	Mt CO_2-e (million tonnes)					Change from 1990 - 2009	
	1990	2000	2007	2008	2009	%	
Residential Building Energy Use	2.9	4.3	4.2	4.0	3.9	34%	↑
Commercial Building Energy Use	1.7	2.9	2.9	2.7	2.7	54%	↑
TOTAL BUILDINGS GHG EMISSIONS	**4.7**	**7.1**	**7.1**	**6.6**	**6.6**	**41%**	↑

Figure 11: Buildings Sector trends in emissions (Mt CO_2-e)



Emissions from the buildings sector represented 5Mt or 14% of the total inventory in 1990 and 22% in 2009. Total Building emissions were 2Mt or 41% higher in 2009 than in 1990.

Residential building emissions rose 34% and commercial building emissions rose 54% over this time.

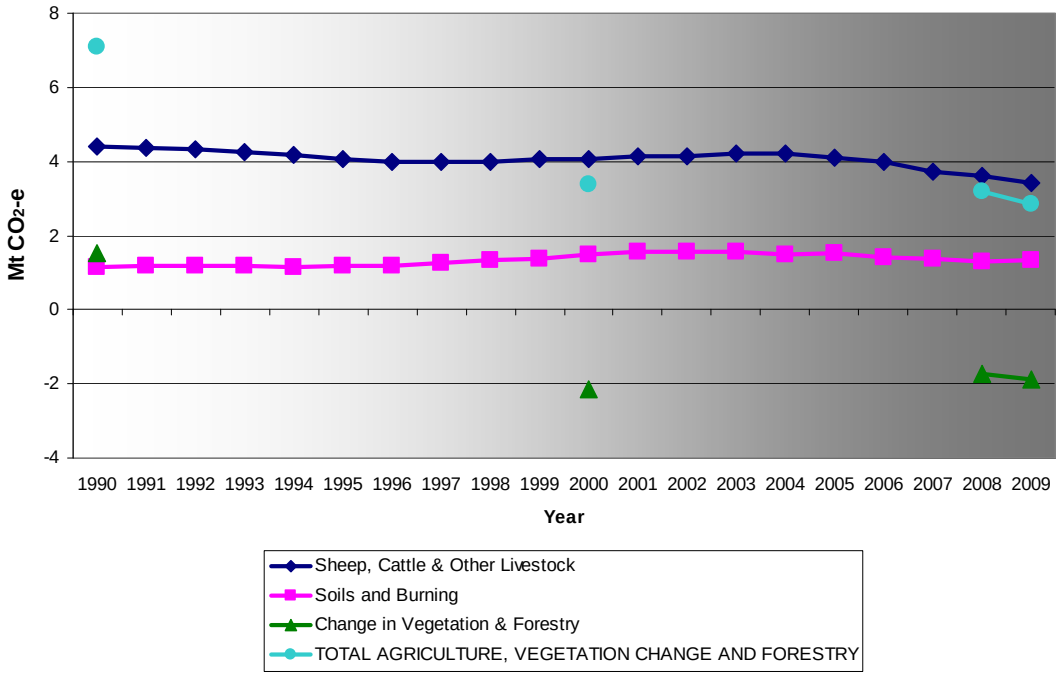
Emissions in buildings is largely due to electricity use and a recent flattening in emissions is caused by the reduced emissions intensity of electricity from increased use of renewable energy.

4. Agriculture, Land Use change and Forestry

Table 9: Natural Resources Sector Greenhouse Gas Emissions

NATURAL RESOURCES SECTOR	Mt CO_2-e (million tonnes)					Change from 1990 - 2009	
	1990	2000	2007	2008	2009	%	
Sheep, Cattle & Other Livestock	4.4	4.1	3.7	3.6	3.4	-22%	↓
Soils and Burning	1.1	1.5	1.4	1.3	1.3	16%	↑
Change in Vegetation & Forestry	1.5	-2.1		-1.7	-1.9	-223%	↓
TOTAL AGRICULTURE, VEGETATION CHANGE AND FORESTRY	7.1	3.4		3.2	2.9	-60%	↓

Figure 12: Natural Resources Sector trends in emissions (Mt CO_2-e)



Emissions from the natural resources sector represented 7Mt or 22% of the total inventory in 1990 and 10% in 2009.

Total emissions from Agriculture and LULUCF fell by 60% from 1990 to 2009 due mainly to the LULUCF sector moving from a 1.5Mt emissions source in 1990 to a 1.9Mt emissions sink in 2009.

Sheep, Cattle and other Livestock emissions fell by 22% over this time.

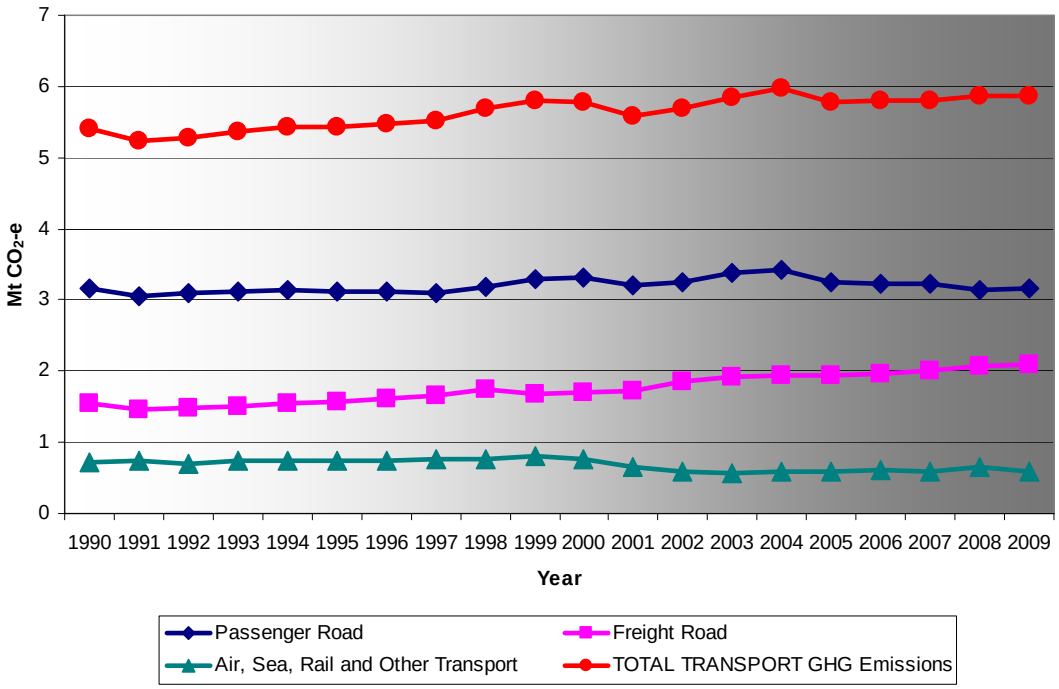
Emissions from Soils and Burning increased by 16%.

5. Transport

Table 10: Transport Sector Greenhouse Gas Emissions

INDUSTRY SECTOR	Mt CO_2-e (million tonnes)					Change from 1990 - 2009	
	1990	2000	2007	2008	2009	%	
Passenger Road	3.2	3.3	3.2	3.1	3.2	0%	↑
Freight Road	1.5	1.7	2.0	2.1	2.1	36%	↑
Air, Sea, Rail and Other Transport	0.7	0.8	0.6	0.7	0.6	-18%	↓
TOTAL TRANSPORT GHG Emissions	**5.4**	**5.8**	**5.8**	**5.9**	**5.9**	**8%**	↑

Figure 13: Transport Sector trends in emissions (Mt CO_2-e)



Emissions from the transport sector represented 5Mt or 17% of the total inventory in 1990 and 20% in 2009.

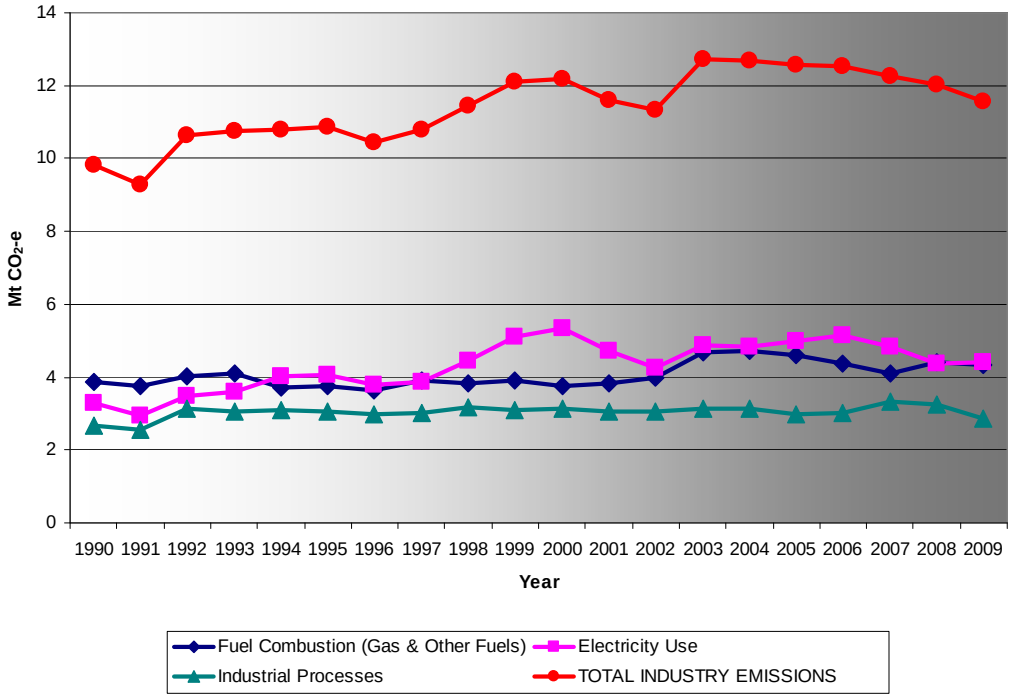
Total Transport emissions rose by 0.5Mt or 8% over the period 1990 to 2009. Emissions from passenger road were fairly stable. Freight Road emissions rose 36% over this time. Air, Sea, Rail & Other Transport emissions decreased by 18%.

6. Industry

Table 11: Industry Sector Greenhouse Gas Emissions

INDUSTRY SECTOR	Mt CO_2-e (million tonnes)					Change from 1990 - 2009	
	1990	2000	2007	2008	2009	%	
Fuel Combustion (Gas & Other Fuels)	3.9	3.8	4.1	4.4	4.3	12%	↑
Electricity Use	3.3	5.3	4.8	4.4	4.4	34%	↑
Industrial Processes	2.7	3.1	3.3	3.3	2.9	7%	↑
TOTAL INDUSTRY EMISSIONS	**9.8**	**12.2**	**12.2**	**12.0**	**11.6**	**18%**	↑

Figure 14: Industry Sector trends in emissions (Mt CO_2-e)



Emissions from the industry sector represented 10Mt or 31% of the total inventory in 1990 and 39% in 2009.

Total industry emissions increased by 2Mt or 18% from 1990 to 2009.

The decline in recent years can be attributed to the increase in renewable electricity being used on the grid.

Attachment 2 - Key South Australian Government Climate Change Initiatives

From 2009 to 2011 South Australia had a number of significant programs, delivered through a variety of agencies that reduce emission and/or assist the State to better manage the impacts of climate change. Key outcomes of these programs have been reported annually under the Annual Report for the Department of Premier and Cabinet.

The programs are summarised in the Table below.

Topic	Key Programs
Sustainable Housing	Residential Energy Efficiency – SASP Target 60 Building policy Solar Feed-in Scheme Solar Hot Water Rebate Program SA Water H_2OME Rebate Programs Housing SA Design Guidelines for Sustainable Housing and Liveable Neighbourhoods Off-Grid Remote Area Energy Efficiency Program
Climate Smart Buildings and Precincts	South Australian Planning Strategy Sustainable Development and Climate Smart Precincts Building Innovation Fund Cool Roofs Mini Wind Turbine Trial
Encouraging Sustainable Behaviour	Awareness and Behaviour Change Program Safer, Greener and More Active Travel Community Programs Education Curriculum: Sustainable and Attainable, Tackling Climate Change Waste Avoidance, Reduction and Recycling Programs Australian Service Excellence Standards for Community Organisations
Adaptation	South Australia's Draft Climate Change Adaptation Framework Primary Industry Development under Changing Climatic Conditions - Adaptation Coastal Management Natural Resources Management Planting for Biodiversity Policy Development for Natural Resource Management *Water for Good* Emergency Management, South Australian Fire and Emergency Services Commission Health Support, Information and Risk Assessment Research

Attachment 2

Lower Emission Transport Options	Public Transport – SASP Target 63 Cycling and Walking – SASP Target 2 Development of a Low Emissions Vehicle Strategy for South Australia
Green Futures – Moving to a Low Carbon Economy	RenewablesSA Geothermal Carbon Capture and Storage Unconventional Gas as a Transition Fuel Primary Industry Development under Changing Climatic Conditions – Mitigation Premier's Science and Research Fund TAFE SA Sustainable Industries Education Centre Green Skills Training Courses 'Skills for All' Reforms to the Vocational Education and Training in South Australia Zero Waste SA Resource Efficiency Assistance Program EPA Sustainability Licences Innovation and Cleantech South Australian Tourism Commission
Government Leadership	Government Energy Efficiency – SASP Target 61 Fleet Target GreenPower™ purchasing Sector Agreement Program International Leadership National and International Leadership for Geothermal Energy

Sustainable Housing

Residential Energy Efficiency – SASP Target 60

SASP includes Target 60 *Energy efficiency – dwellings: Increase the energy efficiency of dwellings by 15% by 2020.* The energy efficiency of dwellings is defined as the number of residential dwellings that can have their annual energy needs met by a given quantity of energy – in this case 1 terajoule (TJ) of energy. This value is referred to as the Energy Efficiency Index (EEI).

The South Australian Government is implementing a number of energy efficiency programs to attain this target, including the following programs.

- *The Residential Energy Efficiency Scheme (REES)* commenced on 1 January 2009. This program requires South Australian gas and electricity retailers to install energy saving measures to households, with a certain proportion of measures delivered to low-income households as a condition of their license. Energy providers are also required to provide home energy audits to low income households.

  The Essential Services Commission of South Australia (ESCOSA) is the administrator of the REES. In its 2010 review on the REES, ESCOSA advised that the energy efficiency activities delivered in the first two years of the scheme equated to 456,000 tonnes of greenhouse gas reduction. Refer to http://www.escosa.sa.gov.au/electricity-overview/residential-energy-efficiency-scheme-rees-.aspx for further information.

- The South Australian Government has had rules in place since July 2008 to promote the use of water heaters with lower greenhouse emissions. *South Australia's water heater installation requirements* require plumbers, in many situations, to install low-emission water heaters when installing new or replacement water heaters.

  ETSA Utilities in its Regulatory Proposal 2010–2015 to the Australian Energy Regulator (AER) noted declining hot water electricity sales due to government policies. AER in its final determination also concluded that ETSA Utilities' hot water electricity sales are forecasted to decline. This implies less electricity is being used for water heating.

- *South Australia's Air Conditioning Measures and Minimum Energy Performance Standards* program consists of a package of voluntary and regulatory measures to improve the energy efficiency of residential air-conditioner installations.

- *Minimum Energy Performance Standards* (MEPS) and *Labelling for Appliances and Equipment* program is a national measure to increase the energy efficiency of energy-consuming appliances and equipment. Many of the products regulated under this program are residential appliances and equipment.

  The effectiveness of the MEPS and labelling program has been reported on a national basis. The Commonwealth released "Australia's emission projections 2010" report (refer http://www.climatechange.gov.au/~/media/publications/projections/australias-emissions-projections-2010.pdf) which notes MEPS and the labelling program as contributing 20.3 Mt of the 109 Mt projected national abatement from current policies and measures by 2020. As such, it is one of Australia's key abatement measures. In terms of cost effectiveness, the MEPS and labelling program is projected to nationally return net benefits of $22.44 billion from 2009 to 2024. This is an overall benefit/cost ratio of 2.9.

- The *Energy Advisory Service* provides independent information, advice, training and resources to assist householders minimise their home energy consumption, related energy bills and greenhouse gas emissions.
  On average over 70% of callers to the Energy Advisory Service indicate that the interaction has motivated them to implement energy efficiency and/or renewable energy actions.
- *Home Energy Toolkits* enable householders to conduct their own home energy audit. The toolkit assists householders understand where significant energy is being used in their home, and how to minimise this use whilst maintaining comfort. The toolkit includes a DIY Energy Audit Guide, worksheets and tools e.g. a Power-Mate and infrared thermometer to assist the audit. Householders can access the toolkit for free from all metropolitan and many regional local council libraries.
- *Energy Friends* training is a free one day home energy audit course for community volunteers. The trained volunteers (Energy Friends) then provide free in-home energy audits to low income householders and others in their community.

Based on the most recent electricity, gas and housing data, the Energy Efficiency Index (EEI) for 2009-10 can be estimated to be 23.51, indicating an improvement of 8% since 2003-04 towards the 2020 target. This is an indication of energy efficiency improvements in the residential sector.

Building policy

The Department of Planning and Local Government (DPLG) 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) actions endorsed by the Council of Australian Governments (COAG). For houses this included a minimum energy efficiency requirement of 6 stars and increased requirements for lighting. A concession was provided for transportable houses in recognition of their contribution to affordable housing in remote areas.

A Minister's Specification has been developed for Cool Roofs which will be adopted on 1 May 2012 and will introduce requirements for commercial buildings to be built with roofs with low absorption of energy, for example light colour roofs.

Solar Feed-in Scheme

South Australia introduced the Solar Feed-In Scheme on 1 July 2008. It was the first scheme of its kind in Australia, designed to reward solar owners for their investment and encourage uptake and community acceptance of small-scale rooftop solar photovoltaic systems by paying them a premium for electricity returned to the grid. The Scheme is administered through the electricity distribution network operator, ETSA Utilities, and funded by all electricity customers via network charges passed through to their bills.

Parliament recently made amendments to the Scheme as a result of a review of the scheme. The 44c/kWh feed-in tariff closed to new entrants at the end of September 2011, and a new step-down phase is now open to new entrants until the end of September 2013 - paying 16c/kWh for electricity exports until the end of September 2016. Those in the 44c/kWh category will be eligible to receive it until 30 June 2028. In addition, Parliament introduced extra eligibility criteria.

The amendments to the Solar Feed-in Scheme achieve the aims of providing the solar industry with a transition away from public support and limiting the cost impact on all electricity customers at large.

The Solar Feed-in Scheme has been highly successful, with nearly 112,000 solar customers approved to connect a solar system to the grid as at 30 November 2011. Nearly 78,000 of these customers had their solar system installed and operating.

Solar Hot Water Rebate Program

Since July 2008 the South Australian solar hot water rebate scheme has been focussed on assisting low income households to meet the cost of installing a new hot water system by providing a $500 rebate.

The introduction of low income eligibility in July 2008 coincided with the introduction of hot water performance standards at that time.

The South Australian Government rebate scheme will cease as of 30 June 2013.

In South Australia, about 1,200 rebates were granted to low income households in 2010-11 at a cost of just over $600,000.

SA Water H_2OME Rebate Scheme

On 1 November 2007 SA Water launched H_2OME, a rebates scheme for South Australians to encourage water wise behaviour and reduce household consumption. 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.

Housing SA Design Guidelines for Sustainable Housing and Liveable Neighbourhoods

The *Design Guidelines for Sustainable Housing and Liveable Neighbourhoods* provide detailed design information for application across all Housing SA building and development projects, with the aim of achieving sustainable housing outcomes.

They provide clear and consistent information in relation to site layouts and house designs, land titling and service infrastructure, amenity targets, adaptable housing, housing modifications and upgrades and environmental sustainability.

The program has led to improved sustainability performance across all new and upgraded Housing SA stock with rainwater storage and water efficient fixtures, insulation in the walls and ceilings and the inclusion of passive design energy efficiency principles to achieve acceptable levels of thermal comfort. Where possible, houses are sited close to public transport, shopping centres and other facilities.

Off-Grid Remote Area Energy Efficiency Program

Funding for this program is provided by the Australian Government's Renewable Remote Power Generation Program (RRPGP).

The first part of this program is focused on assisting commercial customers who consume more than 30 MWh per year of electricity in off-grid areas of the State to become more energy efficient.

The second part of the program is focused on subsidising the cost of installing solar hot water systems in remote Aboriginal housing in collaboration with the Department for Communities and Social Inclusion.

The third part is focused on improving end use energy efficiency for domestic households and small businesses in South Australia's largest off-grid remote area town of Coober Pedy.

Funding for the whole program totals $915,000. Twelve large commercial customers have been provided with subsidised energy audits, and approximately half of these are following up on audit recommendations with significant retrofits for which additional funding is available via RRPGP.

Approximately 51 solar hot water systems have been installed in remote Aboriginal housing during 2010-11.

Two rounds of applications have been invited from the domestic and small business sector. Approximately six of these customers have taken the offer of assistance to date, with continuing enquiries indication that more applications are expected.

Climate Smart Buildings and Precincts

South Australian Planning Strategy

Responding to the risks and impacts of climate change is a critical component of the *30-Year Plan for Greater Adelaide*. The Plan was launched on 17 February 2010 and is one volume of the *South Australian Planning Strategy* in conjunction with volumes for each regional area. The Plan outlines specific policies and targets to address the impacts of climate change in Greater Adelaide and to prepare the groundwork for long-term adaptation. The climate change adaptation and mitigation principles outlined in the *30-Year Plan for Greater Adelaide* will also form a basis for regional volumes of the Planning Strategy. The new urban form will make one of the most important contributions to both reducing the growth of greenhouse gas emissions and creating environments that are more liveable in the likely event of hotter temperatures, extreme weather conditions and rising sea levels.

The Plan has an important role to play in reducing reliance on private vehicles and encouraging the development of new carbon-efficient industries and green technologies. One of the key strategies in the Plan is to encourage a more compact urban form with 70% of growth to be accommodated through urban infill. The Plan also provides for the land use decisions that need to be made to allow new industries and technologies to flourish, such as setting aside land for renewable energy industries and changing building standards to encourage new technologies.

The DPLG is undertaking a two stage reform process to deliver clear and directive planning policy that aligns with the government's strategic priorities as expressed in the latest volumes of the *South Australian Planning Strategy*. The reforms include an update of the South Australian Planning Policy Library. Urban design and public realm development are also a key component in delivering the Plan and remain a focus for DPLG.

Sustainable Development and Climate Smart Precincts

The Land Management Corporation (LMC) is undertaking a number of projects with the following aims:

- reduce greenhouse gas emissions associated with the urban development industry in South Australia
- increase the use of renewable energy sources
- promote new and alternative products that assist developers to reduce their carbon footprint.

LMC has developed Lochiel Park as a green village which includes energy efficient building design, solar energy systems and improved waste management to minimise the impact on the environment.

As the result of the introduced measures at Lochiel Park:

- the average home consumes 5,520kWh of electricity per annum (15.1kWh per day) of which 57% is locally generated and 2,340 kWh per year (6.4kWh/day) is supplied by the grid
- the highest emitting homes were responsible for emitting 1.2 tonne of CO_2 per month in winter and 0.4 tonne of CO_2 in autumn; the corresponding lowest emitters produced zero emissions in winter and a negative net emission (-0.4 tonne per month) in summer. The average emissions of the monitored Lochiel Park homes ranged between 0.1 tonne in May and 0.5 tonne in the winter months
- the total annual monitored energy use of Lochiel Park homes amounts to 18.9GJ, which is a reduction of 53% in comparison with the Australian average. The corresponding reduction of greenhouse gas emissions is 66%.

The learnings from this project will be extended to the redevelopment at Bowden, which has been designed as a transit oriented development and will play an important role in showcasing the vision of the Government's *30-Year Plan for Greater Adelaide*.

Early work has also commenced on the master plan for the redevelopment of the former Mitsubishi industrial site at Tonsley, which will also strive to embody sustainability principles in its design.

The Integrated Design Commission (IDC) was announced in late 2009. The IDC provides leadership, independent expert advice and strategic direction to ensure the quality and sustainability of publicly funded buildings, infrastructure programs, urban design and public realm place-making, and to maximise opportunities for good design to contribute to the State Government's commitment to sustainability. Through its advice, the Commission supports the State Government's aim to reduce greenhouse emissions and the lifecycle costs of buildings and infrastructure. It also provides advice on legislation and regulation that will influence good design practice and raises community awareness of the value of good design and a more sustainable built environment.

Initiatives that deliver on this responsibility include:

- a Design Review, including the early and ongoing review of the design of all significant projects in the built environment to promote design excellence through socially and environmentally sustainable practices
- the *Zero Carbon Challenge* (in collaboration with LMC), which is promoting more sustainable, energy efficient and adaptable housing that reduces the total carbon footprint of South Australian housing models through next

generation design, material use, construction processes, and building operation

- Research that facilitates efforts across government to promote new regulatory support for next generation construction technology to reduce emissions used during construction while also reducing the time and cost of construction.

The IDC is also leading the delivery of *5000+ an Integrated Design Strategy for Inner Adelaide*. This is a project that connects the Commonwealth, State, and Local Government, including Adelaide and the seven inner-metropolitan Councils. As one of the 12 principles identified for the City of Adelaide in the *30-Year Plan for Greater Adelaide*, *5000+ an Integrated Design Strategy for Inner Adelaide* will provide a vision for inner Adelaide to guide the development of a sustainable, liveable and vibrant city. The realisation of increased residential population in the city is central to the objective of achieving 70% of growth as urban infill and the associated reduction in reliance on transport.

The Government of South Australia is a participant in The Climate Group's *Climate Smart Precincts Initiative*, which aims to bring together forward-thinking businesses with State and Territory Governments to advance the development of low carbon and climate resilient precincts.

Building Innovation Fund

The Building Innovation Fund is a four-year, $2 million initiative that aims to establish South Australia as the nation's leader in demonstrating innovative ways to reduce the carbon footprint of existing commercial buildings. The Fund offers grants to owners of commercial buildings for initiatives that demonstrate new and leading edge approaches to retrofitting existing buildings, which significantly reduce the building's energy use and greenhouse gas emissions.

As a result of three annual funding rounds completed to date, nearly $1.5 million in grant funding has been committed to support 10 projects, including the installation of a green wall and green roof systems, the development of a solar façade, the installation of ceramic fuel cells, and a tri-generation plant. Three feasibility studies have been completed and results made publicly available. The construction of the green wall and green roof systems were completed in mid 2011 and their performance will be monitored for 12 months.

Cool Roofs

The Cool Roofs program 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 over the year by around 10%.

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, are planned to come into operation from May 2012.

Encouraging Sustainable Behaviour

Awareness and Behaviour Change Program

The State Government has worked with the Conservation Council to deliver a $230,000 Sustainability Community Grants Program to fund 28 projects that support a grass roots community response to climate change.

The community projects were successfully completed and feedback from the groups involved was overwhelmingly positive. While the majority of the projects would only have achieved only small emission reductions, the community response to the Grants Program is the greater indicator of success. Over 90 applications were received for funding, and there is a strong request from community groups to continue the grants program if more funding becomes available in the future.

The State Government also worked with the Conservation Council to deliver the Green Hubs community engagement program. Developed and implemented by the Council, this program works with community clubs and societies to implement practical changes to make their facilities more environmentally sustainable and influence the behaviour of their members and local communities.

The Green Hubs program has continued from a successful pilot program to expand the number of clubs involved in 2010-2012 from 8 to 12. These clubs have a combined membership of over 15,000 and are very supportive of the program; currently working on audit suggestions that will save over 100 tonnes of CO_2 per year and over 1,700 kilolitres of water per year.

In 2008-09, the State Government also provided a contribution towards a South Australian-based Energymark trial run by the CSIRO in late 2009. The results from the CSIRO Energymark trial indicated good success in changing knowledge and behaviours, but at a high cost per person. This was deemed too expensive under existing resources to implement.

Safer, Greener and More Active Travel Community Programs

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 range of programs including:

- the *Local Government Partnership Program* which collaboratively works with Councils to deliver projects that reduce car use through safer, greener and more active travel
- the *TravelSMART Households Program* 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 Program* which is a safer, greener and more active travel program 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 Program* 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 travel.

This is achieved through implementation of workplace specific initiatives and small scale projects over a two year timeframe.

- *the TravelSMART Grants Program* which is available to organisations to deliver a wide range of travel behaviour change initiatives including increasing walking and cycling modes and increasing use of public transport; smarter car use, e.g. carpooling or combining trips; reducing the distances travelled by car, e.g. encouraging the support of local shops, services and activities; eliminating some journeys, e.g. by working from home, using phone or internet.

Education Curriculum: *Sustainable and Attainable, Tackling Climate Change*

Sustainable and Attainable: Tackling Climate Change is a climate change education resource available to teachers across South Australia. The resource supports learning and action to address climate change in schools and preschools. The resource includes auditing tools for energy, water, waste and biodiversity.

The program web site is regularly updated and provides educators with a set of resources to integrate climate change education into learning areas, multidisciplinary and whole school approaches to learning.

Waste Avoidance, Reduction and Recycling Programs

The South Australian Government, through its grant programs and activities administered by 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.

Recycling substantially improves South Australia's environment by saving energy, conserving resources and reducing emissions of greenhouse gases to the atmosphere.

Annual Recycling Activity Survey's commissioned by Zero Waste SA indicate that South Australia's recycling efforts 2009-10 prevented the equivalent of approximately 970,000 tonnes of CO_2-e entering the atmosphere. Greenhouse gas savings estimated for 2009-10 were 9% greater than that reported in 2008-09. This increase is due to greater material recovery.

Australian Service Excellence Standards for community organisations

The Department for Communities and Social Inclusion supports the community services sector in improving quality of services and organisational systems through the Australian Service Excellence Standards.

The standards provide a total quality management and accreditation system, specifically developed for the community service sector, and have recently included measures to reduce the environmental impact of organisations operations and service delivery.

Adaptation

South Australia's Draft Climate Change Adaptation Framework

The Draft Climate Change Adaptation Framework (when finalised) is intended to provide the foundation for South Australians to develop well-informed and timely actions to increase their preparedness for the impacts of climate change. It will guide

action by government agencies, local government, non-government organisations, business and the community. A draft of the Framework was released for consultation in December 2010 and an extensive community consultation process finished in March 2011. The Framework is currently being finalised.

Primary Industry Development under Changing Climatic Conditions - Adaptation

PIRSA's *Climate Change Management Framework* (2011) identifies strategies and proposed action in South Australia's primary industries (agriculture, fisheries, aquaculture, forestry, minerals and energy resources sectors) to support ecologically and economically sustainable development under changing climatic conditions.

The following projects are some of the programs, research and trials led by PIRSA to improve the resilience and sustainability of this sector.

- *Land use planning*

  PIRSA is undertaking a mapping program that will assist implementation of policies in the *30-Year Plan for Greater Adelaide* to incorporate areas of primary production significance into local government development plans. Identification and agreement on these areas will enable government to consider the introduction of stricter controls on forms of development not directly related to primary production.

- *Drought Response*

  PIRSA's five year drought response program has just been completed and had an emphasis on improving the strategic planning and risk management of farmers. There were 1600 farm businesses that participated in the "Planning for Recovery" program that provided grants to farmers to engage a strategic planning consultant to assist in the preparation of a plan and to implement projects identified in the plan that underpin preparedness for the next event.

- *South Eastern Australia Program*

  The South Eastern Australia Program (SEAP) aims to prepare marine fisheries and aquaculture sectors, and those responsible for fisheries management, to adapt to future changes. This is vital for meeting the challenges and capturing opportunities ahead. SEAP is not a strategy or a plan, but a program to coordinate projects to implement action and answer priority questions, and coordinate work across jurisdictions.

- *Biodiversity Corridors*

  This project aims to improve the connectivity and extent of ecosystems locally and at landscape scales. PIRSA Forestry is the lead in a biodiversity corridor program across the Lower South East that has established revegetation to link areas of isolated native forest. The community, including a number of schools, has been heavily involved in the biodiversity corridor program by helping to plant and maintain the corridors. This provides opportunities for school students to learn about connectivity, climate change, adaptation and forests - covering many curriculum areas and providing students with hands-on outdoor activities.

  Annual monitoring has shown that many bird species are using the revegetated corridors more than the surrounding landscape, demonstrating that the project has succeeded in increasing connectivity. This gives animals greater opportunity to move through the landscape as climate changes and different resources become available in different areas.

- *Forests - Weed control*

  PIRSA Forestry has instigated the SE NRM and Forests Pest Management network in April 2010, with membership from key forest industry entities and the SENRM Board, with the purpose of coordinating and improving pest plant and animal control on the forest estate and providing timely response to pest management threats arising from climate change.

- *Transects for Environmental Monitoring and Decision-Making (TREND)*

  The TREND program (http://www.trendsa.org.au/) is monitoring South Australia's environment to evaluate the impacts of potential climatic and environmental shifts. It will establish a network for climate change adaptation, which will coordinate activities through the Agriculture Food and Wine and Natural Resource Management and Climate Change nodes of Constellation SA. The project provides a two-way flow of information between science and decision makers at multiple levels (including policy, industry, individual enterprise and community groups) to develop improved climate change adaptation strategies for natural and production systems in South Australia.

Coastal Management

DENR provides direct support to the Coast Protection Board (CPB), whose strategic priorities for 2009-2014 are:

- adaptation of existing development to coastal hazards and the impacts of climate change
- ensure new development is not at risk from current and future hazards
- plan for resilience in coastal ecosystems to adapt to the impacts of climate change.

To this end, Business Plans include a range of projects and initiatives where the objective is to prepare South Australia for the anticipated impacts of climate change, and in particular rises in sea levels and the frequency and magnitude of extreme weather events.

Program Priorities

- DENR administers the CPB's works programme ($499,000 in 2010-11), which prioritises vulnerability assessments and protection strategies and works. Funding is largely delivered to councils to undertake these activities and works.
- DENR officers also responded to Development Applications referred to the CPB by planning authorities under the *Development Regulations 2008*. These responses aligned with the CPB's policies

  (http://www.environment.sa.gov.au/Conservation/Coastal_Marine/Coast_Protection_Board/Policies_strategic_plans).

- DENR was assisted in responding to reviews and amendments of development plans through the statutory review process. DENR coastal staff provided in-kind support and advice to the Central Local Government Association's Central region climate change vulnerability assessment and is contributing to the Western regions assessment.
- The CPB also fund a coastal survey program to monitor coastal erosion. Over 400 sites across the South Australian coast where development is vulnerable have been regularly monitored since 1975. Coastal officers within DENR

undertake this monitoring work involving precise measurement of beach and seabed levels. This data is utilized by scientific and engineering staff located in DENR to develop management strategies and sustain ongoing management activities such as sand management along Adelaide's beaches. Baseline aerial photography funded by the Board in the 1970's also enables current and future shoreline change being measured.

- The CPB's works programme expended over $330,000 on grants to local councils for protection works, hazard identification and investigations. These included continued construction of flood levees at Port Augusta and detailed design of an upgraded seawall for Christies Beach. All protection works assisted by the CPB and DENR incorporate adaptation for climate change-induced sea level rise.

Natural Resources Management

- *Soils and Land Management*

  Soils and land management is about developing and implementing policy and projects for the sustainable management of the State's agricultural and pastoral landscapes under a changing climate. In particular it involves investigation of climate change impacts on land condition and protection, and the evaluation of carbon sequestration opportunities.

  DENR has entered into a partnership with CSIRO to deliver the South Australian component of the National Soil Carbon Research Program. This program is assessing the impact of farming system and management on the amount and type of soil carbon and the opportunity for the soil to act as a carbon sink. Other work is exploring the opportunity for improving sequestration of soil carbon by increasing the clay content of sandy soils.

- *Aquatic and Marine Environs Research*

  Targeted climate change focused research projects have been undertaken that deal with the aquatic and marine environs including identifying climate change adaptation strategies to inform wetland and floodplain management along the River Murray in South Australia. This project identifies aquatic-ecosystem dependent species that are vulnerable to the impacts of climate change.

  Through the Wetlands and Waterbirds Taskforce, the South Australian Government is contributing to a national issues paper which will consider the role of wetlands in carbon cycling and biodiversity conservation, the implications of climate change on these functions/services, and the potential use of wetlands for carbon sequestration.

- *Threatened Species and Ecological Communities*

  The Threatened Species and Ecological Communities (TSEC's) Unit works in partnership with other government agencies, NGOs, research institutes, industry, and community groups to provide national, state and regional policy guidance, technical expertise and recovery plans for listed TSEC's in South Australia.

  Identification and prioritisation of objectives and actions for TSEC's 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 adaptive management, but is yet to be directly tested by climate change.

- *Reserve Management Plans*

  Reserve management plans are the most important source of clear management direction for a reserve. The Plans are prepared in consultation with the community

and stakeholders, as a strategic document to facilitate management directions over a ten-year period. Methodologies for incorporating climate change considerations have started to be developed into the plans, including focusing on landscape scale conservation and enabling adaptive management frameworks.

- *Seed Bank*

  The South Australian Seed Conservation Centre (SASCC) is one of 14 organisations comprising the Australian Seed Bank Partnership. This has been formed to safeguard Australia's flora and plant communities against extinction. One of the threats to survival of our flora is climate change.

  Seed scientists at the SASCC have been working on developing a screening tool to identify native plant species at risk of decline as a result of climate change.

  Since the program's inception, seed preparation and storage techniques have been researched and improved, reducing the wastage of seed and resources. All seed collected is sampled for viability; this information has greatly enhanced our understanding of the genetic health of our plant populations.

  The conducted seed germination trials provide information for practitioners involved in the restoration of natural landscapes, thus improving the efficiency and quality of their work. The trials primarily help to determine the germination triggers for species difficult to propagate; thus ensuring a better mix of plants for inclusion in revegetation programs. 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 seed has led to a better understanding of the distribution and abundance of our native flora. Not only is this knowledge allowing for improved accuracy and reliability of the State's databases, it also contributes to DENR's on-going revision of the rare and threatened schedules under the *National Parks and Wildlife Act 1972*. Most importantly, through searching for these species, it is possible to understand which species and which populations are declining, possibly due to or exacerbated by climate change.

  The enhanced sharing of knowledge between States and contributing partners is an implicit but important component of the program's effectiveness.

- *South Australian TRansect for ENvironmental monitoring and Decision making (TREND)*

  As discussed previously, the TREND program is providing a system and a network for climate change monitoring in South Australian terrestrial (natural and production) and marine systems. It is providing recommendations for adaptive management while establishing transects and a data collection system across South Australia to monitor and predict the impacts of climate change. This will provide the State with a climate change early warning system and a legacy of long term monitoring, giving the State the necessary tools to adapt to climate change. The program will provide tangible evidence-based adaptation options for policy makers and environmental managers. http://www.trendsa.org.au/.

Planting for Biodiversity

- *Trans-Australia Eco-Link*

  The Trans-Australia Eco-Link is a joint initiative between the South Australian and Northern Territory governments to establish a 3,500 kilometre-long corridor of connected landscapes and natural places from Spencer Gulf in South Australia to the Arafura Sea and Arnhem Land in the Northern Territory. In South Australia,

implementation projects will deliver enhanced sustainable land management in the rangelands which aim to increase landscape and socio-economic resilience to climate change and other threats.

- *NatureLinks*

  NatureLinks is South Australia's primary strategy to guide on-ground action to increase the resilience of biodiversity to climate change. Conservation efforts are focussed within five NatureLinks corridors across the State: Arid Lands, Cape Borda to Barossa, East meets West, Flinders-Olary and River Murray-South East. Within these areas, the NatureLinks program aims to:

  - Protect and restore native habitat and ecosystems
  - Coordinate conservation efforts across private and public land
  - Encourage sustainable farming practise
  - Improve nature's resilience to change

  The Trans-Australia Eco-Link incorporates the Flinders-Olary and Arid Lands NatureLinks.

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

  Jointly funded by the Australian and South Australian Governments, this program is funded over five years and aims to restore wetland habitats and ecological process within the CLLMM Region - particularly in relation to the management of acid sulfate soils. The underlying philosophy of the program is to provide resilience in the environment in-order to cope with changes in climatic scenarios and water availability.

  The effectiveness of carbon to mitigate acid sulfate soil is also being studied by Southern Cross University and other institutions. There is now scientific evidence that the program is achieving this aim.

- *River Murray Forest Project*

  The State Government River Murray Forest initiative was launched in August 2007 to plant 2.5 million native trees and shrubs throughout the River Murray corridor between the State Border and Tailem Bend, and to the southern extent of the River Murray.

  Through this project a total of 2,695 hectares have been commissioned for planting to provide biodiversity and carbon sequestration benefits.

- *Million Trees Program*

  The Million Trees Program has the goal of planting 3 million locally native trees and plants by 2014. Over 1,000 hectares of plantings have already been established and when completed, the program will have reconstructed approximately 2,000 hectares of predominantly woodland habitat. 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 program.

Policy Development for Natural Resource Management

- *State Natural Resource Management Plan Review*

  Under the *Natural Resources Management Act 2004* the State NRM Plan must:

  - assess the State and condition of the natural resources of the State

- identify existing and future risks of damage to, or degradation of, the natural resources of the State
- provide for monitoring and evaluating the State and condition of the natural resources of the State on and ongoing basis
- set out or adopt policies with respect to the protection of the environment and the interests of the community through the operation of the Act.

Updating the State NRM Plan involved extensive stakeholder consultation which was guided by the *State and Condition of South Australia's Natural Resources 2011* report. The report identified the importance of considering climate change in the formulation of NRM plans.

DENR also undertakes scientific and research studies and policy development for climate change adaptation and in carbon farming and carbon markets.

Water for Good

Water for Good is South Australia's strategy to ensure safe, reliable water supplies to 2050, and preparing for the future impacts of climate change. *Water for Good* includes measures to diversify water supplies through desalination, stormwater and wastewater recycling, improve the way we allocate and use water, and improve and modernise the water industry. Collectively, these actions will ensure the State has a secure and reliable supply of water to support the growth of our population and economy into the future, while preserving both our quality of life and the environment.

As reported in the *Water for Good* Annual Statement 2010 and Progress Report Card 2010, significant progress is being made implementing *Water for Good*'s 94 actions since the release of the Strategy in June 2009, in particular in the areas of water supply diversification and reform of the urban water sector.

The *Water for Good* Annual Statement 2010 also reported on the demand and supply for Greater Adelaide. Based on the most current science, *Water for Good* demand and supply projections assume that climate change impacts will reduce inflows to the Mount Lofty Ranges storages by 41% by 2050 – a gradual reduction of one per cent per annum. The review of demand and supply for Greater Adelaide, undertaken in late 2010, found there was no decrease, but year-to-year natural variability is not unusual and is expected even in an environment of long-term climate change. *Water for Good* projections and assumptions remain valid.

Emergency Management, SA Fire and Emergency Services Commission

- *State Hazard Plans*

  The State Emergency Management Committee has identified 10 State emergency hazards that require a State Hazard Plan. Of these hazards, it is bushfire, flood and extreme weather that will potentially be impacted by climate change - resulting in the potential for more frequent and extreme emergency events. A particular focus in 2010-11 has been adaptation and response planning for floods and heatwaves.

- *Extreme Hot Weather*

  Heatwaves kill more Australians than any other natural disaster. The incidence of severe and extreme heat events in southern regions of Australia has been considerable and is projected to increase.

  The triggers for activating the South Australian Extreme Heat Response Plan were amended in 2011 in response to the recent studies on *Extreme Heat in South*

Australia are Defining and predicting Excessive Heat Events, a National System 2009 (Nairne, Fawcett and Ray; Australian Bureau of Meteorology) and *Morbidity and mortality during heatwaves in metropolitan Adelaide 2007* (Nitschke, Tucker and Bi). These reports can be accessed at: http://www.cawcr.gov.au/events/modelling_workshops/workshop_2009/papers/NAIRN.pdf and http://www.ehjournal.net/content/10/1/42.

In 2011, the Royal District Nursing Service of SA (RDNS) received Natural Disaster Resilience Grant funding to work in partnership with the University of Adelaide, Torrens Resilience Research Institute and the Flinders University to develop a *South Australian Framework for Policy and Action – Building Community Resilience to Extreme Heat Events*. Also the Department of Health in partnership with the University of Adelaide is further assessing the Extreme Heat Arrangements triggers in South Australia. Both of these publications will be available in 2012.

- *Flood*

  The Department for Water is contributing to the development of a nationally consistent approach to flood mapping and modelling. The project is including research on the impact of climate change on sea level rise and rainfall patterns.

  The Department for Water is also completing five risk assessments of the highest flood risk catchments in South Australia. There is currently insufficient knowledge on predicted change to rainfall patterns, however, knowledge of climate change impact on sea level rise has been factored into flood risk assessments of the Patawalonga Catchment and Western Adelaide Catchments of the Port River. The National Climate Change Adaptation Research Facility (NCCARF) is working to address the current knowledge gap on climate change impact and rainfall patterns

- *Natural Disaster Resilience Program (NDRP)*

  The NDRP is a joint funded program of the Commonwealth and South Australian Governments. The NDRP funds projects that enhance South Australia's resilience to natural disasters and in 2009-10 and 2010-11 the program has contributed funding to the following climate change adaptation projects:

  - the Central Regional LGA Climate Change Vulnerability Assessment.
  - identifying and evaluating potential sea level rise adaptation strategies for the coastal settlements of DC Mallala
  - the Southern Adelaide Region Change Vulnerability Assessment and Adaptation Action Plan
  - the Western Adelaide Region Climate Change Adaptation Plan
  - the RDNS – Building Community Resilience to Extreme Heat.

Health support, information and risk assessment research

The Department of Health is undertaking research to support adaptation of the South Australian population to the effects of climate change - particularly extreme heat events. 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* describing heat related conditions and what to do if people have any symptoms, along with practical tips on preparing for and coping during periods of extreme heat. The guide and topic specific fact sheets are available on the SA Health website. 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 which 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.

Collaborative adaptation research undertaken by SA Health (Public Health) and the University of Adelaide (Discipline of Public Health) has also resulted in a number of successful study grants investigating population groups that are likely to be more at risk during extreme heat. This includes studies of risk factors for people who were admitted to hospitals or died during the 2009 heat wave, the elderly, rural communities and those from culturally and linguistically diverse communities. These studies are currently ongoing. Research into temperature triggers and thresholds associated with adverse health effects has been completed. The results will lead to a number of scientific papers and stakeholder reports which will inform adaptation to extreme heat policies and assist in reduction of avoidable extreme heat-related health effects.

A SA Health Omnibus Survey *'Report on how SA adults respond to influenza and heatwaves'* April 2010 verified the importance of having heat health information, as well as other strategies, to raise awareness with the public.

Lower Emission Transport Options

Public Transport – SASP Target 63

SASP includes Target 63 *Increase the use of public transport to 10% of metropolitan weekday passenger vehicle kilometres travelled by 2018.*

The South Australian Government has 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.

The outcome of the plan is to increase public transport usage to 10% of metropolitan weekday passenger vehicle kilometres travelled by 2018.

Cycling and Walking – SASP Target 2

The development of a number of bicycle projects across the State includes providing subsidy funding to local councils to encourage them to improve local networks and further development of the Amy Gillett Bikeway and the Adelaide to Marino Rocks Greenway.

Adelaide's network of bicycle lanes and paths has been extended from around 480 kilometres in 2002 to about 1,061 kilometres in 2011.

ABS Census data indicates cycling as a mode of travel for work in South Australia increased by 34% from the 2001 to the 2006 census. Walking as a mode of travel increased by 4% from the 2001 to the 2006 census.

The ABS *Survey on Environmental Issues: Waste Management and Use of Transport* indicated that from 2006 to 2009 the mode share of those cycling to work or full time study in South Australia increased from 2.2% mode share to 2.8% (an increase of 27%). Walking increased from 3.5% to 3.6% (an increase of 3%).

Annual Adelaide City Cordon Counts indicate that numbers cycling to and from the city on a typical day have increased by an average annual rate of 9.9% from 2007 to 2011. Walking numbers have decreased at an average annual rate of -2.6%.

Low emission vehicles

In response to advice from the Premier's Climate Change Council tabled in Parliament in September 2009, the Government is developing a Low Emission Vehicle Strategy and a discussion paper was released in late 2010. To ensure that the strategy is informed by industry experts an Industry Reference Group has been established and consultation occurred with this group in 2011.

The strategy is now being developed by a cross-agency working group and will outline the roles and future actions of the South Australian Government in relation to low emission vehicles.

In 2010 the South Australian Government announced a new target for its own passenger vehicle fleet. This will have flow on effects to the greater South Australian vehicle fleet and is discussed further under 'Government Leadership' on page 75.

As noted in Section 9, the South Australian Government is a member of The Climate Group's EV20 initiative which aims to accelerate the global uptake of electric vehicles by 2020.

Green Futures – Moving to a Low Carbon Economy

RenewablesSA

RenewablesSA commenced in mid-2009 to provide a single focus for the Government's efforts to draw more renewable energy to the State. The initiative consists of the RenewablesSA Board and Commissioner for Renewable Energy to develop and oversee the implementation of a framework for attracting renewable energy investment to South Australia and to recommend disbursements from a $20 million Renewable Energy Fund.

Wind energy is an important part of the State's energy mix and already contributes over 20% to the State's electricity generation. Wind and other renewable energy technologies will continue to play an important role in the progress towards the South Australian Government's further commitment under the State's Strategic Plan of having one third of electricity production from renewable energy sources by 2020.

The achievement of this target is important to creating a competitive advantage for the State's economy as it would also result in the carbon intensity of the State's electricity generation falling to around 0.5 tonnes of carbon dioxide equivalent for each megawatt hour produced.

This result, which would be two thirds of the predicted outcome for Australia,[1] would make the economy less vulnerable to the cost impacts of carbon pricing and position South Australian businesses better in terms of competing in carbon sensitive markets.

The management of South Australia's world class renewable energy resources with informed and effective policies will be an enduring part of the State's strategy for moving towards a low carbon intensity economy.

The summary below provides an overview of RenewablesSA's activities for the reporting period.

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[1] Projected carbon intensity for South Australian Renewable Energy Target in 2020, McLennan Magasinik Associates, January 2010.

- *Renewable Energy Target – SASP Target 64*

  Renewable energy: Support the development of renewable energy so that it comprises 33% of the State's electricity production and consumption by 2020.

  In 2010-11, renewable energy accounted for 22.0% of the State's total energy production compared to 14.8% in 2008-09.

- *South Australia's Renewable Energy Plan*

  In October 2011 RenewablesSA released a landmark renewable energy plan for South Australia, which provides an agenda for the future growth of the State's renewable energy sector. It builds on South Australia's leadership in hosting wind and geothermal energy investment, and pioneering support for household solar.

  The South Australia's Renewable Energy Plan is built around five key strategies for supporting renewable energy investment and generation in South Australia. These are: providing quality information; having the most efficient and certain regulatory environment; selectively intervening to address market failures; government leadership by example; and positioning South Australia to take advantage of National policy settings, including the Commonwealth's Clean Energy Future Package.

  A key strategy articulated in the Plan is a role for Government to provide the nation's most competitive regulatory and lowest fee charging environment for investors. South Australia is the first and only Australian jurisdiction to introduce a payroll tax rebate for the construction phase of wind and solar projects. In October 2011, RenewablesSA released draft legislation to provide renewable energy investors with access to the 40% of South Australia's land mass that is Crown Land subject to pastoral lease.

- *Wind Farm Policy and Planning framework*

  In conjunction with the Plan, RenewablesSA released a new policy and planning framework for wind farm developments. With more than half of the nation's wind farm investment, South Australia has a national responsibility to lead in reforming policy to respect the interests of both community and industry alike.

  The wind farm reforms are an important complement to South Australia's Renewable Energy Plan. The new wind farm rules will take immediate interim effect and have been developed to achieve a balance with an interest in ensuring that both local communities and industry are served by the overall package.

  The wind farm planning framework is intended to reinstate local councils as the key authority for assessing planning applications for wind farms. The reform policies combined with the processes for implementing them will help to move investment away from populated areas. They will set new restrictions for distances between wind farm developments and dwellings, while giving greater assurance and consistency to wind farm investors.

  The main elements of the package include:

  - amendment of Council Development Plans to provide greater consistency for assessment of wind farm development applications
  - requiring that developers manage the visual impact of their developments, which includes requiring that turbines be located at least 1 kilometre from dwellings (unless both parties agree to a lesser distance)

  - removal of the capacity for appeal by third parties against proposals that are consistent with this approach and are located in sparsely populated zones
  - similarly, removal of third party appeals against proposals in sparsely populated zones where turbines are located more than two kilometres from the periphery of country towns.

- *Green Grid Project*

  RenewablesSA recognises the Green Grid project presents a particularly outstanding opportunity as potentially Australia's first renewable energy province, and is currently establishing the case for having the infrastructure classified as a regulated asset. The Green Grid study commissioned by the Government identified a commercial case for 2,000 megawatts of wind generation on the Eyre Peninsula, a sparsely populated area with outstanding wind resource. The project has capacity to contribute 15% to the national renewable energy target, at lower cost than the cost of adding wind generation incrementally to existing grid infrastructure.

The target of having 20% of energy production by renewable energy sources by 2014 has been met three years ahead of schedule. The achievement of the target in the main reflects the significant contribution that wind power makes to the overall profile of the State's electricity generation.

Geothermal

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 $3.77 million in the term 2005-10 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 provided by the South Australian Government to establish the South Australian Centre for Geothermal Energy Research at the University of Adelaide. Additional support of $2 million to continue the work of the Centre was provided in June 2011.

The South Australian Government has also led the coordination of the national geothermal industry development.

The number of South Australian geothermal licences has grown from 3 in 2004 to 211 as at 30 Septemebr 2011.

South Australia has attracted 86% (estimated to be $584 million of $672 million total) of all investment in Australian geothermal energy exploration projects in the term 2002-2010.

South Australia is home to the 3 most advanced geothermal projects in Australia (Geodynamics in the Cooper Basin, Petratherm in the Flinders Range, and Panax Geothermal in the Otway Basin).

South Australian geothermal projects have also been offered 85% ($200 million of $235 million total) of all Federal Government grants for geothermal projects across the nation.

Carbon Capture and Storage

DMITRE's Energy Resources Division 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 projects.

One gas storage retention licence currently exists in the Otway Basin and twenty five gas storage exploration licence applications for areas in the Officer Basin have also been submitted under the *Petroleum and Geothermal Energy Act 2000*.

DMITRE funding towards the Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC) assisted with the decision made in September 2010 to retain the centre in Adelaide rather than re-locating it to Victoria.

Unconventional Gas as a Transition Fuel

The South Australian Government and Unconventional Gas Roundtable is working toward a roadmap to support the development of South Australia's unconventional gas resources. This will foster the security of competitively priced natural gas supplies for decades to come, and gas is well recognised as the most cost-effective transition fuel to a lower carbon economy. The Roundtable will produce a roadmap for unconventional gas development in mid 2012 to inform government policies and investors decisions in relation to the sustainable and profitable development of unconventional gas resources in South Australia. This is noted in the context of gas-fired electricity generation as being roughly half as emissive as conventional coal-fired generation.

There has been significant interest in the roundtable initiative with, to date, 27 companies, 3 peak lobby groups, the Energy Market Operator, five State Government agencies and observers from both the Victorian State Government and the Australian Government (including the CSIRO) having joined as members of this interest group.

Primary Industry Development under Changing Climatic Conditions – Mitigation

PIRSA's *Climate Change Management Framework* (2011) identifies strategies and proposed action in South Australia's primary industries (agriculture, fisheries, aquaculture, forestry, minerals and energy resources sectors) to support ecologically and economically sustainable development under changing climatic conditions.

The following projects are some of the programs, research and trials led by PIRSA to increase carbon sequestration or reduce emissions of this sector.

- *Forests - Long term Climate Change and Low Rainfall Trials*

  Recent trials have commenced using South Australian native species to identify provenances that adapt best to low rainfall and produce carbon absorbing dense timber.

  Funding support has also been provided for oil mallee trials in low rainfall regions of the Murray Mallee and Eyre Peninsula to identify the most suitable species. Measurement programs are continuing because oil mallees have the potential to increase carbon sequestration in South Australia, provide renewable biofuel that can substitute for non-renewable fossil fuel, give farmers with the opportunity to diversity incomes in changing climates as well as ameliorating soil erosion and enhancing biodiversity.

  PIRSA has datasets derived from climate change research trials and species trials across a range of sites. The first of these commenced 19 years ago in the

Mount Lofty Ranges and monitoring has continued. Plantings are available for landholders to visit and trial results will be made available in reports.

- *Primary Industries - Soil Carbon Review*

  PIRSA has completed a review (Liddicoat, 2010) of the potential for South Australian soils to sequester carbon and to increase soil productivity and health. It provides practical/on-farm and policy measures for increasing soil carbon for sequestration, productivity and soil health.

Premier's Science and Research Fund

The Premier's Science and Research Fund (PSRF) is an initiative of the South Australian Government and the Premier's Science and Research Council. The Fund was established to facilitate investment in key science and research initiatives of strategic and sustainable value to the State. It aims to make transformational investments that have a demonstrable potential to generate significant and sustainable economic, social and/or environmental benefits for the State.

Funding of $4.2 million per year is allocated to strategic research and development projects, which are funded for a period of three years. Over the last eight rounds $31.5 million has been awarded by the South Australian Government though PSRF. Of this $7.1 million has been awarded to projects that focus on climate change or renewable energy.

The State Government is also either an investor or is participating in a number of national Cooperative Research Centres 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 Auto2020 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 $125 million Sustainable Industries Education Centre planned for Tonsley Park is a crucial element of South Australia's sustainability commitment. The Centre will specialise in training more than 8,000 students a year in new green technologies associated with the burgeoning $4.5 billion construction industry which accounts for 8.3% of overall State employment.

The new Centre will allow TAFE SA to increase its existing building and construction course numbers by at least 16%, with new training offered in renewable energy and water operations. In addition to providing the catalyst for development of TAFE SA's wider infrastructure network, the Centre will be an important economic driver for the southern suburbs. Building is due to commence in early 2012.

Green Skills Training Courses

DFEEST has developed a range of vocational training courses that increase the sustainability skills of tradespeople, trainers and key decision makers in industry and government. These include:

- Diploma of Sustainability - for key decision makers and trainers in industry and government to build a common understanding of sustainability across all sectors
- Graduate Certificate in Environmental Compliance – includes environmental law, compliance, and investigating environmental crimes. Jointly devised by

Flinders University Law School and TAFE SA; it is the first higher education qualification of its type in Australia

- Short Course in Carbon Accounting - provides practical skill (and compliance with Australian Accounting standards) for environmental managers, accountants and sustainability practitioners
- Skills in Environmental Sustainability Pilot - an industry driven program centred on three pilot sustainability projects:
    - Solar Panel Grid Connect training to alleviate a backlog of demand for solar panel installation in the metropolitan area
    - Suzlon Wind Turbine maintenance training program to upskill the existing workforce at Suzlon Energy Australia to maintain wind turbines
    - Sub-surface Irrigation Project to train Berri Barmera Council staff involved in the installation of 'state of the art' subsurface irrigation system across 52 hectares of council's parks and gardens.

'Skills for All' Reforms to the Vocational Education and Training in South Australia

Announced on 10 February 2011 the 'Skills for All' initiative commits an additional $194 million over the next six years to support an increase of 100,000 training places. The reforms will also provide a vehicle to meet the Commonwealths *GreenSkills* sustainable training agenda, as well as South Australia's future sustainable training needs delivered through the new $125 million TAFE SA Sustainable Industries Education Centre.

For training to meet current industry standards there is a need to upgrade and provide infrastructure that meets specialised training needs and will provide flexible learning, e-learning and increased training in new skill areas such as sustainable technologies.

Zero Waste Industry Program

Zero Waste SA (ZWSA) is part of the Business Sustainability Alliance (BSA) in partnership with DMITRE through Innovate SA, SA Water and the EPA. ZWSA delivers as part of its commitment to the BSA the Zero Waste Industry Program, a program which helps businesses, industry and government to understand, develop and implement cost-saving resource efficiency measures. In doing so, the companies and organisations also build capacity to deal with a range of rapidly emerging environmental, financial and social imperatives.

The Zero Waste Industry Program has successfully engaged with a wide range of small, medium and large enterprises. In 2011/12 it is intended to reach approximately 150 sites and 60 businesses per year. The program's effectiveness is enhanced through working at the industry association level in areas as diverse as the print, wine, technology, food and hospitality, defence, mining, manufacturing, health and community services sectors alongside a range of Government public service clients.

EPA Sustainability Licences

The South Australian Government, through the Environment Protection Authority (EPA), offers Sustainability Licences to encourage businesses to go beyond compliance towards best practice. These licences provide recognition for businesses who, in conjunction with a sound environmental compliance record, lead their sector with strong cultures of sustainable behaviour in relation to waste, water and energy. A Sustainability Licence provides a company with an exclusive and distinct marketing

advantage through recognition by a globally recognised brand such as the EPA. Sustainability licences also recognise a company's effort to work collaboratively with government and other key stakeholders in the area of sustainability, hence improving their environmental performance and creating a competitive advantage.

There have been five Sustainability Licences awarded since the commencement of the program in July 2009, with a further 15 under development as of November 2011.

Innovation and Cleantech

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.

Cleantech is one of four key priority sectors identified by the DMITRE as a focus for development. DMITRE released an industry development consultation paper, which was discussed with industry representatives at the recent industry consultation session held at Tonsley Park on 22 November 2011. The results of the industry consultation sessions will form part of a manufacturing strategy green paper, which will be released for further discussion in early 2012.

- *Sustainable Technologies Employment Precinct, Tonsley Park*

  On 1 February 2010, the South Australian Government through the Land Management Corporation purchased the former Mitsubishi site at Tonsley Park

  The South Australian Government has recently completed the site master plan following extensive community and stakeholder consultation with a view to establishing an integrated sustainable technologies employment precinct that will drive the future economic development of the southern metropolitan area.

- *Cleantech Partnering Program*

  As part of its commitment to developing the cleantech industry in South Australia, the State Government has established a $2.15 million Cleantech Partnering Program to be delivered over three years to assist small and medium enterprises commercialise new ideas and products relevant to the rapidly growing market for environmentally responsive products.

  Launched on 19 November 2010, the Program provides innovation grants up to $50,000 for proof-of-concept and commercial viability testing. It also offers commercialisation grants up to $100,000.

  The Cleantech Partnering Program has had a total of 45 applications for innovation grants since its commencement. Eleven applicants have received funding with another four expected from the recently concluded fourth round. Interest in the program and the quality of applicants received to date indicates that the program is helping to foster innovation in the cleantech sector, with a view to successfully launching the innovations to the market.

- *Eco-Innovation Program*

  The Eco-Innovation Program will assist companies to develop innovative solutions that promote a collaborative approach to resource efficiency, waste reduction/reuse and sustainable manufacturing. The program will provide information, tools and techniques, facilitation, research, education and where appropriate, grant assistance to improve resource efficiency and to reduce barriers to improved efficiency between companies, and within supply chains.

- *Business Sustainability Alliance and Energy Efficiency Program*

  The Business Sustainability Alliance (BSA) was developed in 2009 as an initiative of four agencies (DMITRE, SA Water, Zero Waste SA and the EPA) to provide a single access point for business, to build resource efficiency and support business development. The Alliance targets reduced water and energy consumption, increased recycling and lean manufacturing to improve profitability using fewer resources.

  The BSA is now engaged over 350 businesses with a range of clean technology programs designed to accelerate the uptake of sustainable business practices. A 2010 evaluation of the BSA pilot indicated that the program had yielded annual savings of $12.1 million and over 5,000 tonnes of greenhouse gas emissions.

  Through the BSA Energy Efficiency Program, the South Australian Government will provide $300,000 over three years, commencing in 2010-11, to help businesses identify initiatives to improve energy efficiency. This program was launched on 19 November 2010 and is being delivered through Innovate.

  There were 11 successful applicants in the first two rounds. Results from the 6 audits completed to date from Round 1 identified potential savings of about $427,000.

- *Water Industry Alliance:*

  In 2009-10 the State government entered into an agreement to provide the Water Industry Alliance with $600,000 over three years to fund the organisation's industry development activities.

  The Water Industry Alliance promotes business opportunities to its members in a range of areas including desalination, stormwater harvesting and waste water re-use.

South Australian Tourism Commission

The South Australian Tourism Commission is a member of the National Industry Resilience Working Group established under the National Long Term Tourism Strategy (NLTTS). The role of this group is to investigate external factors impacting tourism, such as climate change and external shocks, and to develop recommendations for dealing with these. One of the Group's main focus to date has been climate change. Programmes to assist small businesses in adapting to climate change have been identified and a list is publicly available on the NLTTS publications web page: http://www.ret.gov.au/tourism/nltts/publications/Pages/default.aspx.

In 2008 the South Australian Tourism Commission, together with the Great Barrier Reef Marine Protection Authority, provided funds for the development of a new Climate Action Certification program for tourist operators. The program allows the travelling public to identify operators who are committed to reducing their carbon emissions. This program is administered by the South Australian Tourism Industry Council on an ongoing basis.

There are three levels of certification. To date four businesses have attained certification as Climate Action Leaders, 14 businesses have attained certification as Climate Action Innovators and ten businesses have attained certification as Climate Action Businesses.

Government Leadership

Government Energy Efficiency – SASP Target 61

SASP includes Target 61: *to improve the energy efficiency of Government buildings by 30% from 2000-01 levels by 2020,* with an interim target of 25% by 2014. The target covers all non-commercial agencies, as defined in the General Government sector of the SA budget papers, published annually by the Department of Treasury and Finance.

The two largest energy users in Government are the Health and Education portfolios. Energy efficiency in hospitals has been the major contributor to progress against the SASP target.

The Department of Education and Child Development has also shown a commitment to energy reduction through the now completed SA Solar Schools Program and Green School Grant program. Currently schools and preschools are given support to reduce energy consumption through a range of strategies outlined in the *'4E' Energy Management Guide for Schools and Preschools* available on the Capital Programs and Asset Services website at www.decd.sa.gov.au/assetservices/pages/topiclisting/topiclistinge. .

Since 2000-01, the South Australian Government has achieved a 16.7% overall energy efficiency improvement in its (owned and leased) buildings. This is more than halfway towards achieving SASP Target 61 but is slightly behind a linear pathway, which would require a 17.9% improvement.

There are currently 15 portfolios, comprising all agencies of Government, which report energy consumption and business measures. Portfolios reported individual energy efficiency improvements of up to 52.8% on base year levels.

Energy efficiency improvements can generally be attributed to portfolios moving to more energy efficient buildings, undertaking building upgrades or refurbishments that utilise more efficient equipment, adopting behavioural change programs, and increasing the output of services, people or space without a significant effect on their total energy consumption.

Fleet Target

In December 2010, the South Australian Government established a new target to reduce emissions in the State Government Fleet by 10% by 2014-15 over the 2009-10 level based on average greenhouse gas emissions (CO_2-e) grams per kilometre travelled.

Achievement of the target is expected to reduce the greenhouse gas emissions from the State Government passenger and light commercial motor vehicle fleet by approximately 3,556 tonnes CO_2-e. The program will have a flow on effect to the secondary vehicle market when they are sold to the wider public community after their relatively short fleet life.

The South Australian Government purchased two of the first volume production electric vehicles to be released in Australia – the Mitsubishi iMiEV – so as to pilot the use of electric vehicles in the Government fleet.

The South Australian Government achieved its previous fleet target to convert 50% of State Government light vehicles to alternative fuels by June 2010.

GreenPower™ purchasing

The Government's electricity contracts currently provide for 20% of total electricity consumption to be sourced from GreenPower™ and this will increase to 50% from 1 July 2014.

Climate Change Sector Agreement Program

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 17 Sector Agreements in operation with industries and community groups as diverse as steel, community services, local government and regional development (for a full list refer to Section 5). This program has been a highly effective industry and regional engagement tool. Sector agreements are very well supported by industry partners and the South Australian Government continues to receive unsolicited requests to participate in the program.

International Leadership

The former Premier, Mike Rann, was the Co-Chair of the State and Regions Alliance, which is a group of 40 sub-national governments that are committed to accelerating action on climate change.

Under the *Statement of Federated States and Regional Government of Low Carbon and Climate Resilient Development* , a statement of commitment made at the meeting of the Alliance in Cancun in December 2010, Premier Rann committed the South Australian Government to:

- develop specific policies to reduce greenhouse gas emissions, stimulate green jobs and promote energy security in the following areas:
    - decreasing energy use
    - promoting energy efficiency
    - supporting the transition to a sustainable transport system
    - encouraging renewable energy generation
- explore sectoral agreements between states and regions on renewable energy, energy efficiency, alternative fuel and electric vehicles
- provide further support to regions in developing countries.

Leadership for the geothermal industry

The South Australian Government has provided national leadership for Australia's embryonic geothermal sector. It does so by providing:

- the Secretariat for the peak geothermal whole-of-sector cluster, the Australian Geothermal Energy Group (The AGEG). The AGEG has 108 organisational members (86 companies, 13 universities, and 9 government agencies from all States, the Northern Territory and the Australian Governments)
- the contracting party and Australia's Executive Committee representation to the International Energy Agency's geothermal cluster under the Geothermal Implementing Agreement; and reducing information asymmetries in regards to geothermal research, demonstration, development and deployment across Australia

- elected representation for Australia and the international geothermal community on the Board of the Geothermal Resources Council
- Australia's only Coordinating Lead Author for the Renewable Energy Report published by the Intergovernmental Panel for Climate Change, with a focus on chapters covering messages for policy makers and geothermal energy
- Australia's convener for the International Partnership for Geothermal Technologies working group addressing the risk management of induced seismicity associated with fracture stimulation of hot rocks that is a part of developing Engineered Geothermal Systems; and
- supporting a 'Team Australia' approach to international conferences – to boost awareness of Australia's great prospects for the development of geothermal energy as emissions-free based load and dispatchable energy for electricity generation and direct use for centuries to come.

Attachment 3 - Publications and conference papers authored by SARDI scientists

PIRSA - South Australian Research and Development Institute

The South Australian Research and Development Institute (SARDI) has carried out research that provides further scientific support for understanding and responding to climate change in primary industries. Following is a selected list of publications and conference papers, authored or co-authored by SARDI scientists.

1. Hayman PT. 2011. Choices, chances and chocolate wheels: communicating climate risk. Keynote address to Australian Mathematical Sciences Institute Symposium. . In 'Greenhouse 2011', Cairns.
2. Hayman PT, Crean J., Predo C. 2011. A Systems Approach to Climate Risk in Rainfed Farming Systems, in: P. Tow, et al. (Eds.), Rainfed Farming Systems, Springer, Dordrecht. pp. 75-97.
3. Hayman PT, Lemerle D, Rickarts L, Eckard R, 2011. Climate change impacts, adaptation and mitigation at the farming systems level in Australia. Plenary paper for farming systems theme at CCRSPI Conference. The National Climate Change Research Strategy for Primary Industries (CCRSPI) Melbourne). In press for special issue of Crop Science 2012
4. Hayman PT, Alexander BM, 2010. Wheat, wine and pie charts: advantages and limits to using current variability to think about future change in South Australia's climate. In 'Managing Climate Change. Papers from the GREENHOUSE 2009 Conference'. (Eds I Jubb, P Holper, W Cai) pp. 113-122. (CSIRO: Melbourne).
5. Hayman PT, McCarthy MG. 2010. Irrigation and drought in a southern Australian climate that is arid, variable and changing. In 'International Drought Symposium. Water Science and Policy Centre, University of California, Riverside.'
6. Hayman PT, Whitbread A, Gobbett D, 2010. The impact of El Nino Southern Oscillation on seasonal drought in the southern Australian grainbelt. *Crop and Pasture Science* 61, 528–539.
7. Hayman PT, Wilhelm N, Alexander BM, Nidumolu UB. 2010. Using temporal and spatial analogues to consider impacts and adaptation to climate change in the South Australian grain belt. In 'Food Security from Sustainable Agriculture" Proceedings of 15th Agronomy Conference 2010, 15-18 November 2010'. Lincoln, New Zealand. (Eds H Dove, RA Culvenor). (Agronomy Society)
8. Luo Q, Bellotti W, Hayman PT, Williams M, De Voil P. 2010. Effects of changes in climatic variability on agricultural production. *Climate Research* 42, 111-117.
9. Doudle S, Hayman PT, Wilhelm N, Alexander BM. 2009. Farmer's capacity to adapt to climate change- SA case studies. *Agricultural Science* 21, 13-19.
10. Goddard L, Aitchellouche Y, Baethgen WE, Dettinger M, Graham R, Hayman PT, Kadi M, Martinez R, Meinke H. 2009. Providing Seasonal-to-Interannual Climate Information for Risk Management and Decision Making. White Paper for World Climate Congress 3. In 'World Climate Congress 3. Better climate information for a better future.' (WMO: Geneva, Switzerland).
11. Grace WG, Sadras VO, Hayman PT. 2009. Modelling heatwaves in viticultural regions of south eastern Australia. *Australian Meteorological and Oceanographic Journal* 58, 249-262.

12. Hayman PT, Leske P, Nidumolu UB. 2009. 'Climate change and viticulture. Informing the decision making at a regional level. South Australian Wine Industry Association and South Australian Research and Development Institution.' (GWRDC: Adelaide, Australia).
13. Hayman PT, McCarthy MG and Grace W, 2009. Assessing and managing the risks of heatwaves in SE Australian wine regions. *Australian and New Zealand Grape Grower and Winemaker* 543:22-24.
14. Sadras VO, Soar CJ, 2009. Shiraz vines maintain yield in response to a 2-4 C increase in maximum temperature at key phenostages. *European Journal of Agronomy* 31, 250-258.
15. Soar CJ, Collins MJ, Sadras VO, 2009. Irrigated Shiraz vines upregulate gas exchange and maintain berry growth under short spells of high maximum temperature in the field. *Functional Plant Biology* 36, 801-814.
16. Petrie PR and Sadras VO, 2008. Advancement of grapevine maturity in Australia between 1993 and 2006: putative causes, magnitude of trends and viticultural consequences. *Australian Journal of Grape and Wine Research* 14: 33-45.
17. Soar CJ, Sadras, VO and Petrie PR. 2008. Climate-drivers of red wine quality in four contrasting Australian wine regions. *Australian Journal of Grape and Wine Research* 14: 78-90.
18. Ward TM, 2008. Spatial and inter-annual patterns in the spawning dynamics of sardine, *Sardinops sagax*, off South Australia: implications of climate change. Australian Society for Fish Biology Conference, Sydney, 16 - 18 Sept.

SARDI and Adelaide University

19. Wernberg T, Russell BD, Thomsen MS, Gurgel CFD, Bradshaw CJA, Poloczanska ES, Connell SD, 2011, Seaweed communities in retreat from ocean warming. *Current Biology* 21: 1828-1832. doi:10.1016/j.cub.2011.09.028

    Note: This paper is specific to southern Australia, evaluating the changes in macroalgal distribution due to increasing water temperatures since the 1940's.

20. Traill LW, Lim MLM, Sodhi NS, Bradshaw CJA, 2010. Mechanisms driving change: altered species interactions and ecosystem functions from global warming. *Journal of Animal Ecology* 79: 937-947. doi:10.1111/j.1365-2656.2010.01695.x

    This paper is not South Australia-specific but proposes guidelines for pursuing research that quantifies the connection between ecosystem function and global warming. These include documentation of key functional species groups within systems, and understanding the principal outcomes arising from direct and indirect effects of a rapidly warming environment.

    Note: Professor CJA Bradshaw (employed by University of Adelaide and SARDI) has a number of other publications on climate change but they tend towards tropical systems and are not specific to South Australia.

PIRSA - Rural Solutions SA

RSSA has carried out a number of climate-related research programs for DENR and other organisations.

21. DENR & State NRM program - State-wide crop simulation study: "Cropping sustainability & erosion risk under climate change"

22. DENR - Assessment of soil organic carbon opportunities from soil modification
23. Ag Bureau funded by DAFF - Climate variability and farmer response. Land sensitivity analysis
24. Adel Uni and EP NRM - from Premier Science fund - Community climate vulnerability and capacity assessment.
25. Advisory Board of Agriculture funded by DENR and DAFF - Investigation of the opportunity to increase soil carbon storage capacity.
26. DENR - Research into the changes to soil carbon under forage systems
27. Adelaide University funded through the Premiers Science Fund - EP Climate Futures - Adelaide University research into land and production vulnerability & adaptation options on EP.
28. DENR Climate change risk management matrix
29. Eyre Peninsula Climate Change Vulnerability Assessment Report – comprehensive study of the region through assessment of the Five Capitals.
30. Central Regions Climate Change Vulnerability Report – comprehensive study of the region through the triple bottom line, plus workshop
31. Study – 'Understanding the impacts of climate change on Aboriginal communities on Eyre Peninsula'
32. DENR & State NRM program State-wide crop simulation study: "Cropping sustainability & erosion risk under climate change
33. Kangaroo Island NRM Climate Change Community Response – Undertaking community awareness and information dissemination regarding the affects of CC on Primary Industries and their community, including developing community champions.
34. PIRSA - Pest and invasive plant species control; Knowledge gap assessment.
35. DENR and DAFF - Support to PhD investigating extension networks and capacity.
36. assessment of mitigation and adaptation viz infrastructure, residents survey, past and future actions

PIRSA - Agriculture, Food, Wine and Forestry

37. Pinkard L, Bruce J, June 2011, Climate change and South Australia's plantations: impacts, risks and options for adaptation, CSIRO.

    http://www.pir.sa.gov.au/__data/assets/pdf_file/0010/157816/ForestrySA_impact_and_adaptation_report_FINAL_July_2011.pdf

    Note: This report provides a summary of how climate change might affect forestry plantation regions in South Australia.