Report on the operation of the *Climate Change and Greenhouse Emissions Reduction Act 2007* (South Australia)

Prepared under **Section 7** of the
Climate Change and Greenhouse Emissions Reduction Act 2007 (South Australia)

November 2018

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Executive Summary

Net greenhouse gas emissions have reduced by 20 per cent in South Australia between 1989-1990 and 2015-2016. This is significant progress towards South Australia's target "to reduce by 31 December 2050 greenhouse gas emissions within the state by at least 60 per cent to an amount that is equal to or less than 40 per cent of 1990 levels".

South Australia's *Climate Change and Greenhouse Emissions Reduction Act 2007* sets a framework for government to work with business and the community to reduce emissions and build resilience to the impacts of climate change.

Since the previous Section 7 report, which was published in 2015, multiple factors have influenced South Australia's progress towards meeting the greenhouse gas emissions and renewable energy targets including:

- increases in the use of renewables and reductions in the emission intensity of non-renewables for electricity generation
- strengthened land based sinks and reductions in land based sources
- changing agricultural practices
- decreases in electricity consumption and a reduction in electricity generation
- reductions in petroleum gas and in coal extraction and/or processing.

Initiatives and actions that have influenced the reduction in emissions include the Renewable Energy Fund; wind power generators; a premium feed-in tariff for small solar photovoltaic (PV) systems, the Residential Energy Efficiency Scheme; government building improvements; electrification of public transport; and increased uptake of solar power.

1 Introduction

This report has been prepared in accordance with Section 7 of the *Climate Change and Greenhouse Emissions Reduction Act 2007* [1] (the Act). This is the fifth report on the operation of the Act, and provides information about the reporting period for the 2016 and 2017 calendar years. To meet the reporting requirements of Section 7 (Appendix A), this report:

1. provides information about levels of greenhouse gas emissions in South Australia;
2. reports on progress to achieve the renewable electricity targets
3. assesses the effectiveness of South Australia's climate change initiatives
4. describes targets and determinations
5. reports on progress against sector based or interim targets
6. describes climate change agreements
7. provides an overview of offset programs and the national emission trading scheme
8. describes inter-governmental agreements
9. describes significant national or international commitments
10. describes impacts of climate change.

This report also includes an assessment by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) on the extent to which the targets under the Act are being achieved and, if it appears relevant, should be revised.

The first four progress reports were completed in 2009, 2011, 2013 and 2015. They are available from the Department for Environment and Water website[2].

[1] http://www.legislation.sa.gov.au/LZ/C/A/CLIMATE%20CHANGE%20AND%20GREENHOUSE%20EMISSIONS%20REDUCTION%20ACT%202007.aspx

[2] https://www.environment.sa.gov.au/topics/climate-change

2 Greenhouse gas emissions

This section presents an assessment of the progress being made to achieve the greenhouse gas emissions target.

2.1 2015-16 greenhouse gas emissions

In 2015-16, South Australia emitted 26.3 million tonnes of carbon dioxide equivalent ($MtCO_2$-e). Total net emissions are now at their lowest point since the base year of 1990. The 2015-16 financial year is the latest South Australian greenhouse gas data provided by the Commonwealth Government.

Sources of emissions include the following sectors: energy; industrial processes and product use (IPPU); agriculture; waste; and land use, land use change and forestry (LULUCF).

The **energy sector** contributed 63 per cent to total state emissions. This is comprised of 22 per cent from energy industries with the majority from electricity generation, 21 per cent from transport fuels, 12 per cent from other sources including manufacturing industries and construction, and eight per cent from fugitive emissions from fuels such as from the oil and gas and solid fuels industries (see Figure 1).

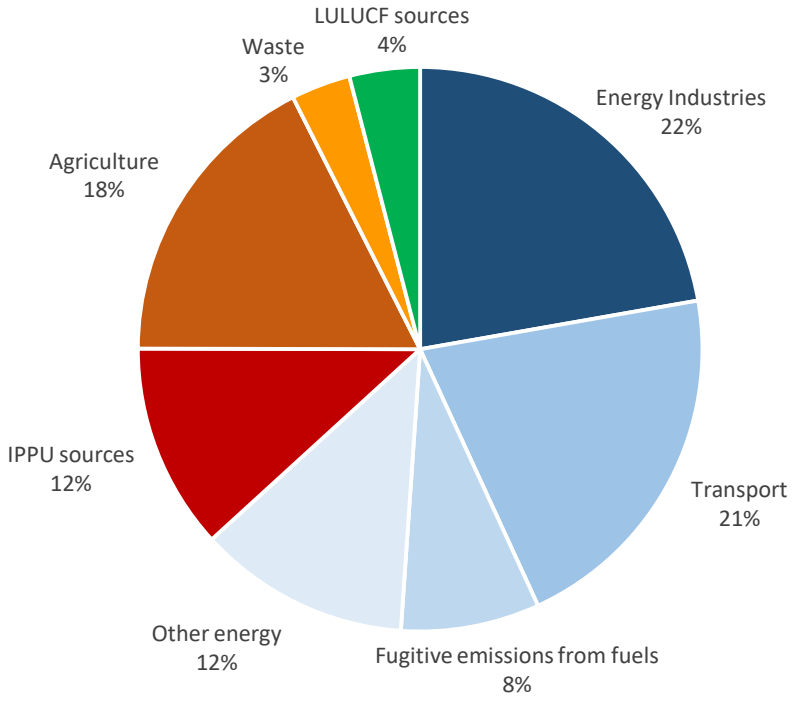


Figure 1: South Australian greenhouse gas emissions by sector in 2015-16[3].

Industrial processes and product use (IPPU) contributed 12 per cent to total state emissions. This includes emissions from the food and beverage industry and the minerals processing industry (including cement and lime production). Emissions from the consumption of halocarbons in air-conditioning and sulphur hexafluoride in electricity supply and distribution have increased steadily since 1990. Hydro-fluorocarbon refrigerants were first used in Australia in 1994 and their use has steadily increased since, as ozone depleting refrigerants are phased out under the Montreal Protocol on "Substances that Deplete the Ozone Layer".

[3] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

The **agriculture sector** contributed 18 per cent to total state emissions. This includes emissions from livestock industries and agricultural soils and soil applications, such as fertiliser use. Emissions trends for this sector are impacted by many factors, including market conditions and climatic conditions such as drought.

The **waste sector** contributed 3 per cent to total state emissions. The majority of emissions from this sector are from municipal solid waste disposal and wastewater treatment and discharge. Emissions from solid waste disposal are influenced by methane recovery and recycling rates and alternative waste treatment options. Changes in estimates for wastewater treatment and discharge emissions are largely driven by changes in industry production, population loads on centralised treatment systems and the amount of methane recovered for combustion or flaring.

The **land use, land use change and forestry (LULUCF) sector** includes both emissions sources and sinks (that is, carbon sequestration). The sources contributed four per cent to total state emissions, and include deforestation. The sinks include plantations and natural regeneration, regrowth on deforested land, activities on cropland and a small amount from harvested wood products and wetlands. As a portion of total gross emissions, sinks contributed a reduction of 16 per cent, as shown in Figure 2.

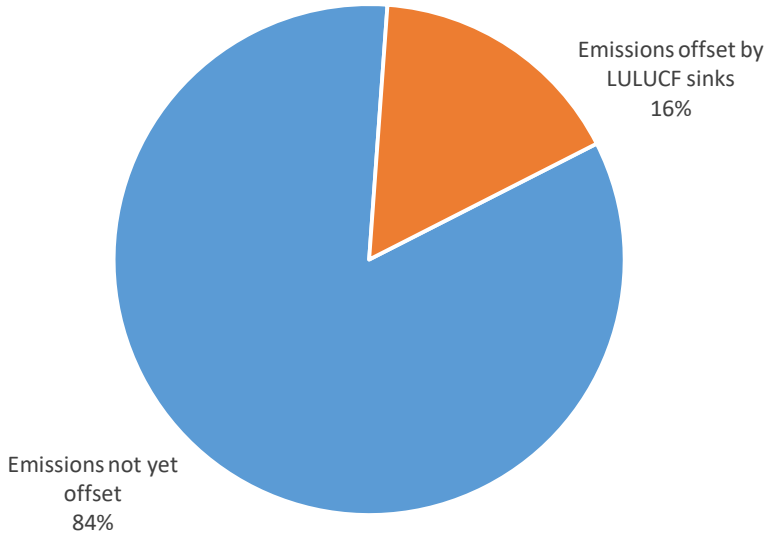


Figure 2: 2015-16 South Australian land use, land use change and forestry (LULUCF) sinks as a porportion of gross emissions[4].

See Appendix B for a detailed breakdown of emissions by sector.

See Appendix F for the technical aspects of the greenhouse gas inventory analysis.

2.2 Change in emissions since the 1990 baseline to 2015-16

The change in net emissions to 2015-16 are presented in Table 1. This report uses the inventory published in the State and Territory Greenhouse Gas Inventories (STGGI) 2016, which was published in February 2018. Note that the greenhouse gas emissions presented in this report are not comparable to those published in previous Section 7 reports as the inventories have been revised.

[4] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

Table 1: Net emissions for two periods of progress to 2015-16, from the 1990 baseline and from 2012-13.

Inventories	Description	Change in net emissions
1989-90 to 2015-16	• Change since baseline • Progress towards South Australia's greenhouse gas target	20.0% reduction
2012-13 to 2015-16	• Change since previous 2015 Section 7 report	4.6% reduction

The Commonwealth Government regularly revises inventory emission factors and methodologies when new information or more accurate methodologies become available. Under the United Nations Framework Convention on Climate Change rules, the government is required to revise figures back to 1990 to ensure time series consistency. As such, the estimates in the current South Australian inventory supersede all previously published estimates. These revisions can lead to substantial reinterpretations of progress, and each inventory's estimate of progress is not comparable with previous inventories.

2.3 Overall change since 1990 baseline to 2015-16

The profile of South Australia's net greenhouse gas emissions from the 1990 baseline to 2015-16 is one of peaks and troughs. **Net** emissions peaked in 2005-06 and were lowest in 2015-16.

In 2015-16, South Australian emissions **per capita** were 15.3 tonnes of CO_2-equivalent (CO_2-e), which is lower than the national average of 21.5 tonnes of CO_2-e (Figure 3).

Figure 4 shows the South Australian gross state product (GSP) alongside net emissions. Since 2005-06, net emissions have reduced while the GSP has continued to increase.

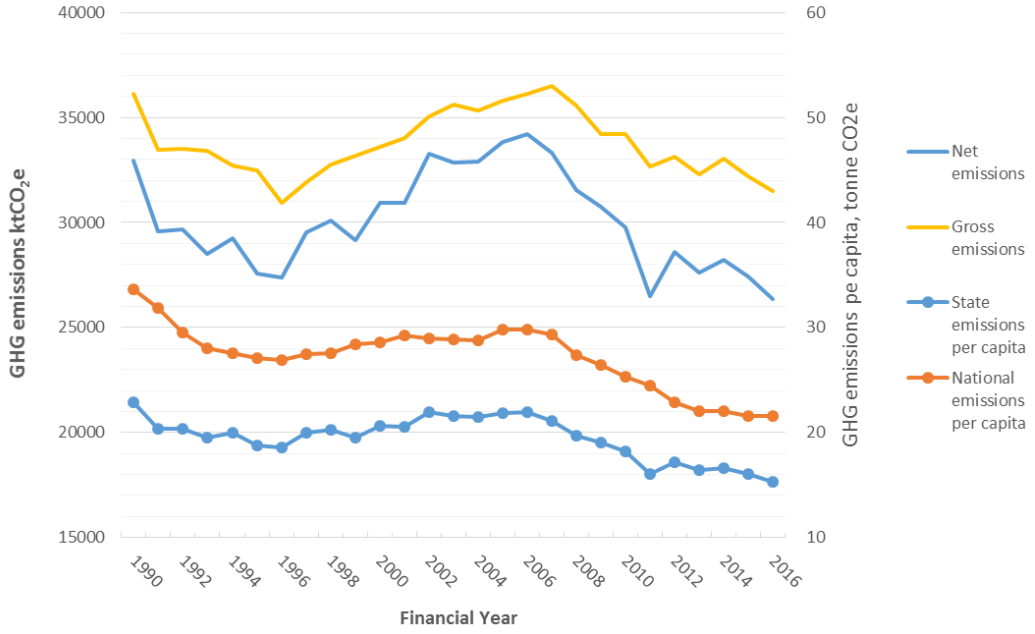


Figure 3: Gross and net emissions for 1989-90 to 2015-16 in South Australia, and per capita (tCO_2-e per person) emissions for South Australia and Australia[5].

Figure 4: South Australian emissions (ktCO2-e) and South Australian gross state product ($ Millions)[6].

[5] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

[6] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

2.4 Change since 2015 Section 7 report

Since the previous Section 7 report published in 2015, net emissions decreased by 4.6 per cent in South Australia. There were reductions in emissions from electricity generation, fuel combustion in the manufacturing industries and construction sectors and enteric fermentation. There were increases in emissions from fugitive emissions from fuel; products that are substitutes for ozone depleting substances (ODSs) and forest management.

2.5 Summary: increases and decreases in emissions 1989-90 to 2015-16 and 2012-13 to 2015-16

Progress towards emissions targets is achieved through a combination of reducing emissions and preventing increases. The increases and decreases in emissions over two periods are illustrated in Figure 5. There was a net decline of 6,602 kilotonne (kt) CO_2-e in emissions from 1989-90 to 2015-16. This was the net effect of an increase in some sources (5,795 kt CO_2e) and a decrease in other sources (-12,397 kt CO_2e).

There was a net decline of 1,275 kt CO_2e in greenhouse gas emissions from 2012-13 to 2015-16, which was also a net effect of increases in some sources and decreases in others.

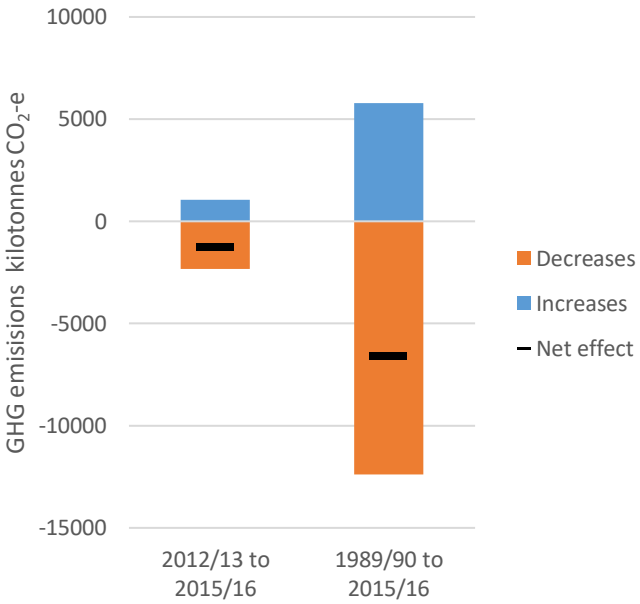


Figure 5: Summary of increases and decreases in emissions for two periods[7].

2.6 Progress towards 2050 target

South Australia's legislated target is to reduce greenhouse gas emissions to an amount that is equal to or less than 40 per cent of the 1990 level, by the end of 2050. This means that a reduction of 60 per cent or more will be required from levels in 1989-90 to 2050.

Between 1989-90 and 2015-16, gross emissions decreased by 13.5 per cent and net emissions (that is, gross less net sinks from land based sequestration) decreased by 20.0 per cent.

Different sources of emissions exhibit different profiles over time. Some sources increased substantially over the period (for example, forest management went from a sink to a source). Others decreased substantially (for example, enteric fermentation). Other sources increased then decreased (for example, electricity generation). The changes

[7] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

observed over any period are the net effect of increases and decreases in subcategories. Hence, the analysis of drivers of change looked at the decreasing and increasing sources separately.

2.7 Drivers of change by source of emissions from 1990 baseline to 2015-16

Appendix B describes the emission sources in detail and presents the change in sectoral emissions from baseline to 2015-16. Table 2 summarises the change in sources and sinks and their contribution to the increase or decrease in emissions from baseline to 2015-16.

Table 2: Changes in sources of emissions and sinks and their contribution to change from 1989-90 to 2015-16[8].

Source of emissions	Greenhouse gas (GHG) emissions (kt CO_2-e)			Contribution to increase or decrease	% change in GHG emissions
	1989-90	2015-16	Change	%	1989-90 to 2015-16
Energy industries	8,066	7,004	-1,062	-16%	-13%
Manufacturing and construction	2,007	2,093	85	1%	4%
Transport	5,377	6,584	1,207	18%	22%
Fugitive emissions from fuels	4,301	2,504	-1,797	-27%	-42%
Other combustion energy	1,273	1,730	457	7%	36%
ENERGY	21,025	19,914	-1,111	-17%	-5%
Mineral industry	1,092	1,034	-58	-1%	-5%
Products used as ODS substitutes	0	928	928	14%	n/a
Other industrial processes	1,683	1,758	76	1%	4%
IPPU	2,774	3,720	946	14%	34%
Enteric fermentation	4,773	3,438	-1,335	-20%	-28%
Agricultural soils	1,316	1,475	159	2%	12%
Other agriculture	395	606	211	3%	54%
AGRICULTURE	6,484	5,519	-965	-15%	-15%
Solid waste disposal	1,028	816	-212	-3%	-21%
Waste water treatment and discharge	357	234	-123	-2%	-34%
Other waste	3	21	17	0%	499%
WASTE	1,389	1,072	-317	-5%	-23%
LULUCF sources(1)	4,446	1,272	-3,174	-48%	-71%
LULUCF sinks	-3,170	-5,151	-1,981	-30%	-62%
LULUCF	1,276	-3,879	-5,155	-78%	-404%
Total	**32,948**	**26,346**	**-6,602**	**n/a**	-20%

(1) LULUCF sources are a negative category. When they have a positive change over the period, this means the sink is increasing and net emissions are reduced. When they are negative it means the sinks are becoming smaller, which increases net emissions.

Drivers of reduced emissions 1989-90 to 2015-16

The top three sector contributors to reductions in net greenhouse gas emissions by since 1989-90 are:

1. Land use, land use change and forestry (LULUCF), with a reduction in sources contributing 48 per cent and an increase in sinks contributing 30 per cent. LULUCF sources and sinks contributed most to reduced emissions.

[8] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

This is mainly due to plantations and natural regeneration of forest land, regrowth on deforested land and to a lesser extent cropland remaining as cropland.

2. Fugitive emissions from fuels and energy industries, contributing 27 per cent. This is likely to have been driven by a combination of changes in technology as well as the reduction in coal mining, crude oil extraction and natural gas extraction in South Australia over 1989-90 to 2015-16. The reductions were 72, 25 and 40 per cent respectively[9].
3. Enteric fermentation, contributing 20 per cent. This is likely to be driven by changing agricultural practices and the reductions in the numbers of dairy cattle, meat cattle, sheep and pigs over this period. Since 1998 (the earliest year for which data comparable to 2015-16 is available) the reductions were 17, 13, 18 and 4 per cent respectively[10].

These sources explain a substantial share of the overall reduction from 1989-90 to 2015-16.

It should also be noted that the energy industries sector contributed 16 per cent to the reduction in emissions. This sector peaked in 2007-08 and has significantly declined primarily due to the increase of renewables and the reduced emission intensity of non-renewables, both of which contributed to a reduced emissions intensity in public electricity generation.

Drivers of increased emissions 1989-90 to 2015-16

The top contributors to increases in emissions over this period are transport and products used as substitutes for ozone depleting substances (ODS).

- The growth in emissions related to transport was explained by increased emissions from light vehicles and medium to heavy duty trucks and buses.
- Substitutes for ozone depleting substances (ODSs) had no emissions in 1989-90, but use of substitutes has increased, causing associated emissions to also rise.

[9] Australian Energy Statistics Table I6 Production of primary fuels in South Australia, physical units (2017)

[10] ABS: Agricultural Commodities Catalogue 7121.0 1997-98 and 2015-16

3 Renewable electricity targets

This section presents an assessment of the progress being made to achieve renewable electricity targets.

3.1 About the renewable energy targets

Three renewable energy targets are relevant to the Act and to this reporting period. They refer to the proportion of South Australia's electricity that is generated using renewables (Table 3).

Table 3: Summary of renewable generation targets, 2008 to 2017.

Short form target	Detailed target	Notes
20% by 2014 (included in the Act) Exceeded in 2010-11 when the result was 22.0%	To increase the proportion of renewable electricity generated so that it comprises at least 20% of electricity generated in the state by 31 December 2014	South Australia's 20% generation and consumption targets in the Act were achieved during 2010-11. The consumption target was not renewed (Source: 2015 Section 7 report[11]).
33% by 2020 Exceeded in 2013-14 when the result was 39.3%	Pursuant to section 5.7 of the *Climate Change and Greenhouse Emissions Reduction Act 2007* the Minister set a target of "33.3% of South Australia's electricity generation to come from renewable energy by 2020".[12]	McLennan Magasanik Associates (MMA) advised that a range of 30-40% was appropriate. The National Institute of Economic and Industry Research (NIEIR) concluded that "a stretch target of 40% may be attainable but we consider that given uncertainty surrounding future South Australian total and renewable electricity generation a target of 33.3% would be prudent and appropriate".[13]
50% by 2025 Climate Change Strategy 2015	"South Australia will generate 50% of its electricity from renewable sources by 2025." (Climate Change Strategy 2015[14])	This target was not tabled in Parliament and hence progress to this target was not assessed under Section 7.

[11] https://www.environment.sa.gov.au/about-us/our-reports/climate-change-greenhouse-emissions-reduction-reports

[12] Tabled under section 5 of Act, 2009; referenced in 2009 Section 7 Report: https://www.environment.sa.gov.au/about-us/our-reports/climate-change-greenhouse-emissions-reduction-reports

[13] Refer to 2009 Section 7 Report: Attachment A: Potential for Renewable Energy in South Australia, 2009 Report by McLennan Magasanik Associates (MMA) and Attachment B: The future prospects for renewable energy in South Australia, 2009 Report by the National Institute of Economic and Industry Research (NIEIR)

[14] http://www.environment.sa.gov.au/files/sharedassets/public/climate-change/sa-climate-change-strategy-2015-2050-towards-low-carbon-economy.pdf

3.2 The renewable energy statistic and progress against targets

The proportion of South Australia's electricity that was generated using renewables in 2015-16 and 2016-17 was 43 per cent and 48.9 per cent respectively (Figure 6). These exceed the tabled target of 33 per cent by 2020, and also exceed the stretch target of 40 per cent by 2020. Renewables include rooftop solar and wind generation and other types of renewables, as described in Appendix D, which also details the methods used by DPC to calculate this statistic.

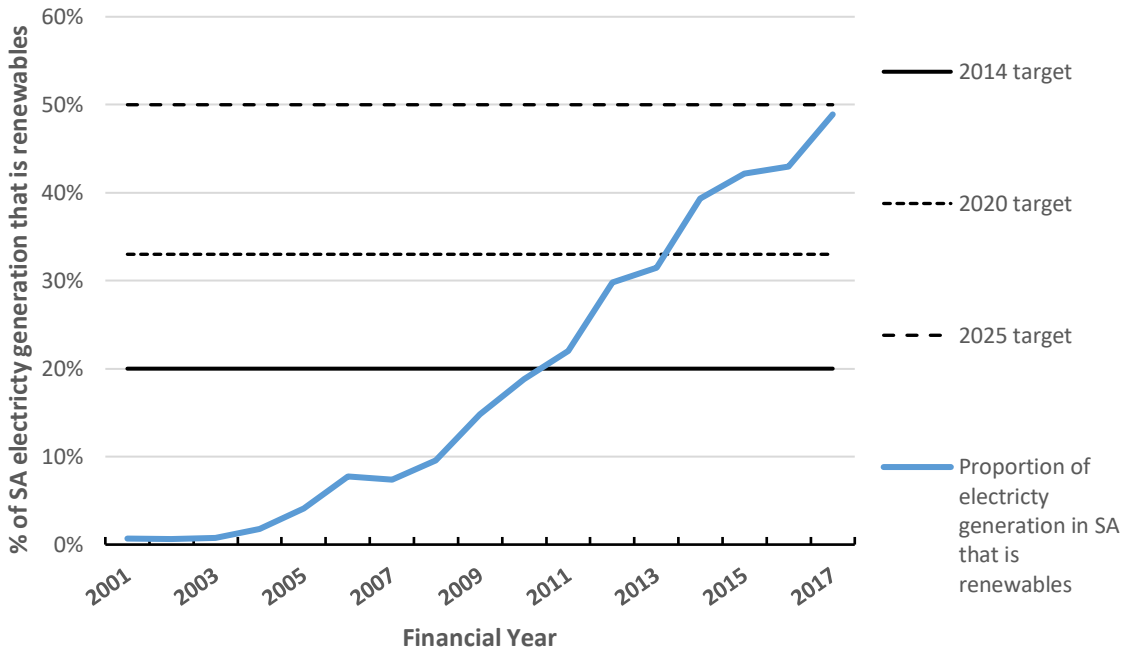


Figure 6: The proportion of electricity generated in SA that is generated using renewables, 2000-02 to 2016-17[15].

3.3 Assessment of progress towards the 2020 renewable energy target

Two factors were considered in the assessment: structural drivers of progress, and the sensitivity of these drivers to future changes in context.

Structural drivers are the mechanics of change, not the cause. The structural drivers toward and beyond the 33 per cent by 2020 target are:

- reduced electricity generation in South Australia
- reduced generation using non-renewables
- change in composition of non-renewable fuels, most notably the removal of coal
- increased generation using renewables
- reduced South Australian demand
- increased net imports of electricity to South Australia.

Total South Australian generation reduced over this period, and imports increased; the increase in the renewables statistic should be considered in this context. This situation is illustrated in Figure 7 and explained in more detail in Appendix D.

[15] Graphic generated from data provided by the South Australian Department of Premier and Cabinet.

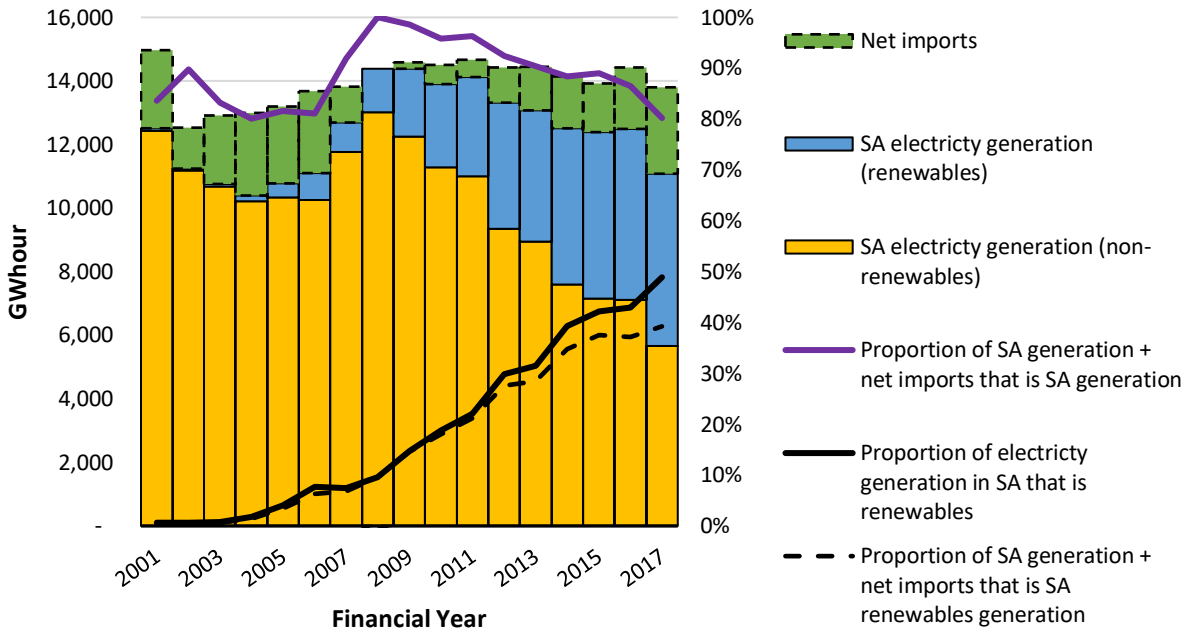
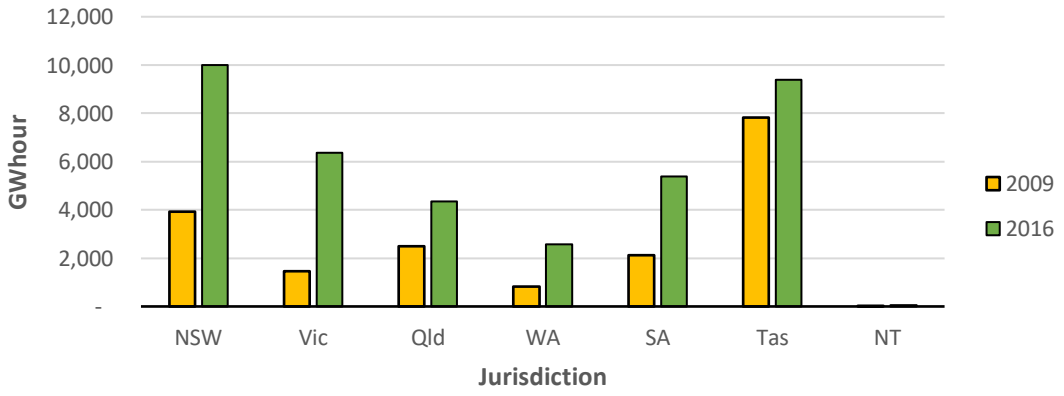


Figure 7: South Australian consumption GWh, by SA generated and imported, SA production by non-renewables and renewables 2008-2009 to 2016-2017[16].

Contextual drivers include:

- relative market prices;
- decisions by businesses to close coal fire power generators and invest in gas and renewable power plants;
- Australian government schemes (for example, Renewable Energy Target schemes);
- increased capacity of the interconnector;
- incentives provided by the Government of South Australia (for example, planning approvals for wind generators and solar feed-in tariff legislation); and
- changes in technology.

As indicated in Figure 8, all jurisdictions in Australia have experienced growth in renewable energy generation.



[16] Graphic generated from data provided by DPC on renewables and non-renewables generation and data from AEMO on SA imports and exports of electricity from historic SA market data reports.

Figure 8: The change in renewable energy generation from 2008-9 to 2015-16[17].

3.4 Renewable energy use in 2016-17

The renewable energy use in South Australia estimate for 2016-17 was 5,417GWh. The Australian Energy Market Operator (AEMO) estimate (presented in Table 4) is slightly less at 5,359 GWh. The difference in the two estimates is because data on some renewable generators may not available to the AEMO.

Table 4: 2016-17 South Australian capacity and generation by fuel type[18].

Fuel Type	Registered capacity (MW)	Generation (GWh)
Gas	2,668	5,596
Wind	1,698	4,343
Coal	0	0
Rooftop PV (A)	781	1,016
Diesel + SNSG(B)	289	122

[17] Department of the Environment and Energy, Australian Energy Statistics, Table O, August 2017

[18] *AEMO, 2017.* Notes from original source**:** Rooftop PV installations are not registered with AEMO, but are included here given their material contribution to generation in 2016–17. Rooftop PV capacity and generation estimates as listed build on those presented in the 2017 NEM ESOO forecasts. Diesel + SNSG includes small and large diesel, small landfill methane, hydro generating systems and the PV systems larger than 100 kW and smaller than 30 MW.

4 Effectiveness of South Australia's climate change initiatives

4.1 Key findings

The main contributors to the net greenhouse gas emissions reduction of 20 per cent from the 1990 baseline to 2015-2016 included:

- strengthening of land based sinks and reduction in land based sources
- changing agricultural practices and reductions in livestock numbers, which helped to reduce greenhouse gas emissions from enteric fermentation (agriculture sector)
- increases in the use of renewables and reductions in the emission intensity of non-renewables, both of which contributed to the reduced emissions intensity of public electricity generation
- decreases in South Australia's electricity consumption and increases in imports, which explained the reduction in South Australian electricity generation, which in turn contributed to the reduction in greenhouse gas emissions from public electricity generation in the state
- reduced petroleum gas and coal extraction and/or processing, for example the closure of Port Stanvac in 2003, which reduced fugitive emissions from fuel.

Incentives related to renewables were important in working with other market and Australian Government incentives to increase the generation of electricity from renewables.

Examples of the initiatives and actions adopted by the South Australian Government included the Renewable Energy Fund, planning approvals for wind power generators, legislation for a premium feed-in tariff for small solar photovoltaic (PV) systems which increased the rate of uptake of solar, the Residential Energy Efficiency Scheme, and government building improvements such as building energy efficiency and solar panels and public transport electrification.

Other contributors to reductions in emissions since baseline included:

- Structural changes in the South Australian economy. Emissions intensive manufacturing and electricity, gas and water supply sectors reduced their contribution to the economy over the period. The growth in economy was driven largely by services sectors, which have a very low emissions intensity.
- The market context, in which there was an increase in renewables use (for example, due to the reduced price of rooftop solar PV).
- Technological developments, which improved the options available to industry (for example, to improve efficiency of electricity generation using non-renewables and of renewable energy generation in general).
- South Australian Government initiatives outside the climate change strategy (for example, in the area of afforestation and reforestation).
- Australian Government policy, by generating incentives for renewables. The Renewable Energy (Electricity) Regulations commenced in 2001 and used mechanisms including the Renewable Energy Certificate to generate financial incentives for investment in renewable energy generation.

5 Targets and determinations

This section reports on any determination or target made or set under section 5 during the reporting period.

There were no determinations or targets made or set under section 5 of the Act during the reporting period.

6 Sector based or interim targets

This section presents an assessment of the progress being made to achieve any sector based or interim target under this Act, including a target set for the State Government, or any government agency or instrumentality.

There were no sector based or interim targets in place during the reporting period.

7 Climate change agreements

This section reports on any sector agreements between the Minister and any other person or entity entered into under this Act during the reporting period.

The South Australian Government has entered into more than 25 sector agreements with a range of organisations to improve energy efficiency, reduce energy consumption, promote renewable energy, identify adaptation pathways, and support innovation in technologies and practices.

Three sector based agreements were entered into in the reporting period:

- Resilient Hills and Coasts (RH&C)
- Resilient East
- Limestone Coast
- Adapting Northern Adelaide
- Yorke and Mid North

Appendix C presents a background to Sector Agreements and their purpose and includes a list of Agreements.

Table 5: Resilient Hills and Coasts (RH&C) Sector Agreement for the Adelaide Hills, Fleurieu Peninsula and Kangaroo Island Region (2017).

Partners to agreement	Objectives and activities
• Adelaide Hills Council • Adelaide and Mount Lofty Ranges Natural Resources Management (NRM) Board • Alexandrina Council • District Council of Yankalilla • City of Victor Harbor • Kangaroo Island Council • Kangaroo Island NRM Board • Mount Barker District Council • Southern and Hills Local Government Association	• Resilient Hills and Coasts Project (RH&C Project) • Improve the resilience of community assets and infrastructure, local economies and natural environment to cope with the inevitable impacts and challenges of climate change. • Do so through the implementation of the Climate Change Adaptation Plan for the Adelaide Hills, Fleurieu Peninsula and Kangaroo Island Region. • Promote the RH&C Project objectives. • Prioritise opportunities to implement the Adaptation Plan on a regional scale.

Table 6: Resilient East Sector Agreement (2017).

Partners to the agreement	Objectives and activities
• City of Adelaide • City of Burnside • Campbelltown City Council • City of Norwood, Payneham and St Peters • City of Prospect • City of Tea Tree Gully • City of Unley • The Corporation of the Town of Walkerville.	• Develop strategies to support research and innovative planning. • Identify and progress partnership opportunities. • Implement the Resilient East Adaptation Plan. • Deliver initiatives and community engagement activities to deliver the Climate Change Adaptation Plan. • Facilitate geographically specific responses to climate change across the Eastern Adelaide region. • Promote and showcase achievements. • Provide information and advice to government on progress with the agreement.

Table 7: Limestone Coast Sector Agreement (2016).

Partner to the agreement	Objectives and activities
• Regional Development Australia Limestone Coast • The Limestone Coast Local Government Association • South East Natural Resources Management Board	• Work in partnership to deliver the Limestone Coast Regional Climate Change Adaptation Plan. • Provide strategic decision making and direction towards achieving the objectives of the agreement. • Establish criteria to measure success for reporting on progress. • Provide recommendations to inform the annual business planning processes of the Limestone Coast Region partners on initiatives that may have business impact.

Table 8: Adapting Northern Adelaide (2016)

Partner to the agreement	Objectives and activities
• The City of Playford • The City of Salisbury	• Collaborate and work in partnership with a range of stakeholders that can contribute to delivering the objectives of this agreement. • Follow principles of inclusiveness and transparentcy. • Work to together and with other stakeholders to implement the Adapting Northern Adelaide Plan to support resilient and prosperous communities. • Enage with industry, community and other partners to develop, improve and market the Northern Adelaide's green industries' products, services and capabilies that support a low carbon and adaptive economy.

Table 9: Yorke and Mid North (2017)

Partner to the agreement	Objectives and activities
• Legatus Group • Northern and Yorke Natural Resources Management (NRM) Board • Regional Development Australia Yorke and Mid North	• A key focus on adaptation and response to its impacts, risks and opportunities of climate change in the region - to be implemented as per the identified priorities from the Yorke and Mid North Regional Climate Change Action Plan (the Plan), including: – setting agreed objectives – cooperatively identifying and progressign partnership opportunities across sectors within the region – commitment by each of the local government partners to produce a local action plan, and – cooperate in the implementation of the Plan, and its ongoing evaluation and review.

8 Offset programs and national emission trading scheme

This section reports on any emissions offset programs established or recognised under the Act during the reporting period, and on progress in establishing a national emissions trading scheme.

There were no offset programs or emissions trading in place during the reporting period.

9 Intergovernmental agreements

This section presents a report on any intergovernmental agreements relevant to climate change entered into by the Government of South Australia during the reporting period.

9.1 Climate Action Roundtable

The Climate Action Roundtable includes Australian climate change ministers and Lord Mayors working in the transition to net zero greenhouse gas emissions. Two meetings of the Climate Action Roundtable were held during the reporting period. At the meeting on 26 August 2016 in Melbourne, the Roundtable issued a communiqué identifying the agreed priorities for members:

- Ensuring the development and implementation of effective national climate change policy settings, in recognition of the 2015 Paris Agreement, including states, territories and local governments having direct and material input into the 2017 review of Australia's national climate policy.
- Engaging with Planning and Building Ministers on opportunities to accelerate consistent, stronger, and cost effective standards and guidelines where appropriate for sustainability and efficiency in new and existing residential and commercial building performance.
- Promoting a national framework for meeting Australia's international climate change commitments at least cost, integrating climate policy with energy policy, including support for ongoing efforts to strengthen energy networks and markets.
- Working together on policies and programmes targeting low emission vehicles, renewable energy and energy storage technologies including opportunities for cost reduction through collaboration.
- Supporting innovation in low carbon technologies and materials such as timber, and developing supply chains and business models that accelerate penetration of carbon reducing practices.

10 International commitments

This section presents a report on any significant national or international commitments or agreements relevant to climate change made or entered into during the reporting period.

10.1 States and Regions Alliance

Created in 2005, members of the States and Regions Alliance signed the Montreal Declaration of Federated States and Regions. The Government of South Australia was an inaugural signatory to the Montreal Declaration and a founding co-chair of the Alliance.

The Alliance consists of a network of 39 governments from six continents, which collectively account for 368 million people, 12 per cent of global GDP and 2.9 gigatonnes of CO_2 emissions. Governments share expertise on innovative policy, report on measurable climate actions, and drive emission reduction initiatives.

10.2 States and Regions Compact

In 2014, several state and regional government coalitions for climate change were created including: the Climate Group States and Regions Alliance; Network of Regional Governments for Sustainable Development (nrg4SD); R20-Regions of Climate Action (R20); and the CDP (formerly the Carbon Disclosure Project).

The coalitions report annual progress against commitments made by state and regional governments. The States and Regions Compact is a mechanism for regional governments to report on and demonstrate their support for the Paris Agreement.

10.3 Under2MOU

South Australia signed on to the Global Climate Leadership Memorandum of Understanding (the Under2MOU) on 6 December 2015. The Under2MOU aims for sub-national governments to reduce their greenhouse gas emissions towards net zero by 2050. Signatories commit to reducing greenhouse gas emissions by 80 to 95 per cent on 1990 levels, or to 2 metric tons of carbon dioxide-equivalent per capita, by 2050. These are the levels needed to limit global warming to below 2 degrees Celsius recommended by the Intergovernmental Panel on Climate Change.

As at April 2018, 208 jurisdictions which represent 43 countries have signed or endorsed the Under2MOU. Signatories are requested to: establish mid-term targets to support long-term reduction goals; share technology, scientific research, and best practices to promote energy efficiency and renewable energy; work towards consistent monitoring, reporting and verification of their emissions; and assess the projected impacts of climate change on communities.

South Australia contributes to the Annual Disclosure Report to provide a transparent, global picture of the impact, progress and climate action driven by state and regional governments.

10.4 Climate Leadership Declaration 2017

On 13 July 2017, South Australia signed a Climate Leadership Declaration along with the governments of Victoria, the Australian Capital Territory and Queensland. The Declaration emphasised the role of Australia's states and territories in climate change action and sets out collaborative actions to be pursued by the signatories.

10.5 EU World Cities Programme

In 2017, Adelaide commenced a partnership under the EU World Cities Program, with Manchester in the United Kingdom. World Cities is a project of the European Union managed by the European Commission's Directorate-General for Regional and Urban Policy. The project promotes the exchange of experience and best practice between EU and non-EU countries in sustainable urban development. During the year-long partnership, the organising teams

have established pilot projects under three themes: Governance and policy structures for smart cities; financing; and sustainable growth.

10.6 RegionsAdapt

In 2015, South Australia joined RegionsAdapt, a cooperative framework to exchange experiences and best practices on adapting to climate change. Regional governments collaborate, exchange knowledge and share best practice on adaptation and resilience to climate change. The practices include: developing a sub-regional plan or strategy on adaptation; concrete actions; and reporting data on the progress of the adaptation annually through the States and Regions Compact reporting platform.

11 Impacts of climate change

This section presents information on any relevant rates, trends or impacts associated with climate change, with particular reference to any identified or assessed impacts of climate change on South Australia or any expected future impacts of climate change that have emerged or become increasingly relevant during the reporting period.

11.1 Climate projections in South Australia

The national *Climate Change in Australia* website and the South Australian Climate Ready projections developed by the Goyder Institute for Water Research remain the key sources of information in relation to climate impacts in South Australia over the reporting period. The two complementary sources of information were launched in 2015.

Changes in climate will mean continued trends towards warmer temperatures, rising sea levels, changes to rainfall and more frequent and intense extreme events. In particular, projections for South Australia include:

- continued increases in average temperatures across all seasons
- slightly larger increases in the maximum temperature for the spring season
- more hot days and heatwaves of longer duration, and fewer frosts
- decreases in annual rainfall amounts, with decreasing rainfall in the cooler months
- increases in the intensity of extreme rainfall events and time spent in drought
- continued mean sea level rise and an accompanying increase in the height of extreme sea level events and coastal erosion
- a continued trend towards a harsher fire weather climate.

The Climate Change in Australia website was developed using funding from the Australian Government Department of the Environment under the Regional Natural Resource Management Planning for Climate Change Fund. The project was co-funded and delivered by the CSIRO and the Australian Bureau of Meteorology. The website contains numerous links to climate change projections information for Australia. The projections are spatially focused around natural resource management 'clusters' for which summary information is available. The website is available at www.climatechangeinaustralia.gov.au.

The Goyder Institute for Water Research has developed projections for individual weather stations across the state's natural resources management regions that extend to 2100, for 'intermediate' and 'high' emissions pathways. This information can be accessed through the Goyder Institute for Water Research website[19] and the Government of South Australia's Enviro Data SA website[20].

11.2 Impacts of Climate Change in South Australia

Changes to South Australia's climate such as warmer temperatures, rising sea levels, changes to rainfall patterns and more frequent and intense extreme events are likely to impact on agricultural production, public health, community wellbeing, natural landscapes and wildlife habitats, and public and private infrastructure, particularly in coastal areas.

[19] http://www.goyderinstitute.org/

[20] https://data.environment.sa.gov.au

12 CSIRO report

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

A report prepared by the CSIRO for this Section 7 report is in Appendix E.

Appendix A : Section 7 of the Climate Change and Greenhouse Emissions Reduction Act 2007 (SA)

7—Two-yearly reports

(1) The Minister must, on a two-yearly basis, prepare a report on the operation of this Act.

(2) The report must include—

(a) an assessment of the effectiveness of the initiatives that are being adopted in order to achieve the SA target; and

(b) a report on any determination or target made or set under section 5 during the reporting period; and

(c) an assessment of the progress being made to achieve the renewable electricity target; and

(d) an assessment of the progress being made to achieve any sector-based or interim target under this Act, including a target set for the State Government, or any government agency or instrumentality; and

(e) a report on any sector agreement between the Minister and any other person or entity entered into under this Act during the reporting period; and

(f) a summary of—

(i) the levels of greenhouse gas emissions, and of the use of renewable energy, within the State (as determined or estimated at the time of reporting); and

(ii) the development of technologies to reduce greenhouse gas emissions or to remove greenhouse gases from the atmosphere; and

(g) a report on any emissions offset programs established or recognised under this Act during the reporting period, and on progress in establishing a national emissions trading scheme; and

(h) a report on any inter-governmental agreements relevant to climate change entered into by the South Australian Government during the reporting period; and

(i) a report on any significant national or international commitments or agreements relevant to climate change made or entered into during the reporting periods; and

(j) information on any relevant rates, trends or impacts associated with climate change, with particular reference to any identified or assessed impacts of climate change on South Australia or any expected future impacts of climate change that have emerged or become increasingly relevant during the reporting period.

(3) The Minister must cause a copy of the report to be laid before both Houses of Parliament within 6 sitting days after the report is prepared.

(4) The first report under this section must be completed and tabled in Parliament by the end of 2009.

(5) The first report under this section, and thereafter every alternate report, must incorporate a report from—

(a) the CSIRO; or

(b) if the CSIRO is unwilling or unable to provide a report—an independent entity designated by the Minister by notice in the Gazette,

that assesses the extent to which any determination or target made or set under section 5 is being achieved and, if it appears relevant, should be revised.

(6) In this section—

CSIRO means the Commonwealth Scientific and Industrial Research Organisation.

Appendix B : Review of sources of greenhouse gas emissions by sector

This Appendix presents the 2015-16 South Australian greenhouse gas inventory by sector. It presents the 1989-90 to 2015-16 inventory, the changes from 1989-90 and 2012-13 to 2015-16, and graphics, data and summary statistics for each of the sectoral categories.

B.1 All emissions

The South Australian inventory from 1989-90 to 2015-16 is presented in Figure 9 by sectoral source, separating the subcategories in land use, land use change and forestry (LULUCF) that are net sources in a given year from those that are net sinks. The categories with the greatest annual variability are LULUCF sources and sinks and the category with the largest range over the period is Energy. The red line shows net greenhouse gas emissions.

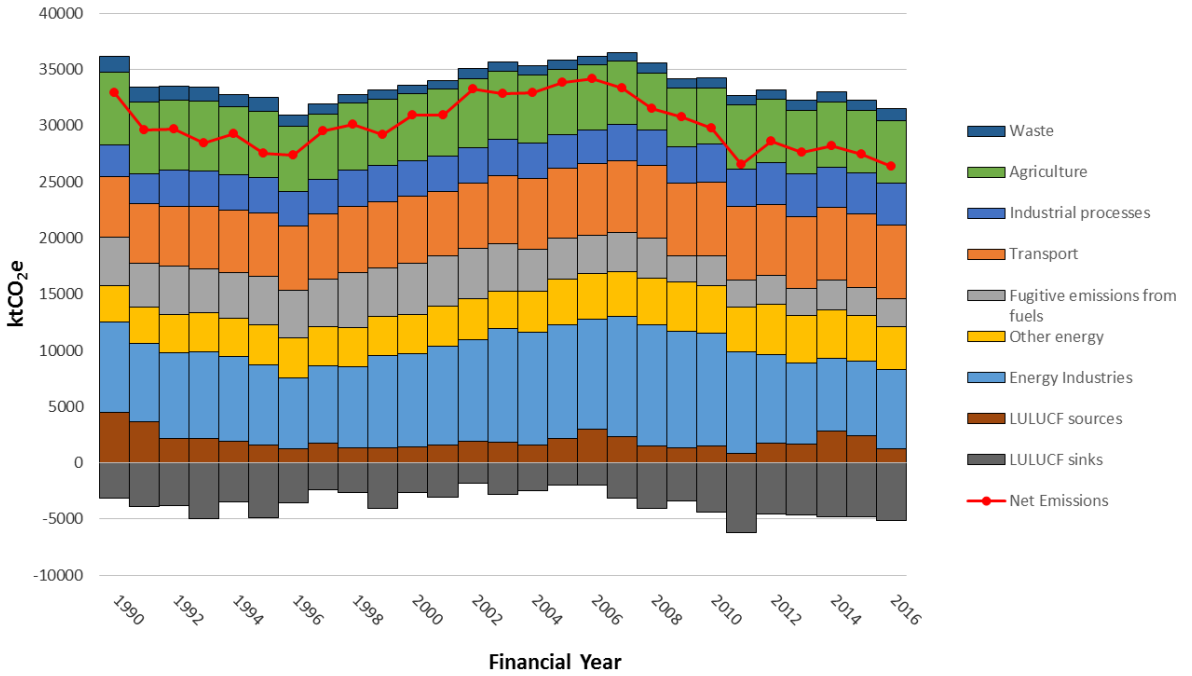


Figure 9: South Australian greenhouse gas inventory, 1989-90 to 2015-16, by source of emissions[21].

Table 10 summarises these categories by their absolute values at three points in time and the change in that category from two starting points (baseline and the previous Section 7 report of 2012-13).

[21] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

Table 10: SA inventory by source of emissions, change to 2015-16 from selected years[22].

Source of emissions	Greenhouse gas emissions (kt CO_2-e)			Change to 2015-16	
	1989-90	*2012-13*	*2015-16*	*1989-90 to 2015-16*	*2012-13 to 2015-16*
Energy	*21,025*	*20,213*	*19,914*	*-5%*	*-1%*
Industrial processes	*2,774*	*3,805*	*3,720*	*34%*	*-2%*
Agriculture	*6,484*	*5,637*	*5519*	*-15%*	*-2%*
Waste	*1,389*	*935*	*1,072*	*-23%*	*15%*
LULUCF sources	*4,446*	*1,691*	*1,272*	*-71%*	*-25%*
Gross emissions	***36,118***	***32,281***	***31,497***	***-13%***	***-2%***
LULUCF sinks (1)	*-3,170*	*-4,660*	*-5,151*	*62%*	*11%*
Net emissions	***32,948***	***27,621***	***26,346***	***-20%***	***-5%***

(1) LULUCF sources are a negative category. When they have a positive change over the period, this means the sink is increasing and net emissions are reduced. When they are negative it means the sinks are becoming smaller, which increases net emissions.

The following sections in this Appendix provide detailed graphics, data and summary statistics about each of the categories. With the exception of one graphic (Figure 17, which details LULUCF sources and sinks by category) no further commentary or interpretation is provided.

B.2 Energy

Energy sector emissions are presented in Figure 10 and Figure 11 and are broken down into the following components:

- *Energy industries* – the combustion of fuel in electricity generation, petroleum refining, gas production and solid fuel manufacture.
- *Manufacturing industries and construction* – direct emissions from fuel combustion in manufacturing industries, ferrous and non-ferrous metals production, plastics production, construction and non-energy mining.
- *Transport* – road transportation (passenger cars, trucks, and buses), domestic aviation, domestic navigation and pipeline transport.
- *Other combustion energy* – direct fuel combustion in the residential, commercial and institutional sectors, including energy used in mobile equipment in agriculture, forestry, fishing and military sectors.
- *Fugitive emissions from fuels* – emissions other than energy use including in mining activities and oil and gas sector operations (including venting, flaring, exploration, extraction, production, processing and transmission).

[22] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

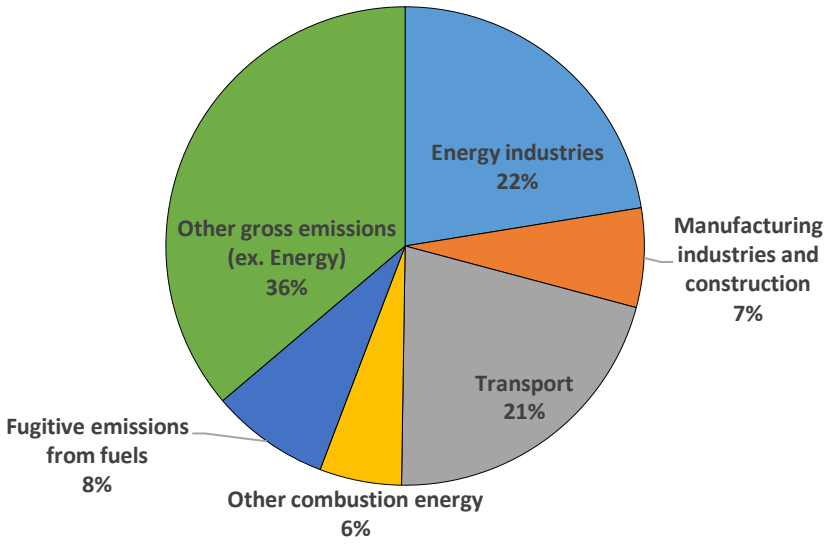


Figure 10: Greenhouse gas emissions, Energy relative to all other gross emissions, 2015-16, South Australia[23].

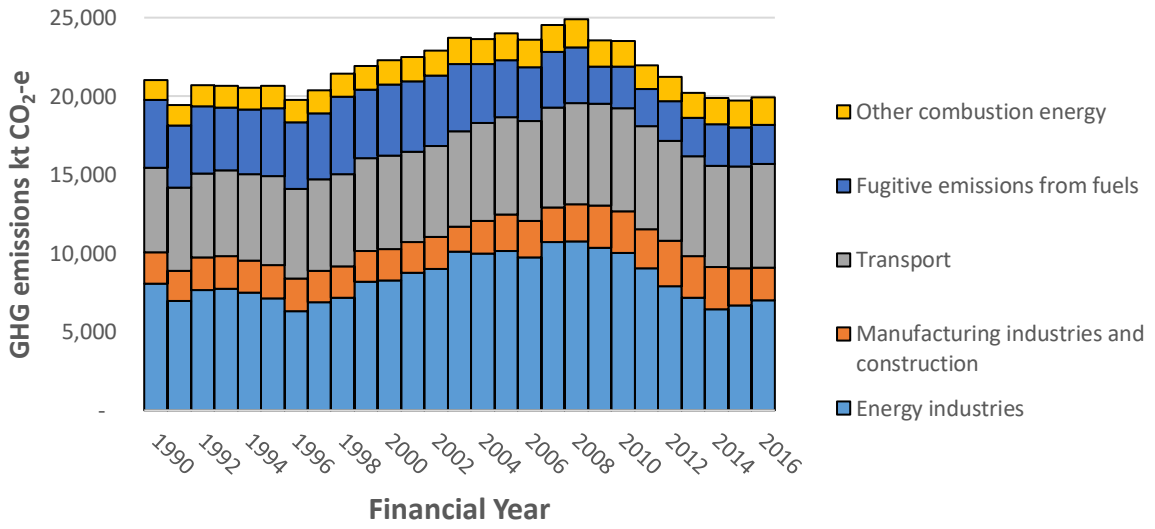


Figure 11: Greenhouse gas emissions kt CO_2-e, Energy, by subcategory, 1989-90 to 2015-16, South Australia[24].

[23] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

[24] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

Table 11 presents the change in emissions from the 1990 base year to the most recent reporting year of 2015-16. A comparison from the previous Section 7 report (2012-2013 greenhouse gas inventory data) is also provided.

Table 11: SA inventory, Energy category, by source of emissions, change to 2015-16 from selected years[25].

	Greenhouse gas emissions kt CO_2-e			Change to 2015-16	
	1989-90	2012-13	2015-16	1989-90 to 2015-16	2012-13 to 2015-16
Energy industries	8,066	7,163	7,004	-13.2%	-2.2%
Manufacturing industries and construction	2,007	2,659	2,093	4.2%	-21.3%
Transport	5,377	6,363	6,584	22.5%	3.5%
Other combustion energy	1,273	1,581	1,730	35.9%	9.4%
Fugitive emissions from fuel	4,301	2,447	2,504	-41.8%	2.3%
Energy	**21,025**	**20,213**	**19,914**	**-5.3%**	**-1.5%**

B.3 Industrial processes

Emissions from industrial processes are presented in Figure 12 and Figure 13 and are broken down into the following components:

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

[25] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

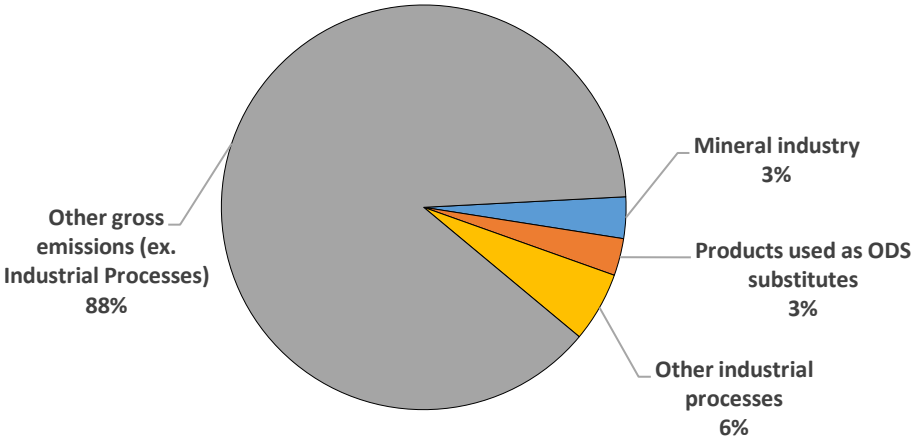


Figure 12: Greenhouse gas emissions, Industrial processes relative to all other gross emissions, 2015-16, South Australia[26].

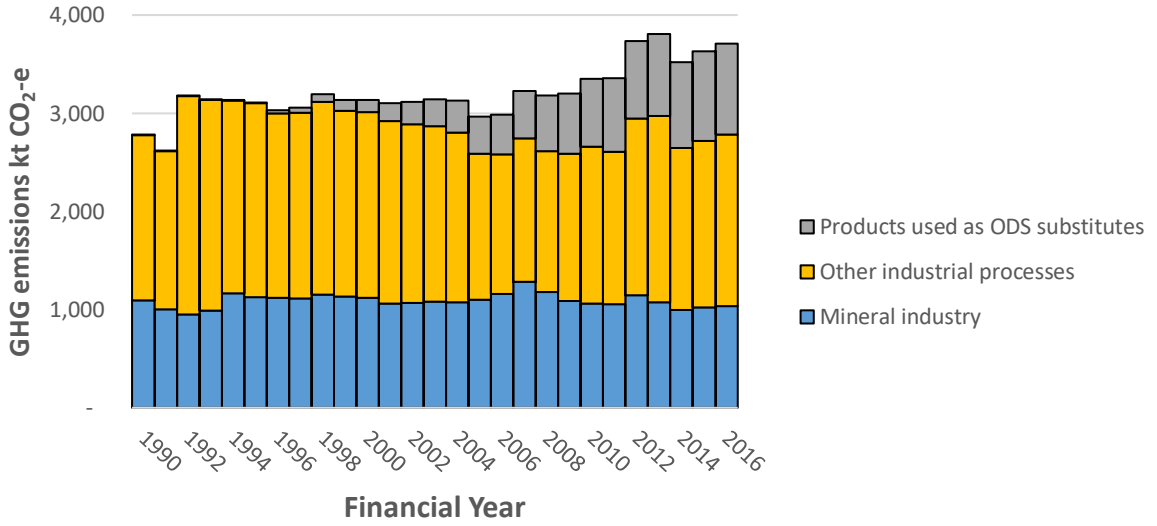


Figure 13: Greenhouse gas emissions kt CO_2-e, Industrial processes by selected subcategory, 1989-90 to 2015-16, South Australia[27].

Table 12 presents the change in emissions from the 1990 base year to the most recent reporting year of 2015-16. A comparison from the previous Section 7 report (2012-2013 greenhouse gas inventory data) is also provided.

[26] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

[27] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

Table 12: SA inventory, Industrial processes by source of emissions, change to 2015-16 from selected years[28].

	Greenhouse gas emissions ($kt CO_2$-e)			Change to 2015-16	
	1989-90	2012-13	2015-16	1989-90 to 2015-16	2012-13 to 2015-16
Mineral industry	1,092	1,072	1,034	-5.3%	-3.5%
Products used as ODS substitutes	0	833	928	n/a	11.3%
Other industrial processes	1,683	1,900	1,746	3.8%	-8.1%
Industrial processes	**2,774**	**3,805**	**3,708**	**33.6%**	**-2.6%**

B.4 Agriculture

Agriculture sector emissions are presented in Figure 14 and Figure 15, broken down into the following components:

- *Enteric fermentation* – emissions associated with microbial fermentation during digestion of feed by ruminant (mostly cattle and sheep) and some non-ruminant domestic livestock.
- *Agricultural soils* – emissions associated with the application of fertilisers, crop residues and animal wastes to agricultural lands and the use of biological nitrogen fixing crops and pastures.
- *Other agriculture* – emissions from manure management, burning of savanna and temperate grasslands, field burning of agricultural residues and CO_2 from the application of urea and lime.

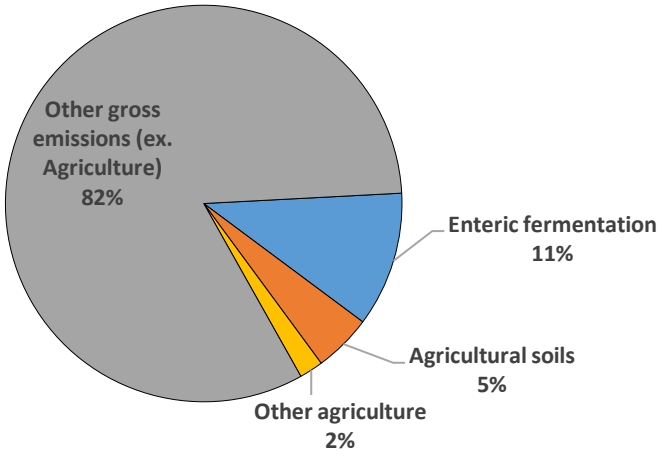


Figure 14: Greenhouse gas emissions, Agriculture relative to all other gross emissions, 2015-16, South Australia[29].

[28] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

[29] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

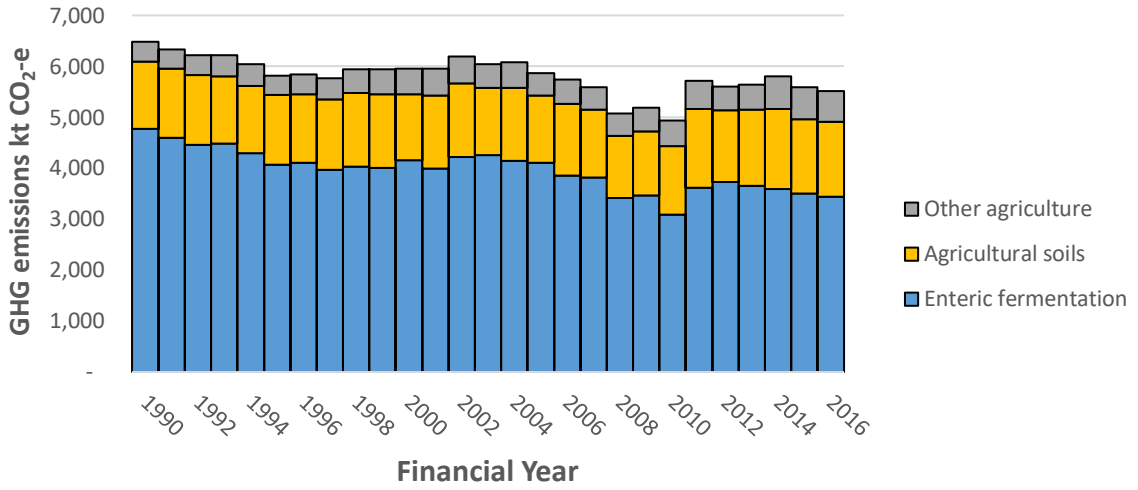


Figure 15: Greenhouse gas emissions kt CO_2-e, Agriculture, by selected subcategory, 1989-90 to 2015-16, South Australia[30].

Table 13 presents the change in emissions from the 1990 base year to the most recent reporting year of 2015-16. A comparison from the previous Section 7 report (2012-2013 greenhouse gas inventory data) is also provided.

Table 13: SA inventory, Agriculture by source of emissions, change to 2015-16 from selected years[31].

	Greenhouse gas emissions (kt CO_2-e)			Change to 2015-16	
	1989-90	2012-13	2015-16	1989-90 to 2015-16	2012-13 to 2015-16
Enteric fermentation	4,773	3,656	3,438	-28.0%	-6.0%
Agricultural soils	1,316	1,492	1,475	12.1%	-1.2%
Other agriculture	395	488	606	53.5%	24.1%
Agriculture	**6,484**	**5,637**	**5,519**	**-14.9%**	**-1.2%**

B.5 Land Use, Land Use Change and Forestry (LULUCF)

Emissions and sinks from land use, land use change and forestry (LULUCF) are presented in Figure 16. Figure 17 presents each of the subcategories in LULUCF separated by sinks and sources within that category. The principal drivers of change in carbon fluxes across the landscape relate to losses and gains of woody vegetation. *Land converted to forest land* and *harvested wood products* are always sinks while *land converted to cropland* and *grassland* are always sources (deforestation). However all of the remaining categories can have both sinks and sources contributing in any one year. For example, *forest land remaining forest land* was primarily a sink until 2005, only featuring as a source in 1998 and 2000, however since then it has been both sources and sinks.

The LULUCF subcategories are as follows:

- *Forest land* includes all lands with a tree height of at least 2 metres and crown canopy cover of 20 per cent or more, and lands with systems with a woody biomass vegetation structure that currently falls below but which,

[30] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

[31] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

in situ, could reach the threshold values of the definition of forest land. *Forest land remaining forest land* includes plantations, harvested native forests and other native forests (regeneration after harvest). Emissions from fuelwood consumption and biomass burning in forests (controlled burning and wildfire) are also included as are the removals associated with post-fire recovery. *Land converted to forest land* includes grassland, croplands, settlements and wetlands (tidal marsh) on which forest is identified to emerge. These changes include plantations and forest regrowth on land previously cleared for other uses, environmental plantings and the regeneration of forest from natural seed sources. Permanent losses of woody vegetation that have been classed as *forest land* are reported under *forest conversion to other land use* classifications.

- *Cropland* includes all land that is used for continuous cropping and those lands managed as crop-pasture (grassland) rotations. Non-CO_2 emissions from cropland remaining cropland are reported in the Agriculture sector. This sector comprises emissions and removals from *cropland remaining cropland* and *forest land converted to cropland* and *wetlands converted to cropland*. Since 1990, there has been no significant consistent trend in emissions, with transient variations driven by fluctuations in climatic conditions and shifts in management practices.
- The *grassland* category represents a diverse range of climate, management and vegetation cover. It also includes increases and decreases in sub-forest forms of woody vegetation (shrubs). This sector comprises emissions and removals from *grassland remaining grassland* and *forest land* and *wetlands converted to grassland*. Changes in carbon stocks in *grassland remaining grassland* are largely affected by changes in land management practice and climatic factors.
- For the sub-sectors *forest land converted to cropland* and *forest land converted to grassland*, the total emissions associated with the transition from forest to non-forest land use include the immediate loss of carbon as trees are cleared and burned, as well as an ongoing loss of soil carbon as it decays to a new equilibrium stock level and other ongoing emissions and removals associated with the new land use.
- *Settlements* are areas of residential and industrial infrastructure, including cities and towns, and transport networks. This sector comprises emissions and removals from *settlements remaining settlements* and *forest land* and *wetlands converted to settlements*. The *Land converted to settlements* subcategory comprises mangrove and other forest land converted to settlements and wetlands (tidal marsh) converted to settlements. Conversion of tidal marsh is assumed to occur along with any clearing of mangroves for settlements – as such the trends are identical. The key drivers of variation over the time period have been urbanisation and population growth.
- *Wetlands* include areas of perennial lakes, reservoirs, swamps and major water course areas. Land areas that meet the definition of forest land, such as mangroves, are reported under the forest land category. *Wetlands remaining wetlands* include tidal marshes and seagrass meadows. Estimates include net changes in sparse vegetation, loss of seagrass beds due to capital dredging and nitrous oxide emissions from aquaculture operations.

The subcategories *wetland remaining wetland, land converted to wetland and settlements remaining settlements* have been omitted from Figure 17 due to insignificant contributions from 1989-90 to 2015-16.

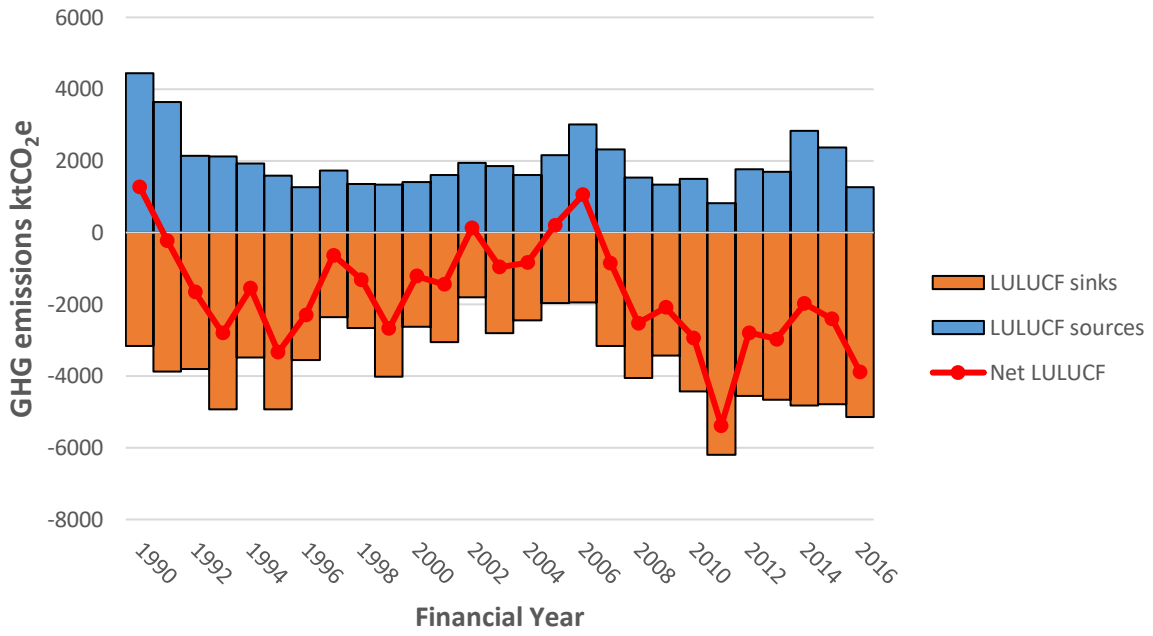


Figure 16: Land use, land use change and forestry sources and sinks, 1989-90 to 2015-16, South Australia[32].

[32] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

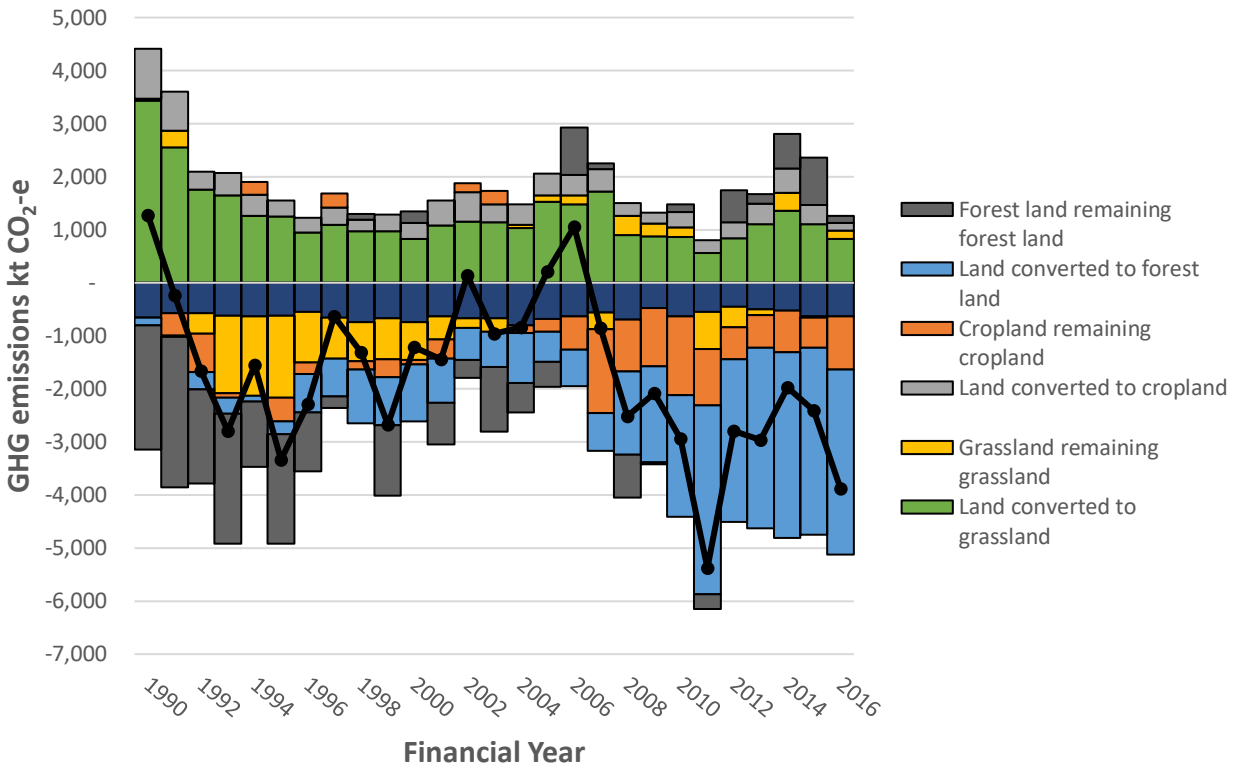


Figure 17: Land use, land use change and forestry by sources and sinks for subcategories, 1989-90 to 2015-16, South Australia[33].

Table 14 presents the change in emissions from the 1990 base year to the most recent reporting year of 2015-16. A comparison from the previous Section 7 report (2012-2013 greenhouse gas inventory data) is also provided.

Table 14: SA inventory, Land use, land use change and forestry category, by source or sink, change to 2015-16 from selected years[34].

Source	Greenhouse gas emissions (kt CO_2-e)			Change to 2015-16	
	1989-90	2012-13	2015-16	1989-90 to 2015-16	2012-13 to 2015-16
LULUCF sources	4,446	1,691	1,272	-71.4%	-24.8%
LULUCF sinks (1)	-3,170	-4,660	-5,151	62.5%	10.5%
Net LULUCF	1,276	-2,969	-3,879	-404.0%	-30.6%

(1) LULUCF sources are a negative category. When they have a positive change over the period, this means the sink is increasing and net emissions are reduced. When they are negative it means the sinks are becoming smaller, which increases net emissions.

[33] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

[34] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

B.6 Waste

Waste sector emissions are presented in Figure 18 and Figure 19 and are broken down into the following components:

- *Solid waste disposal* – emissions resulting from anaerobic decomposition of organic matter in landfills.
- *Waste water treatment and discharge* – emissions resulting from anaerobic decomposition of organic matter in sewerage facilities (including on-site systems such as septic tanks) during treatment and disposal of wastewater.
- *Other waste* – emissions resulting from incineration of solvents and clinical waste and the anaerobic decomposition of organic material in composting and anaerobic digester facilities.

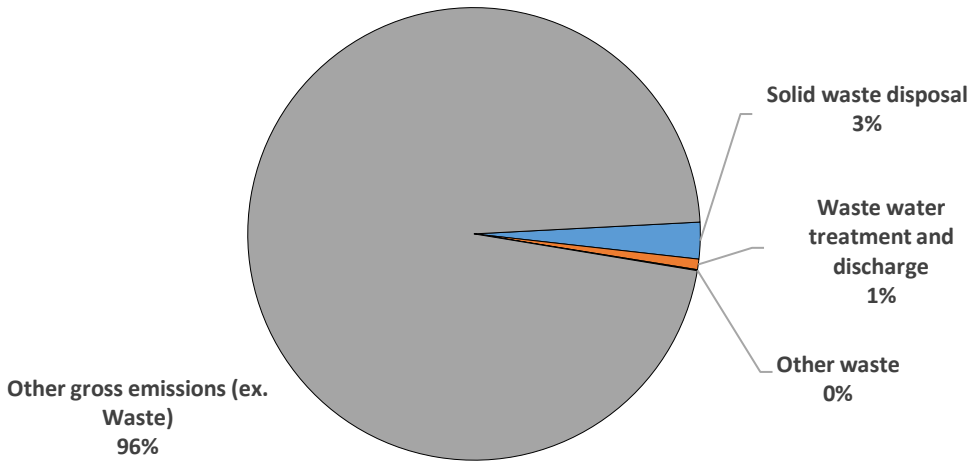


Figure 18: Greenhouse gas emissions kt CO_2-e, Waste relative to all other gross emissions, 2015-16, South Australia[35].

[35] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

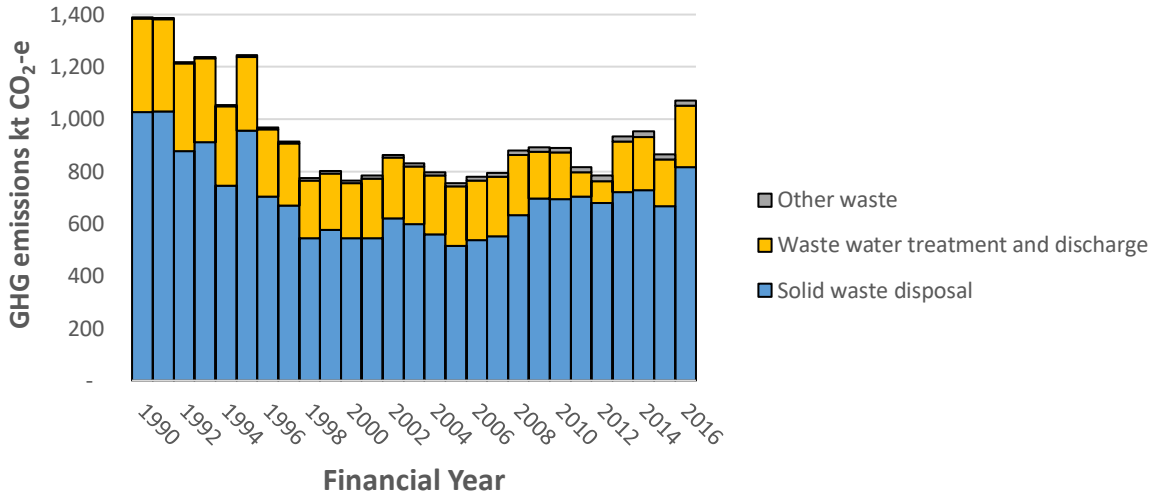


Figure 19: Greenhouse gas emissions kt CO_2-e, Waste, by selected subcategory, 1989-90 to 2015-16, South Australia[36].

Table 15 presents the change in emissions from the 1990 base year to the most recent reporting year of 2015-16. A comparison from the previous Section 7 report (2012-2013 greenhouse gas inventory data) is also provided.

Table 15: SA inventory, Waste category, by source of emissions, change to 2015-16 from selected years[37].

Source	Emissions kt CO_2-e			Change to 2015-16	
	1989-90	2012-13	2015-16	1989-90 to 2015-16	2012-13 to 2015-16
Solid waste disposal	1,028	722	816	-20.6%	13.1%
Waste water treatment and discharge	357	193	234	-34.3%	21.7%
Other waste	3	21	21	499.2%	1.5%
Waste	**1,389**	**935**	**1072**	**-22.8%**	**14.6%**

[36] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

[37] http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/state-and-territory-greenhouse-gas-inventories-2016

Appendix C : Sector agreements

C.1 Sector agreements

The *Climate Change and Emissions Reduction Act 2007 (SA)* (the Act) provides for the government to enter into sector agreements with people, organisations, and industry or business groups to further any strategies to meet targets set under this Act. A sector agreement may include such matters as:

- reduction or limitation or mitigation of the effects of greenhouse gas emissions for a particular enterprise or industry, or a particular sector of the state's economy
- strategies to achieve objectives or reductions in energy use, or to maximise efficiencies in energy use or to promote the use of renewable energy
- strategies to promote or support research, innovation and development to reduce greenhouse gas emissions or to adapt to climate change.

Sector agreements are entered into on a voluntary basis for the purpose of recognising, promoting or facilitating strategies to meet any target set under the Act.

Sector agreements operate under guiding principles and seek to formalise the joint aspiration of the signatories to achieve the aims of the agreement in a non-legally binding way. Typically the agreements will commit the parties to collaborate and work in partnership with a range of stakeholders to deliver the objectives of the agreement. These objectives may include developing and implementing climate change adaptation measures, empowering the community, businesses and institutions to take action in support of such measures, and demonstrating climate change action leadership locally, nationally and globally.

C.2 Sector agreements in operation during the reporting period (commenced prior to the reporting period)

The Carbon Neutral Adelaide, the Local Government Association of South Australia and the Eyre Peninsula sector agreements continued in operation during the reporting period and the SA Water Corporation agreement was extended to continue in operation (Table 16).

Table 16: Sector agreements that commenced prior to 2016 and are still active in 2016 and 2017

SECTOR AGREEMENT TITLE	KEY AIMS
Adelaide City Council Carbon Neutral Adelaide 2015	• Deliver the Carbon Neutral Adelaide initiative for the area comprising the Adelaide City Council municipal area. • Develop a shared vision for the Carbon Neutral Adelaide initiative, as well as an underpinning framework and an action plan. • Develop and implement climate change policies and initiatives to deliver the carbon neutral vision. • Foster innovation and opportunities in climate change. • Implement and deliver the Building Upgrade Finance mechanism, commencing in the City of Adelaide, subject to negotiation of a suitable funding model and establishment of an appropriate legislative framework. • Develop and implement climate change adaptation measures to grow community resilience to climate change impacts and costs, and enhance the City of Adelaide's liveability and vibrancy. • Empower the community, businesses and institutions to take action in support of the Carbon Neutral Adelaide vision. • Develop annual greenhouse gas inventories. • Demonstrate climate change action leadership locally, nationally and globally.
Local Government Association 2013	• Support the implementation of South Australia's Climate Change Adaptation Framework. • Implement the Science to Solutions Project to support adaptation decision making at the local scale. • Work with the State Government to develop and implement the Building Upgrade Finance mechanism. • Support the formulation of policy to address sea level rise impacts on coastal development.
Eyre Peninsula 2015	• Identify and promote low carbon economic opportunities in the energy, water, transport and infrastructure industry sectors. • Recognise differences across the region and facilitate geographically specific responses to climate change. • Collaborate to support a better understanding of climate change risks and issues for communities. • Collaborate in a regional approach to further implement the adaptation plan. • Facilitate and grow community engagement, and industry participation in programmes designed to promote behaviour change.
SA Water Corporation 2015 To be extended in 2018	• Reduce greenhouse gas emissions associated with the provision of water and waste water services for South Australia. • Increase the use of renewable energy sources. • Develop measures to adapt to climate change. • Support necessary research.

C.3 Agreements concluded

No climate change sector agreements completed their full term during the reporting period.

Appendix D : South Australian energy data

D.1 A note on the calculation of the renewable energy target statistics

The Department of Premier and Cabinet (DPC) reported that for 2016-17, South Australia's renewable energy production amounted to 48.9% of the state's total generation.

The figure for renewable energy production calculated by AEMO's 2017 South Australian Historical Market Information Report (SAHMIR) is different to the one calculated by DPC for 2016-17. AEMO have used wind generation and solar PV generation in its renewable calculation whereas DPC has included wind, solar and small non-scheduled renewable generation. The small non-scheduled renewable generation figure is provided to DPC confidentially by AEMO and cannot be published publicly.

The number reported by AEMO and DPC for solar PV generation has differed in previous years. AEMO have changed their methodology for calculating PV generation in recent years. The modelling has become more sophisticated and therefore AEMO have chosen to update it periodically to get a more accurate picture of PV generation. Historically DPC has used its own calculation to estimate PV generation for consistency. AEMO have now determined a methodology to use going forward. DPC are comfortable with this approach and have therefore adopted their PV generation number for 2016-17.

Appendix E : CSIRO Review of Progress to Achieving Targets Under Section 7 of the Climate Change and Greenhouse Emissions Reduction Act 2007

Appendix F : Technical notes

South Australia's *Climate Change and Greenhouse Emissions Reduction Act 2007* (SA) (the Act) defines the SA target as: "to reduce by 31 December 2050 greenhouse gas emissions within the state by at least 60 per cent to an amount that is equal to or less than 40 per cent of 1990 levels".

A reviews of the progress towards the emissions and renewables targets address technical issues, including those related to methods and data sources. Four technical points that influenced the interpretation and comparability of the estimates of progress are outlined below.

F.1 Key dates relevant to this report

This is the fifth Section 7 report on the operation of the Act. The first was prepared in 2009.

Data availability and comparability

This report uses data on the inventories from 1989-90 to 2015-16, which is three additional inventories since the previous Section 7 report. The greenhouse gas emission results presented in this report are not comparable to those published in the previous Section 7 report, as the inventories were all revised.

Key dates

Table 15 summarises the some of the key dates and documents relevant to this report.

Table 17: Key dates relevant to this report.

Date	Item	Description
July 2007	The SA Climate Change Act	Climate Change and Greenhouse Emissions Reduction Act 2007 (SA)
November 2015	Second SA Climate Change strategy	SA's Climate Change Strategy 2015 to 2050 : Towards a Low Carbon Economy
December 2015	4th Section 7 report	Section 7 Report (2015) used figures published in 2015 for greenhouse gas inventories from 1989-90 to 2012-13
September 2017	AEMO Energy data	2016-17 data on electricity generation released and used in the current Section 7 report
February 2018	1989-90 to 2015-16 greenhouse gas inventories	All states' 1989-90 to 2015-16 greenhouse gas inventories released by the Australian Government

Two periods of progress reviewed in report

Two periods of progress in greenhouse gas emissions were analysed for the Section 7 report: progress since baseline; and progress since the previous Section 7 report. These periods reflect the three broad requirements of the report.

F.2 The source of SA's greenhouse gas emission inventory

The Australian Government produces all states' and territories' greenhouse gas inventories and publishes them with a two year delay.

Australian state and territory governments do not develop their own greenhouse gas inventories. They are developed by the Australian Government in accordance with international guidelines and protocols. The estimates are derived from multiple data sources most of which are collected for other purposes, such as agriculture surveys. Data is collected specifically for greenhouse gas monitoring from Australia's large emitters, excluding governments,

under the *National Greenhouse and Energy Reporting Act 2007*. The first estimates for 2015-16 were published in February 2018.

The data that is used by each state and territory to monitor greenhouse gas emissions is developed and provided by the Australian Government. This data is referred to as the State and Territory Greenhouse Gas Inventories (STGGI).

F.3 Revisions of previous Australian Government estimates of SA's greenhouse gas emissions inventory

All previous estimates of SA's net emissions are revised each year by the Australian Government, which develops these estimates. Annual revisions mean that successive inventory statistics on change since baseline are not comparable.

The estimate of South Australia's 1990 baseline net emissions published in 2009 (31.725 $MtCO_2e$) was revised by the Australian Government each year to 2017. All previous estimates for each year are revised, for example in 2018 all the 2017 estimates for inventories from 1989-90 to 2014-15 were revised. These revisions occur for all jurisdictions and for Australia overall.

The revisions are meaningful in the context of interpretation of the South Australian target and progress toward it. The eight revised estimates of 1989-90 net emissions varied between 3.3 per cent above (2015 data) and 2.3 per cent below (2014 data) the 2009 estimate. When estimates of change since baseline are reported, they will change from year to year because all data is revised.

F.4 Treatment of emissions attributable to imported electricity

The definition of net greenhouse gas emissions, and hence the definition of the SA target, changed in 2017.

From 2008 to 2016, for the purpose of reporting the target, South Australia defined its "greenhouse gas emissions within the state" as comprising: gross emissions (sources) plus emissions attributable to net imports of electricity less the land based sinks. This definition excludes the emissions from electricity generated within the state and exported to other states. It includes the emissions attributable to electricity generated interstate but imported by South Australia.

In 2017, the definition of the South Australian target changed with respect to the treatment of emissions attributable to traded electricity. It now defines "greenhouse gas emissions within the state" as gross emissions less land based sinks. The definition is consistent with the Act as it includes all (and only) "emissions within the state".

The new definition **includes** the emissions for all electricity generated in South Australia, including the emissions of electricity exported via interconnectors. This is also the definition that the STGGI generated by the Australian Government uses when they refer to each jurisdiction's "net emissions".[38] The previous definition **excluded** the emissions associated with exported electricity but **included** the emissions associated with imported electricity. In this way it reflects consumption of electricity[39], which was more than generation over this period.

In this report, the term "net emissions" refers to the net emissions for SA as currently defined. It should also be noted that in some previous reports, the definition of net emission was referred to as "including the interconnector". However, the interconnector flows comprise both exports and imports, hence this addition is correctly referred to as "net imports" or "net interconnector".

[38] State and Territory Greenhouse Gas Inventories 2016, Commonwealth of Australia 2018

[39] SA electricity generation, less exports, plus imports reflects, but is not equivalent to, SA consumption or demand. There are a number of factors (including leakages) that mean that consumption estimates are less than SA generation less exports plus imports.