



**ACT**  
Government

Environment, Planning and  
Sustainable Development

**THE LEGISLATIVE ASSEMBLY FOR THE  
AUSTRALIAN CAPITAL TERRITORY**

**REPORT ON THE 2017-18 ACT GREENHOUSE GAS INVENTORY**

**FEBRUARY 2019**

Mr Shane Rattenbury MLA  
Minister for Climate Change and Sustainability

# **ACT Greenhouse Gas Inventory for 2017-18**

**Client:** Environment, Planning and Sustainable Development  
Directorate,  
ACT Government

**Date:** 21 November 2018

**Report prepared by:** Dr Hugh Saddler

## Contents

1. Total ACT Greenhouse Gas Emissions.....	1
2. Emissions by source .....	2
3. Changes in Greenhouse Gas Emissions between 2016-17 and 2017-18.....	5
3.1 Electricity.....	5
3.2 Natural gas .....	5
3.3 Transport.....	5
3.4 Fugitive energy.....	5
3.5 Waste .....	6
3.6 Industrial processes .....	6
3.7 Agriculture and Land Use, Land Use Change and Forestry (LULUCF) .....	6
4. Trends for the future .....	7

## 1. Total ACT Greenhouse Gas Emissions

The estimate of total greenhouse gas emissions for the ACT in 2016-17 is 3,367.5 kilotonnes of carbon dioxide equivalent (kt CO<sub>2</sub>-e).

This total includes the net impact of both emissions and removals of CO<sub>2</sub> in the land use, land use changes and forestry (LULUCF) sector, as well as emissions from all other emission sources occurring in the ACT, expressed in terms of CO<sub>2</sub>-e.

Table 1 shows the results for 2017-18. It also shows results for 2013-14, 2014-15, 2015-16, and 2016-17. These differ slightly from the values reported last year, which are also shown in the Table 1. The main reason for the difference is the upward revision of estimates of synthetic gas emissions in the ACT, contained in the National Greenhouse Gas Inventory (NGGI) for 2015-16, which was published earlier in 2018. There are also some changes to estimated emissions from the Agriculture and the Land use, land use change and forestry sectors, based on the new NGGI data.

The table also shows the ACT's emissions target for 2020. This target is 40 per cent below the 1989-90 level of greenhouse gas emissions and is a legislated objective. It can be seen that emissions in 2017-18 were 5 per cent higher than in 1989-90, but 14 per cent lower than in 2016-17.

**Table 1: Total ACT Greenhouse Gas Emissions Summary (kt CO<sub>2</sub>-e)**

	1989–90	2013–14	2014–15	2015-16	2016–17	2017–18	2020 Target
Current	3196.8	3,934.5	4,063.2	4,102.4	3,927.8	3,367.5	1,918
Previous	3196.8	3,908.6	4,026.8	4,052.3	3,916.2	NA	1,918

Table 2 shows per capita emissions for the same years as reported in Table 1. Per capita emissions rose between 2013-14 and 2014-15 but have fallen each year since then. Factors contributing to the reduction in emissions in 2016-17 are discussed later in this report.

**Table 2: ACT Population, Total Greenhouse Gas Emissions (kt CO<sub>2</sub>-e) and Emissions per Capita (t CO<sub>2</sub>-e)**

Year	1989–90	2013–14	2014-15	2015-16	2016–17	2017–18
Population (at 31 December)	279,219	386,318	391,981	398,874	407,489	416,244
Emissions (kt CO <sub>2</sub> -e)	3196.8	3,934.5	4,063.2	4,102.4	3,927.8	3,367.5
Emissions per capita (t CO <sub>2</sub> -e)	11.45	10.18	10.37	10.28	9.64	8.09

## 2. Emissions by source

Stationary energy is the dominant source of emissions in the ACT. Until 2013-14 it was responsible for over two-thirds of the CO<sub>2</sub>-e emissions that were attributable to the ACT. However, its share gradually declined from then until 2015-16, mainly because consumption of electricity and gas grew more slowly than consumption of petroleum fuels for transport. In 2016-17, and again in 2017-18, decisive reductions in the stationary energy share have occurred because ACT government policy has caused a marked reduction in the emissions intensity of electricity consumed in the ACT. Stationary energy use was responsible for 55 per cent of total emissions in 2017-18, down from 62 per cent in 2016-17.

The transport sector is also very important, with 34 per cent of emissions coming from petroleum based fuels used in transport vehicles. Industrial processes, waste, and fugitive emissions related to the energy sector account for most of the remainder of emissions. Land use, land use changes and forestry (LULUCF) contributed a small quantity of net removals of CO<sub>2</sub> in 2017-18.

**Table 3: ACT Greenhouse emissions 2017-18 by source**

Emissions Source	Emissions in 2017-18, kilo tonnes CO <sub>2</sub> -e	Total emissions
Stationary energy	1,843.2	54.7%
Transport	1,147.0	34.1%
Fugitive emissions	31.4	0.9%
Industrial processes (synthetic gases)	259.5	7.7%
Agriculture	23.9	0.7%
Waste	72.4	2.1%
<b>Sub Total (ex LULUCF)</b>	<b>3,377.3</b>	<b>100.3%</b>
LULUCF	-9.8	-0.3%
<b>TOTAL including LULUCF</b>	<b>3,367.5</b>	<b>100.0%</b>

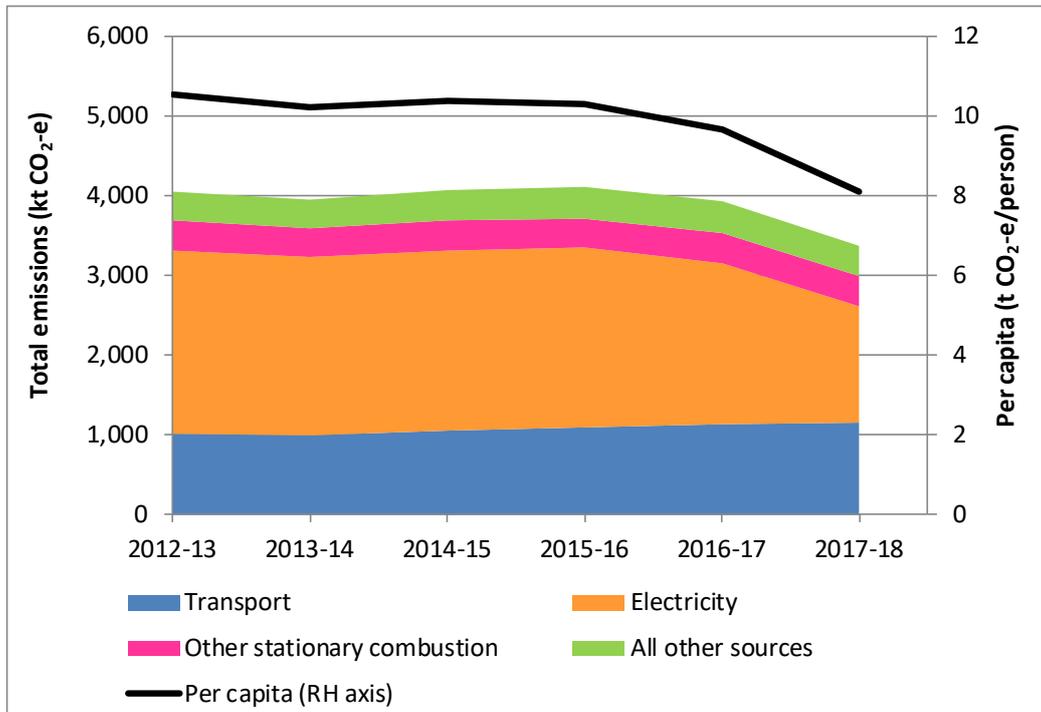
Emissions relating to some form of energy use accounted for 90 per cent of emissions in 2017-18. This is the combined emissions of stationary energy, energy for transport, and fugitive emissions (which in the case of the ACT is the leakage of natural gas from the distribution system). It is only a slightly smaller share than in 2016-17, but of a smaller quantity of total emissions. Stationary energy emissions are predominantly attributable to the generation of electricity used in the ACT, though emitted outside of the ACT, but also include emissions from use of natural gas, non-transport use of petroleum fuels, including heating oil and fuel oil, and use of fuel wood. Emissions attributed to non-transport petroleum fuels and fuel wood are very small.

It should be noted, however, that reported emissions from non-transport use of petroleum fuels are incomplete, in that they do not include emissions from the use of LPG in non-transport applications. For a variety of reasons, a number of residential and business consumers in the ACT use LPG instead of pipeline natural gas. Several businesses, including Elgas, Supagas and Origin provide 45 kg LPG cylinder exchange and larger LPG tank refill services in the ACT. No data are currently available on non-transport use of LPG by businesses and households. Data on emissions from use of heavy fuel

oil includes only the emissions reported by Icon Water, relating to use at the Lower Molonglo Water Quality Control Centre.

The detail of all emissions sources for 2017-18, including changes in land use, land use changes and forestry, is shown below. Figure 1 shows trends of emissions from the five major sectors over the past five years.

**Figure 1: Emission trends in the ACT since 2012-13**



**Table 4: Detailed ACT Emissions Sources 2017-18**

<b>Emissions Source</b>	<b>Emissions (kt CO<sub>2</sub>-e)</b>		
<b>Energy</b>			<b>3,021.6</b>
A. Fuel combustion activities		2,990.2	
Electricity	1,467.8		
Natural gas	372.4		
Transport fuels	1,147.0		
Other use of petroleum fuels	2.7		
Fuel wood	0.3		
B. Fugitive emissions from fuels		31.4	
Natural gas leakage	31.4		
<b>Industrial processes</b>			<b>259.5</b>
Consumption of halocarbons and SF6	259.5		
<b>Agriculture</b>			<b>24.0</b>
Enteric fermentation	21.3		
Manure management	0		
Agricultural soils	2.7		
<b>Land use, land-use change and forestry</b>			<b>-9.8</b>
Afforestation and reforestation	-13.8		
Deforestation	-2.6		
Forest management	4.7		
Cropland management	0.4		
Grazing land management	3.8		
<b>Waste</b>			<b>72.4</b>
Solid Waste Disposal on Land	60.7		
Wastewater Handling	11.6		
Total emissions including net CO <sub>2</sub> -e from LULUCF			<b>3,367.5</b>
Total emissions excluding net CO <sub>2</sub> -e from LULUCF			<b>3,377.3</b>

### **3. Changes in Greenhouse Gas Emissions between 2016-17 and 2017-18**

#### **3.1 Electricity**

Emissions from electricity decreased from 2,023 kt CO<sub>2</sub>-e in 2016-17 to 1,468 kt CO<sub>2</sub>-e in 2017-18, a decrease of 27 per cent. The main factor producing this outcome was the large increase in the volume of electricity acquired by the ACT Government from contracted renewable generators. Two of the largest windfarm contracts, with Ararat and Hornsdale 1, started in the later part of 2016-17 and were in place for the whole of 2017-18. As a result, the share of total electricity supplies against government contracts increased from 9 per cent to 26 per cent. Supply from all other sources of renewable generation also increased slightly, with the result that total renewable supply of ACT electricity consumption increased from just over 30 per cent to 49 per cent.

Other factors affecting Scope 2 emissions from electricity generation were as follows:

- 1) Total electricity supplied through the meter to consumers decreased by 2.2 per cent, caused by a combination of lower total consumption of electricity and increased behind the meter consumption from rooftop PV installations.
- 2) The emissions intensity of the remaining 51 per cent of electricity, sourced from fossil fuel generators supplying the NSW region pool, decreased, because the closure of Hazelwood power station in Victoria, formerly Australia's most emissions intensive power station, had the dual effect of reducing the average emissions intensity of electricity generated in Victoria and reducing net imports to NSW from Victoria.

#### **3.2 Natural gas**

After a large increase last year, emissions from natural gas decreased by 3.8 per cent between 2016-17 and 2017-18. As noted in the 2016-17 report, it is difficult, in the absence of more detailed data about gas consumption, to determine the reasons for reduced consumption.

#### **3.3 Transport**

As has been the case for many, if not all inventory years, emissions from fuels used for transport and mobile equipment, such as construction machinery, increased again, relative to 2016-17. The increase was just under 26 kt CO<sub>2</sub>-e, equivalent to 2.3 per cent, which is a slightly higher rate of increase than last year. Consumption of petrol (auto gasoline, including E10) increased, but only very slightly, while consumption of auto LPG decreased. However, consumption of diesel increased strongly, by almost 7 per cent. Very similar trends in transport fuel consumption are seen throughout Australia.

#### **3.4 Fugitive energy**

Data provided by ActewAGL Distribution show that Unaccounted for Gas (UAG), from which fugitive emissions are estimated, was slightly lower in 2017-18 than in 2016-17, mainly because the volume of gas supplied to consumers was lower.

### **3.5 Waste**

Emissions from solid waste disposal in 2017-18 were 31 per cent lower than in 2016-17. The reduction was caused by a 26 per cent increase in the volume of landfill gas captured and burnt at the Mugga Lane and Belconnen landfill gas generators, as advised by Energy Developments Ltd. This followed a significant increase in the previous year as well. The volume of landfill gas captured and flared mainly affects the estimates of emissions from legacy waste. During 2017-18, the total volume of commercial and residential waste going to landfill, as advised by ACT NoWaste, was slightly higher than in 2016-17. Changes in current volumes of waste to landfill will affect emissions in future years.

The other source of waste emissions is the small quantities of nitrous oxide arising from the denitrification process at the Lower Molonglo Water Quality Control Centre (LMWQCC). As explained in previous greenhouse gas inventory reports, LMWQCC uses an aerobic waste water treatment process and therefore emits negligible quantities of methane.

As a result of the reductions in solid waste emissions, total waste emissions in 2017-18 were at their lowest level for many years.

### **3.6 Industrial processes**

As noted earlier, the National Greenhouse Gas Inventory (NGGI) for 2015-16 reported a significant increase in the estimate of emissions from synthetic fluorinated hydrocarbon gases in the ACT in that and several previous years. Consequently, the estimate of ACT emissions using the linear extrapolation methodology showed a significant increase in estimated emissions for both 2015-16 and 2016-17, compared with last year's inventory report, and also a further increase from 2016-17 to 2017-18.

However, the revised NGGI data also show a significant reduction in the year on year increase between 2014-15 and 2015-16, compared with earlier years, as would be expected given national phase-out policies now in place. Since 2016-17 is only one data point out of seventeen, it has only a minor effect on the estimated linear extrapolation equation. However, NGGI for 2016-17 (when it is published) shows a further slow down in the growth of synthetic gas emissions, it may be useful to consider a review of the methodology used to estimate ACT emissions for the two most recent years. Estimated emissions from this source accounted for 7.7 per cent of total emissions in 2017-18, making it the fourth largest source, after electricity, transport fuels and natural gas.

### **3.7 Agriculture and Land Use, Land Use Change and Forestry (LULUCF)**

Estimates of emissions from both these sources are the figures for the ACT reported in the National Greenhouse Gas Inventory (NGGI) for 2015-16. This was published in April 2018 and is the most recent published National Inventory. The effect of this methodology is that ACT emissions, as recorded in this annual inventory report, remain constant over the three most recent years, but figures for 2015-16 and 2016-17 are revised to reflect the change from NGGI data for 2014-15 to NGGI data for 2015-16. As recognised when the emissions methodology was developed and approved, ACT emissions from these sources are so small that this rather convoluted updating procedure has negligible impact on estimates of total ACT emissions.

Most agriculture emissions arise from enteric fermentation in the gut of cattle and sheep. The volume of emissions is roughly proportional to the numbers of each livestock type, which have not greatly changed in recent years. LULUCF emissions arise from a variety of sources, including Afforestation and Reforestation, Deforestation, Forest management, and Grazing land management. Total emissions from both sources are very small and show little year to year variation.

#### **4. Trends for the future**

On the basis of the figures reported in this 2017-18 inventory, if emissions from all sources of emissions other than electricity remain unchanged over the next two years, achieving zero emissions electricity will ensure that the ACT reaches its overall emission reduction target of 40 percent below 1990 levels in 2020, though not by a wide margin. The major challenge to the ACT, as it is to Australia as a whole, is the continuing steady growth in transport emissions. If ACT transport emissions continue to grow at similar rates to those experienced over the past few years, the 2020 target will not be met, unless significant reductions are achieved in emissions from either natural gas use, or synthetic gas use, or both. These are the only two emission sources in the ACT, other than electricity, large enough to be able to offset growing transport emissions.