



ACT
Government

ACT Greenhouse Gas Inventory for 2016–17

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1. Total ACT Greenhouse Gas Emissions

The estimate of total greenhouse gas emissions for the ACT in 2016-17 is 3,916.2 kt CO₂-e.

This total includes the net impact of both emissions and removals of CO₂ 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 CO₂-e.

Table 1 shows the results for 2016-17. It also shows results for 2013-14, 2014-15, and 2015-16. These differ very slightly from the values reported last year, which are also shown in the Table. The difference is mostly caused by small downward revision of the estimated volume of landfill gas captured and burnt in recent years at the Mugga Lane and Belconnen generation plants. The targeted emissions result for 2020 is also shown. 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 2016-17 were 23 per cent higher than in 1989-90, but 3.0% lower than in 2015-16.

Table 1 - Total ACT Greenhouse Gas Emissions Summary (kilo tonnes CO₂-e)

	1989–90	2013–14	2014–15	2015-16	2016–17	2020 Target
Current	3196.8	3,908.6	4,026.8	4,052.3	3,916.2	1,918
Previous	3196.8	3,839.8	3,997.7	4,016.6	NA	1,918

Table 2 shows per capita emissions for the same years as reported in the previous table. It can be seen that per capita emissions rose between 2013-14 and 2014-15 but have fallen in the two years since then. These numbers differ quite substantially from those reported last year, because the population estimates have been revised upwards by the ABS, in the light of data collected in the 2016 Census. Factors contributing to the reduction in emissions in 2016-17 are discussed later in this report.

Table 2 – ACT Population, Total Greenhouse Emissions (kt CO₂-e) and Emissions per Capita (t CO₂-e)

Year	1989–90	2013–14	2014-15	2015-16	2016–17
Population (at 31 December)	279,219	386,714	392,605	399,578	406,403
Emissions (kt CO₂-e)	3196.8	3,908.6	4,026.8	4,052.3	3,916.2
Emissions per capita (t CO₂-e)	11.45	10.11	10.26	10.14	9.64

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 CO₂-e emissions that were attributable to the ACT. However, its share has gradually declined, mainly because consumption of electricity and gas has been growing more slowly than consumption of petroleum fuels for transport. In 2016-17, for the first time, a further fall in the stationary energy share was caused by a marked reduction in the emissions intensity of electricity consumed in the ACT.

The transport sector is also very important, with almost 29% 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) was also a small net source of emissions in the 2016-17 emissions inventory, in contrast to the previous year when it was responsible for small net removals of CO₂.

Table 3 - ACT Greenhouse emissions 2016-17 - by source

Emissions Source	Emissions in 2016-17, kilo tonnes CO ₂ -e	% of total emissions
Stationary energy	2,412.2	61.6%
Transport	1,121.4	28.6%
Fugitive emissions	28.2	0.7%
Industrial processes (synthetic gases)	208.2	5.3%
Agriculture	19.9	0.5%
Waste	99.9	2.6%
Sub Total (ex LULUCF)	3889.8	99.3%
LULUCF	26.3	0.7%
TOTAL including LULUCF	3916.2	100.0%

Emissions relating to some form of energy use accounted for 91 per cent of emissions in 2016-17. 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). Stationary energy emissions are predominantly attributable to the generation of electricity used in the ACT, though emitted elsewhere, and also include emissions from use of natural gas, non-transport use of petroleum fuels, including LPG, heating oil and fuel oil, and use of fuel wood. Emissions attributed to non-transport petroleum fuels and fuel wood are very small.

However, it should be noted 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 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 2016-17, including changes in land use, land use changes and forestry, is shown in

Table 4: Detailed ACT Emissions Sources 2016-17

below. Figure 1 shows trends of emissions from the five major sectors over the past five years.

Figure 1: Emission trends since 2012-13

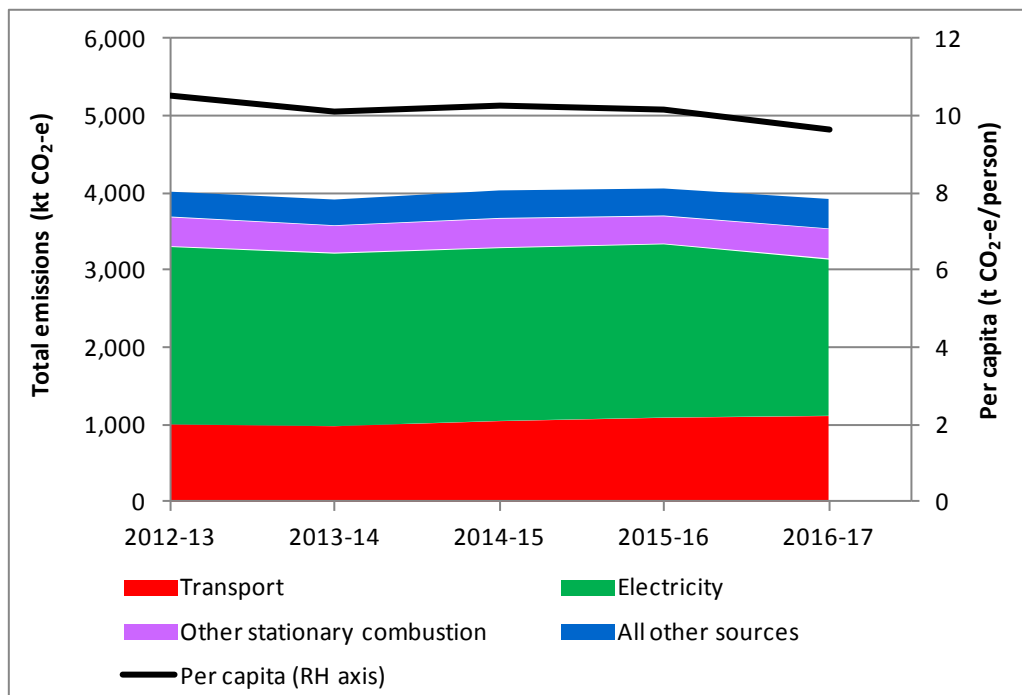


Table 4: Detailed ACT Emissions Sources 2016-17

Emissions Source	Emissions (kt CO₂-e)		
Energy			3,561.8
A. Fuel combustion activities		3,533.6	
Electricity	2,021.6		
Natural gas	387.3		
Transport fuels	1,121.4		
Fuel oil	3.0		
Fuel wood	0.3		
B. Fugitive emissions from fuels		28.2	
Natural gas leakage	28.2		
Industrial processes			208.2
Consumption of halocarbons and SF6	208.2		
Agriculture			19.9
Enteric fermentation	17.6		
Manure management	0		
Agricultural soils	2.3		
Land use, land-use change and forestry			26.3
Afforestation and reforestation	-6.4		
Deforestation	26.1		
Forest management	2.1		
Cropland management	0.01		
Grazing land management	4.5		
Waste			99.9
Solid Waste Disposal on Land	88.5		
Wastewater Handling	11.4		
Total emissions including net CO₂-e from LULUCF			3,916.2
Total emissions excluding net CO₂-e from LULUCF			3,889.8

3. Changes in Greenhouse Gas Emissions between 2015-16 and 2016-17

3.1 Electricity

Emissions from electricity decreased from 2,242 kt CO₂-e in 2015-16 to 2,022 kt CO₂-e in 2016-17, a decrease of 9.8% per cent. Several factors interacted to produce this outcome.

- 1) Consumer demand for electricity supplied through the meter increased by 1.4%, partially offset by a decrease in distribution losses within ActewAGL Distribution's network. Until more disaggregated consumption data separating residential and business consumption become available, it is difficult to know what factors may be contributing to increased consumption.
- 2) The renewable electricity share of total electricity supplied increased from 20% to 29%. Two components of renewable supply contributed to this increase. Firstly, the Renewable Power Percentage increased from an average of 11.31% in 2015-16 to an average of 13.49% in 2016-17, in line with the growing annual Renewable Energy Target under national legislation. Secondly, the first significant supply contracted with wind generators came on line, contributing 9.5% of the electricity supplied to the ACT from the National Electricity Market. There were small increases in below baseline NSW region hydro and in exports from rooftop PV in the ACT, and a small decrease in GreenPower purchases by ACT electricity consumers.
- 3) The emissions intensity of the remaining 69% of electricity, sourced from fossil fuel generators supplying the NSW region pool, increased slightly, mainly because reduced gas generation caused the average emissions intensity of both NSW generation and imports from Queensland to increase by small amounts. This shift should reverse next year, as the closure of Hazelwood, in Victoria, previously Australia's most emissions intensive power station, has caused a large drop in imports of electricity to NSW from Victoria.

3.2 Natural gas

Emissions from natural gas increased by over 8 per cent between 2015-16 and 2016-17, reaching the highest level reported in the past five years, and probably the highest ever level. The absolute increase was 29 kt CO₂-e. Residential customers account for well over half of total gas consumption, making it likely that the increase in gas consumption, and associated emissions, reflects changes in residential sector consumption. However, in the absence of quality time series data on numbers of gas customers and shares of gas use for water and space heating, it is difficult to know what the reasons for the large consumption increase might be.

3.3 Transport

As has been the case for many, if not all inventory years, transport emissions increased from 2015-16 to 2016-17. However, the increase of 23 kt CO₂-e, equivalent to 2.1%, was the smallest for many years, and half the increase in the previous year. Consumption of both petrol (auto gasoline) and diesel increased, though the increase in diesel consumption was the smallest since 2013-14.

Note that some of the apparent increase in diesel consumption in recent years is an artefact of the expanded coverage of the Fuel Use Survey since 2013-14, discussed in last year's Report, i.e. it represents previously unreported diesel consumption in the form of bulk sales, not an actual consumption increase. One effect of the expanded coverage has been to include consumption of diesel fuel used in earth moving equipment and other types of non-transport machinery, virtually all of which are supplied in the form of bulk sales. However, in the absence of any systematic data about how diesel supplied in bulk is used, and noting that bulk sales include diesel used in road vehicle fleets as well as off-road equipment, all diesel consumption is grouped under Transport. That said, diesel consumption by off-road equipment is likely to be a smaller fraction of total diesel consumption in the ACT than in other parts of Australia.

3.4 Fugitive energy

Data provided by ActewAGL Distribution show that from 2015-16 to 2016-17 Unaccounted for Gas (UAG), from which fugitive emissions are estimated, increased as a share of total gas supplied into the distribution network, which in turn increased significantly compared with 2015-16. Hence there was an appreciable increase in estimated fugitive emissions from the distribution network. This source remains, however, only a small contributor to total emissions.

3.5 Waste

Emissions from solid waste disposal in 2016-17 was 16% lower than in 2015-16. The reduction was caused by the combination of a 7% decrease in the quantity of waste going to landfill and a 20% 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. As previously noted, a relatively small downward revision of this value in past years has been made, based on a review of data previously provided by EDL.

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 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 2016-17 were at their lowest level since 2012-13.

3.6 Industrial processes

As anticipated in last year's Report, estimated national emissions from synthetic fluorinated hydrocarbon gases showed a further near linear increase in the National Greenhouse Gas Inventory for 2015-16, published in June 2017. Accordingly, the estimate of ACT emissions, using the approved linear extrapolation methodology, showed a steady increase over 2016-17.

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

Under the approved methodology, estimates of emissions from both these sources are the figures for the ACT reported in the National Greenhouse Gas Inventory (NGGI) for 2014-15. This was published in June 2017 and is the most recent published National Inventory. Total emissions from both sources are small and show very little year to year change.

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 in the ACT, as estimated for the NGGI, increased from 2013-14 to 2014-15, changing from a very small negative, i.e. net removals of CO₂, to a slightly larger positive value. It appears that the main sources of this overall increase were increases in both wood harvesting and in vegetation clearing. That said, emissions from this source remain very small.