Local Energy & Emissions Monitor

Climate and energy in Merri-bek

from 2000-01 to 2023-24

October 2025

Contents

1. Executive Summary

1.1 Overview

This executive summary provides a concise assessment of carbon emissions and key drivers in Merri-bek for 2023-24, with historical comparisons and a sectoral focus. In 2023-24, Merri-bek's total carbon emissions were 881.1 kilotonnes (kt) of CO_2 equivalent, a decrease of 18.1% from 2004-05 and 32.1% lower than pre-COVID levels in 2018-19. Emissions per capita were 4.8 tonnes (t), marking a 38.0% reduction since 2004-05. Economic emissions intensity fell to 0.11 kg CO_2-e per dollar of GRP, down 46.5% over two decades, indicating ongoing improvements in energy efficiency and a shift to less emissions-intensive economic activity.

1.2 Demographic and Economic Context

Merri-bek is a metropolitan local government area within northern Melbourne, with an estimated population of 184,150 in 2023-24 and a diverse housing mix. The area's economy is largely service-based, with 110,518 residents employed but only 52,735 jobs within the area, demonstrating substantial commuting outflows. The average resident income is $91,377.

1.3 Emission Sources and Sectoral Trends

Residential sources were the largest contributors, responsible for 64.1% of total emissions in 2023-24. The commercial sector contributed 22.0%, and the industrial sector 13.9%. The relative share of residential emissions increased over time, highlighting challenges in household energy consumption.

- Purchased Electricity: Emissions declined to 223.7 kt in 2023-24, down 68.9% since 2018-19. The share of renewables in local consumption reached 45.1%, up from 6.6% in 2009-10, reflecting strong solar and wind uptake.
- Natural Gas: Emissions were 169.6 kt, down 16.8% since 2018-19, with residential use dominating.
- Other Fuel Combustion: Emissions decreased to 62.1 kt, mostly from industrial and construction activities.
- Transport: Emissions rose to 327.3 kt, a 23.2% increase since 2004-05. Emissions from private vehicles dominate, although per vehicle emissions have decreased by 11.1% over the past decade.
- Industrial Processes and Product Use: Emissions have trended down, with 35.8 kt in 2023-24, a reduction of 41.7% since 2018-19, reflecting structural changes in local industry.
- Agriculture: Emissions remain low and stable at 8.5 kt, due to the highly urbanised nature of Merri-bek.
- Waste: Emissions fell to 51.6 kt, 37.3% below 2004-05, with the largest contributors being commercial and industrial waste, followed closely by wastewater.

- Land Use: The sector's ability to act as a carbon sink has diminished, shifting from offsetting emissions in 2019-20 (-5.2 kt) to being a minor source (0.3 kt) by 2023-24.

1.4 Comparative Performance

Relative to other Australian local government areas (LGAs), Merri-bek's per capita and economic emissions intensity rankings have worsened over the past two decades but showed some recovery in 2023-24. In 2023-24, Merri-bek ranked 115th for per capita emissions and 161st for economic emissions intensity out of all Australian LGAs, reflecting progress but also highlighting further room for improvement.

1.5 Key Progress and Challenges

The most significant reductions occurred in electricity-related emissions through decarbonisation of supply and the uptake of renewables. Despite economy-wide improvements, the growing share of household, transport, and commercial emissions presents ongoing challenges—especially as residential and road transport emissions now dominate the profile. The diminishing carbon sink capacity in land use and continued growth in fugitive and transport emissions signal areas needing targeted action.

1.6 Conclusion

Merri-bek has achieved substantial overall reductions in carbon emissions, especially since 2018-19, through energy transition and sectoral changes. However, continued attention to residential energy use, transport decarbonisation, waste management, and land use planning is required to accelerate progress and address sectors where emissions remain stable or are growing. The shift towards a less carbon-intensive economy is clear, but further effort is needed to maintain momentum and achieve deeper emissions reductions in line with broader regional and national climate targets.

2. Merri-bek: Typology Profile for Energy Consumption and Emissions

2.1 Location and Geography

Figure 2.1 Merri-bek map
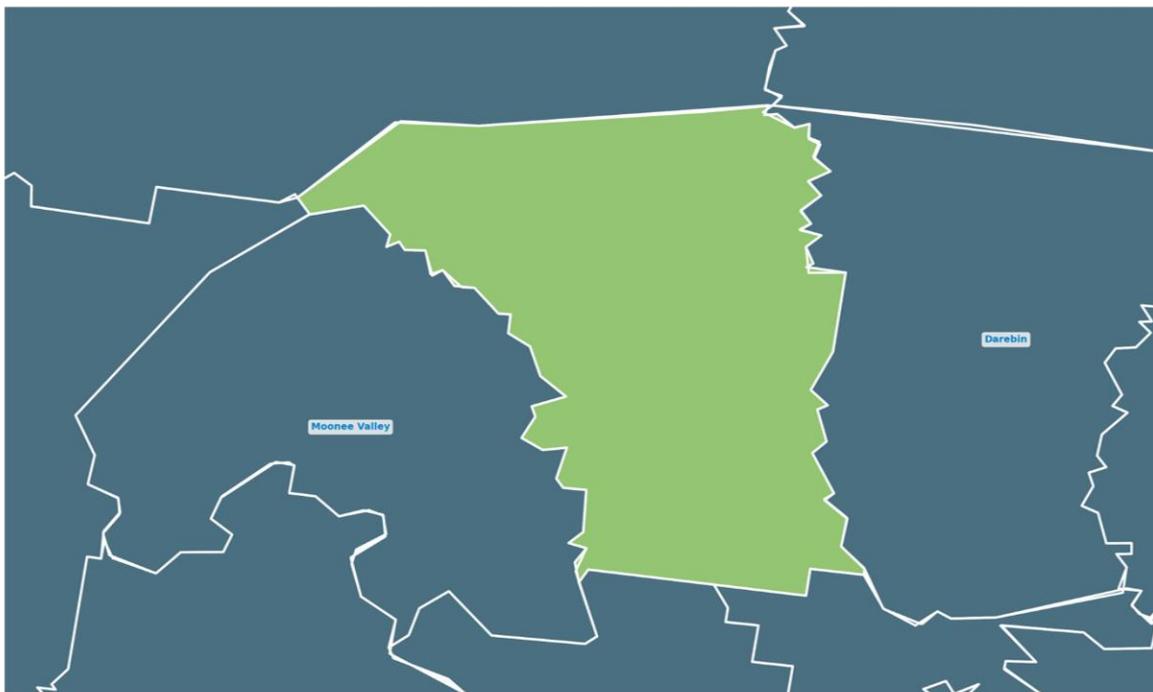
Merri-bek is a metropolitan Local Government Area (LGA) situated in the state of Victoria. Covering an area of 51.0 square kilometres, Merri-bek is part of Melbourne's northern urban corridor and is characterised by a blend of inner-city neighbourhoods and established suburban communities. The region's unique geography incorporates residential, commercial, and green spaces, reflecting its significant role within Melbourne's broader metropolitan landscape. Merri-bek's location provides residents and businesses with direct access to the city's economic, cultural, and transport networks, supporting its status as a key area within Victoria's urban framework.

Table 2.1 Economic profile for Merri-bek for 2023-24		
series	units	value
Economy and Trade		
Gross Regional Product	$ million	7,894.13
Sales	$ million	12,709.24
Interregional imports	$ million	1,557.26
Interregional exports	$ million	6,706.27
International imports	$ million	271.22
International exports	$ million	2,313.91
Population and Households		
Population	no.	184,150
Households	no.	73,930
Dwelling Stock	no.	81,526
Stock of Houses	per cent	66.7
Stock of Flats	per cent	33.3
Employment		
Industry Employment	no.	52,735
Average Industry Income	$ million	80,627
Resident Employment	no.	110,518
Average Resident Income	$ million	91,377

2.2 Population and Housing

Merri-bek's estimated population in 2023-24 is 184,150, accommodated within 73,930 households. This results in an average household size of around 2.5 people, which is broadly consistent with metropolitan averages. The area's dwelling stock totals 81,526, indicating a surplus of dwellings compared to the actual number of households. This may reflect a degree of housing vacancy, multiple property ownership, or properties awaiting occupation or redevelopment.

The composition of housing stock is weighted toward detached houses, which represent 66.7% of all dwellings, while flats make up 33.3%. This suggests that, although the area is undergoing urban consolidation and higher density development, the dominant form remains traditional houses. The relatively high proportion of flats, compared with many other metropolitan regions, indicates a more diverse housing mix and potential for lower per capita carbon emissions from residential energy use, as attached dwellings are generally more energy efficient. The mix of dwelling types also points to a range of demographic and lifestyle needs being met within the municipality.

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2.3 Economy and Employment

The Merri-bek local government area reported a Gross Regional Product of $7,894.1 million in 2023-24, with total sales reaching $12,709.2 million. When examining the flow of goods and services, interregional exports amounted to $1,557.3 million, while interregional imports were much higher at $6,706.3 million. This indicates a significant reliance on goods and services produced outside the region, with interregional imports exceeding exports by $5,149.0 million. Internationally, both exports and imports are much smaller, with international imports ($2,313.9 million) far outweighing international exports ($271.2 million). This significant trade imbalance highlights that Merri-bek sources a considerable portion of its consumption requirements from overseas and other Australian regions.

In terms of employment, the number of residents who are employed (110,518) is markedly higher than the number of people working within the region (52,735), suggesting that a substantial proportion of the local population commutes out of Merri-bek for work. Resident incomes also stand out, with an average of $91,377, compared to the average industry income of $80,627 within Merri-bek. This difference in average incomes supports the inference that many residents may be employed in higher paying jobs elsewhere, further confirming the outward commuting pattern suggested by the employment figures.

2.4 Climate

Table 2.2 Annual climate statistics, 2018–19 to 2023–24						
Indicator	units	2019–20	2020–21	2021–22	2022–23	2023–24
Average temperatures						
Maximum	°C	20.1	20.0	20.4	19.7	20.6
Minimum	°C	10.0	10.3	10.7	10.2	10.9
Average	°C	15.1	15.2	15.6	15.0	15.8
Rainfall	mm	651.6	548.0	619.4	725.6	497.8
Solar irradiation	kWh per m^2	1,482.7	1,460.2	1,503.1	1,467.8	1,539.1

Australian average temperatures have warmed by approximately 1.51 °C from 1910 to 2023. This is around the widely referenced global threshold of an increase of 1.5 °C above pre-industrial levels. At the same time, parts of Australia have trended toward drier conditions with less rainfall. This is most evident in the south-east and south-west regions of Australia[1]. Changes in climate conditions across Australia have increased risks for fires, heavy rainfall and floods.

Long term climate trends in Merri-bek are based on available observations at local weather stations. As such, data is based on shorter time series and can show more volatility than main state weather stations and official Australian national indicators.

Table XX.X shows annual climate statistics for the past five years from 2018-19 to 2023-24. This includes annual averages of maximum, minimum and average temperatures as well as total rainfall and solar irradiation across each financial year. Across the five-year period, average maximum temperatures ranged from a low of 19.7 °C in 2022-23 to a high of 20.6 °C in 2023-24, with average minimum temperatures following a similar upward trend, rising from 10.0 °C in 2019-20 to 10.9 °C in 2023-24. Annual average (mean) temperatures fluctuated from 14.9 °C in 2022-23 to 15.8 °C in 2023-24, representing a modest warming trend. Rainfall totals were notably variable, with the highest annual rainfall occurring in 2022-23 at 725.6 mm and the lowest in 2023-24 at 497.8 mm. Solar irradiation showed a steady increase over the period, growing from 1,482.7 kWh/m² in 2019-20 to 1,539.1 kWh/m² in 2023-24. These statistics highlight a recent pattern of warmer annual temperatures, decreasing rainfall, and increased solar energy availability in Merri-bek.

The following long-term climate trends have been observed in Merri-bek:

- Average annual temperatures have warmed by 1.644 °C as of 2023-24 since 1950-51. The long-term trend is 0.023 °C change per annum.

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[1] CSIRO, State of the Climate 2024

- Average annual rainfall has decreased by -95.757 mm as of 2023-24 since from 1960-61. The long-term trend is -1.52 mm change per annum.
- Average annual solar irradiation has increased by 98.412 kWh per m^2 as of 2023-24 since 1994-95. The long-term trend is 3.394 kWh per m^2 change per annum.

The long-term trend in average annual temperatures in Merri-bek is shown in more detail in figure 2.1. Analysis of the difference between actual and trend temperatures reveals several notable periods of variation over the record. From 1950-51 to 1980-81, actual annual temperatures fluctuated around the trend, often alternating between slightly above and below the expected trend for short runs of years. In the early 1980s, and then more consistently from the mid-2000s onwards, actual temperatures have tended to exceed the long-term trend for multiple years in a row, with particularly large positive deviations seen in 1980-81, 2015-16, and 2017-18, when actual temperatures exceeded the trend by 0.9, 0.9, and 0.7 degrees respectively. In contrast, notable cool years compared to the trend include 1951-52, 1964-65, and 1986-87, each with actual temperatures around 0.1 to 0.7 degrees below the trend. Overall, while short-term fluctuations are evident, the pattern of above-trend actual temperatures has become more persistent since the early 2000s.

Long-term annual rainfall for Merri-bek for each year is shown in figure 2.2. Periodically, there are years when actual rainfall diverges significantly from the trend, such as 1987 and 2003-04, both registering just 156.0 mm compared to trend values above 530.0 mm, reflecting exceptional dry periods. Conversely, years like 1974-75, 1977-78, and especially 2010-11 and 2022-23 saw actual rainfall well above the trend, demonstrating considerable year-to-year variability despite the gradual decline in trend rainfall. Throughout the full time series, most annual values fluctuate within ±100 mm of the trend, indicating that while overall rainfall has trended downward, short-term variations remain common and sometimes extreme. This variability underscores the challenge of using trend data alone to anticipate water availability in any given year.

Figure 2.1 *Long-term annual average temperatures for Merri-bek*
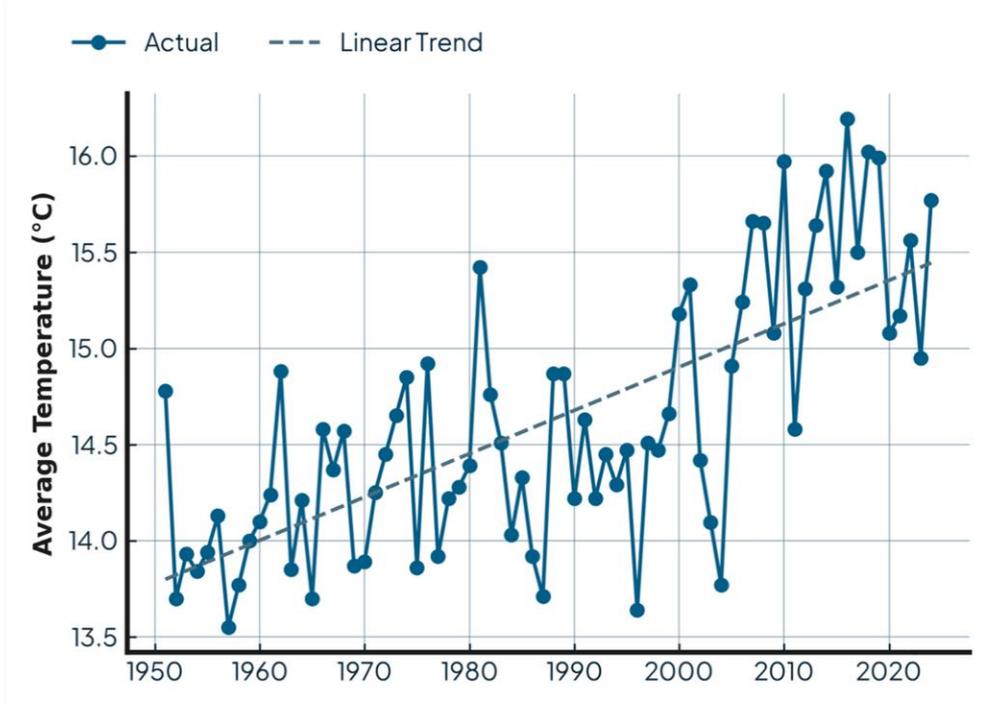
Figure 2.2 *Long-term annual rainfall for Merri-bek*
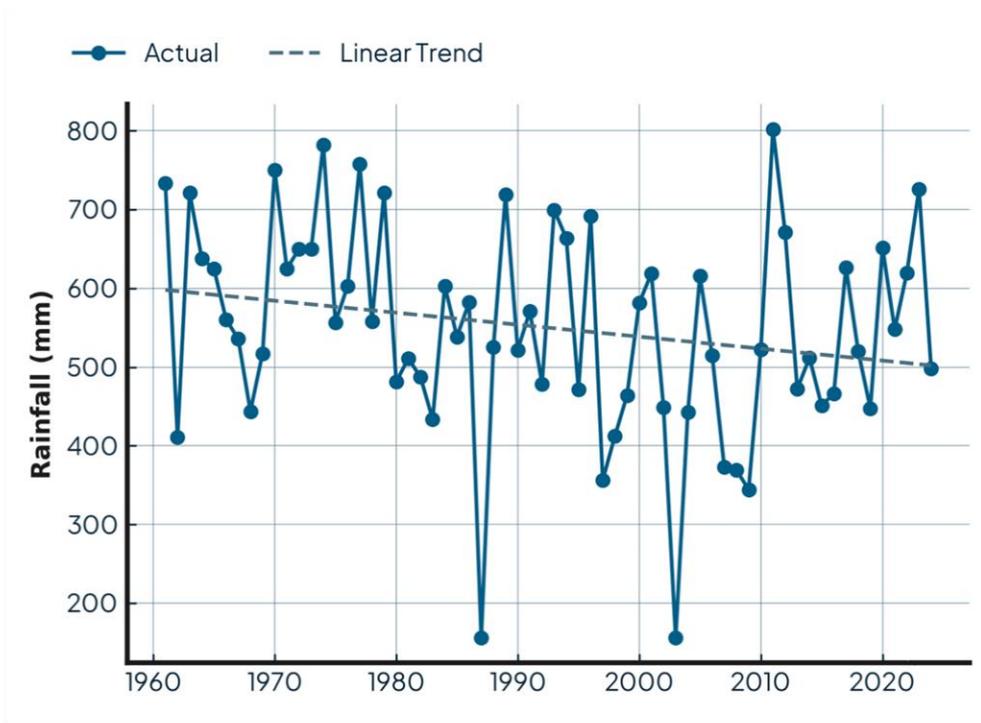
3. Total Emissions

Figure 3.1 Total annual emissions in Merri-bek, 2000-01 to 2023-24
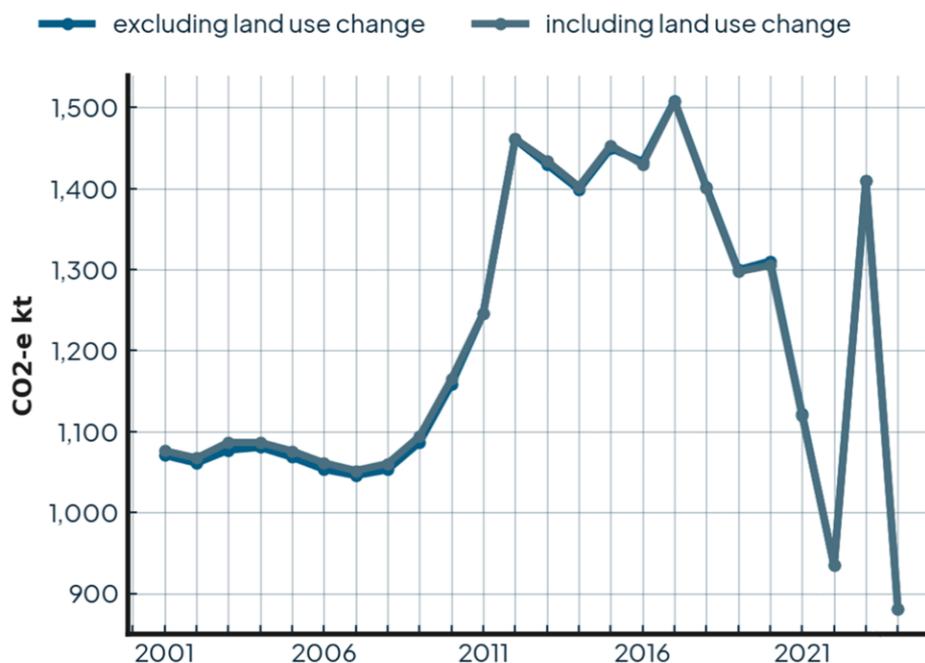
Total annual emissions in Merri-bek from industry and households were a combined 881.1 kt CO2-e in 2023-24. This represents a decrease of -18.1 per cent compared to 2004-05 levels, and a change of -32.1 per cent since pre-COVID levels of 2018-19.

Economic emissions intensity in Merri-bek was 0.11 kg CO2-e per dollar in 2023-24. This marks a 46.5 per cent reduction from 2004-05, when the intensity was 0.21 kg CO2-e per dollar. When compared to 2018-19, where economic emissions intensity was 0.17 kg CO2-e per dollar, the decrease is 35.2 per cent. These figures suggest that the local economy is producing less carbon pollution per dollar generated, consistent with energy efficiency improvements, uptake of renewables, or shifts in the economic base.

Sectoral data show that from 2004-05 to 2023-24, total sectoral emissions in Merri-bek declined by 17.5 per cent, while per capita emissions and economic emissions intensity each fell more sharply, by 38.0 per cent and 46.5 per cent respectively over the same period. From 2018-19 to 2023-24, total sectoral emissions decreased by 32.2 per cent, per capita emissions dropped by 34.2 per cent, and emissions intensity fell by 35.2 per cent.

Within the local profile, residential sources accounted for 64.1 per cent of emissions in 2023-24, up from 57.6 per cent in 2004-05 and 61.5 per cent in 2018-19, indicating a growing relative contribution from households. The commercial share was 22.0 per cent in 2023-24, having risen from 20.5 per cent in 2004-05 but down from a recent peak of 25.4 per cent in 2022-23. Industrial emissions made up 13.9 per cent in 2023-24, a substantial decrease from 22.0 per cent in 2004-05 and also below the 14.5 per cent recorded in 2018-19. Among high-emitting sectors, the share from road transport rose from 5.5 per cent in 2004-05 to 7.7 per cent in 2023-24, reflecting recent shifts in travel patterns or fleet composition.

Overall, these trends highlight that Merri-bek has achieved significant reductions in carbon emissions on both a per resident and per dollar basis, with the sharpest falls over the past five years. The increasing share of residential emissions suggests further work may be needed to address household energy use, while the reduction in industrial emissions reflects broader changes in the local economy.

Annual per capita emissions in Merri-bek were 4.8 tonnes CO2-e in 2023-24. This is a decrease of 38.0 per cent compared to 2004-05, when per capita emissions were 7.7 tonnes CO2-e. Compared to 2018-19, which recorded 7.3 tonnes CO2-e, per capita emissions in 2023-24 have fallen by 34.2 per cent. This reduction is sharper than the change in total emissions, indicating not just an overall fall in emissions, but also a decline per resident, likely reflecting both population growth and local emissions reduction efforts.

Figure 3.2 Total annual emissions per capita in Merri-bek, 2000-01 to 2023-24
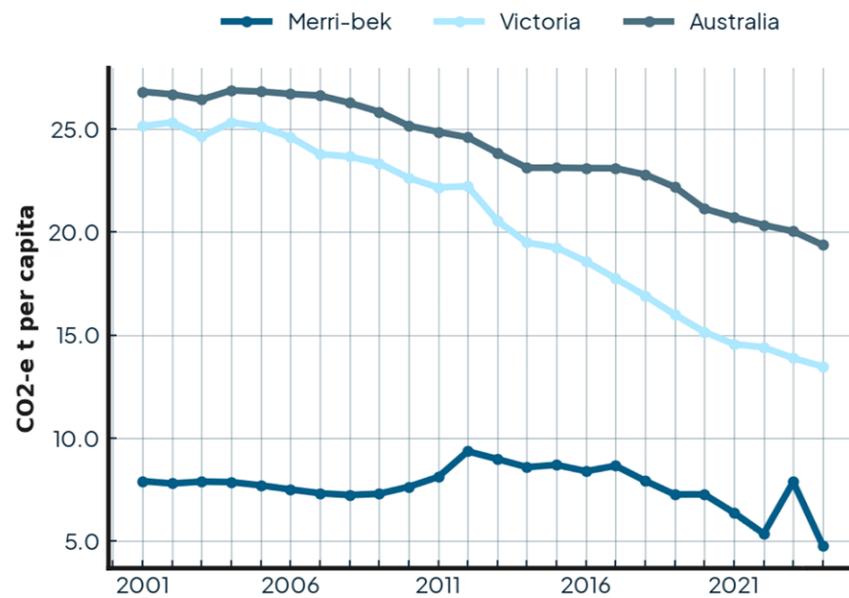
Note: Excludes Land Use, Land Use Change and Forestry

Figure 3.3 Total annual economic emissions intensity in Merri-bek 2000-01 to 2023-24

Note: Excludes Land Use, Land Use Change and Forestry

Table 3.1 Total Emissions profile for Merri–bek		Annual Levels							Long–term absolute change (per cent)	
		2005	2019	2020	2021	2022	2023	2024	2005 to 2024	2019 to 2024
Total sector										
Total Emissions exc. Land Use	CO2–e kt	1,068	1,300	1,310	1,122	935	1,409	881	–17.5	–32.2
Total Emissions per capita	CO2–e t per capita	7.7	7.3	7.3	6.4	5.4	7.9	4.8	–38.0	–34.2
Economic Emissions intensity	CO2–e kg per $	0.208	0.172	0.179	0.156	0.124	0.178	0.112	–46.5	–35.2
Share of sectoral emissions in LGA total emissions (exc. Land Use)	per cent	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	0.0
Share of sectoral emissions in total State sectoral emissions	per cent	0.9	1.2	1.3	1.2	1.0	1.5	0.9	10.1	–24.5
Industry class share										
Residential	per cent	57.6	61.5	63.0	65.1	64.6	60.4	64.1	11.3	4.2
Commercial	per cent	20.5	24.0	23.5	21.2	21.6	25.4	22.0	7.4	–8.4
Industrial	per cent	22.0	14.5	13.5	13.8	13.9	14.2	13.9	–36.5	–3.8
Highest emitting ANZSIC subdivisions, ranked by 2024 emissions share										
1. Road Transport	per cent	5.5	4.3	4.2	4.6	6.8	5.6	7.7	40.0	78.9
2. Construction Services	per cent	2.2	2.3	2.0	2.4	2.8	2.5	2.7	26.4	20.9
3. Food and Beverage Services	per cent	1.5	3.5	3.3	2.7	2.4	3.6	2.2	46.2	–38.7
4. Building Construction	per cent	1.6	1.3	1.1	1.4	1.7	1.5	1.7	2.9	23.3
5. Food Product Manufacturing	per cent	2.5	1.8	1.6	1.3	1.2	1.6	1.3	–47.9	–27.7
Other Industries	per cent	86.8	86.8	87.8	87.7	85.1	85.3	84.5	–2.7	–2.7

4. Emissions by IPCC sector and Industry

4.1 IPCC sector

Figure 4.1 Share of emissions by carbon sector, 2023-24
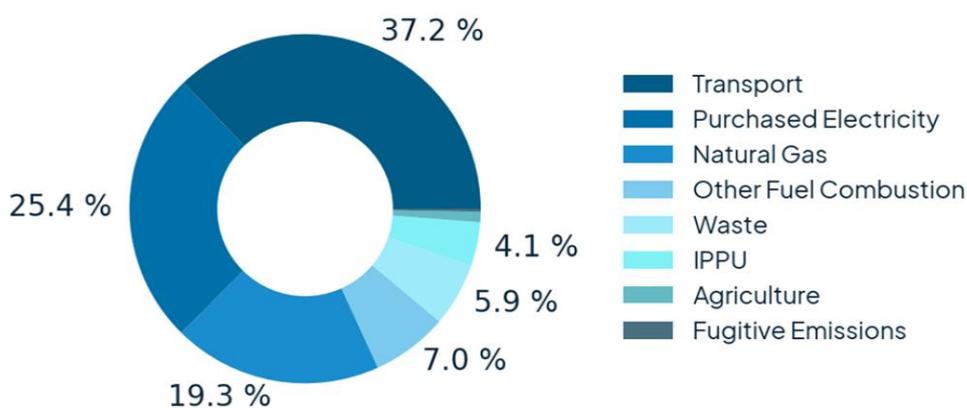
Note: Excludes Land Use, Land Use Change and Forestry

The energy sector remains the dominant source of local emissions, with its four key subsectors contributing a combined 784.9 kilotonnes in 2023-24, or nearly 89.1% of the total. Within this, Transport generated the largest emissions at 327.3 kilotonnes, followed by Purchased Electricity (223.7 kilotonnes), Natural Gas (169.6 kilotonnes) and Other Fuel Combustion (62.1 kilotonnes). Notably, although Purchased Electricity has historically been one of the highest sources, it saw a marked decrease of 457.6 kilotonnes (67.2%) from 2022-23 to 2023-24, continuing a longer-term downward trend measured at an average annual reduction of 18.6% from 2018-19 to 2023-24. This decline reflects both local and wider grid decarbonisation trends.

Transport was the only major sector to display ongoing growth, increasing by an average of 1.9% annually between 2018-19 and 2023-24. The emissions from this sector rose by 23.2% since 2004-05, demonstrating resistance to reduction efforts and indicating the challenge in shifting local transport patterns, despite progress in other

areas. Natural Gas and Other Fuel Combustion have both declined at average annual rates of 2.6% and 1.1% respectively over the past five years, reflecting gradual improvements in the energy efficiency of buildings and technologies.

Fugitive Emissions, while small in absolute terms at 2.3 kilotonnes in 2023-24, have displayed the fastest proportional growth of all sectors, increasing by 743.3% since 2018-19, and 2,602.2% since 2004-05, albeit from a very low baseline. This trend indicates a need for further investigation and targeted responses as these emissions may become more significant over time.

The Industrial Processes and Product Use sector accounted for 44.3 kilotonnes in 2023-24, falling by 31.2% over the past five years as changes in local industry continue to reduce their impact. The Waste sector, with emissions of 51.6 kilotonnes, has remained relatively stable, with a small decline of 2.4% per year on average since 2004-05, though it saw a slight increase of 0.2% on average between 2018-19 and 2023-24.

Land Use, Land-Use Change and Forestry acted as a minor carbon sink in earlier years, with removals shifting towards marginal positive emissions by 2023-24 (0.3 kilotonnes). The declining sink capacity over time is evident with a reduction of 115.9% since 2018-19.

In summary, Merri-bek has made strong progress in reducing overall carbon emissions, particularly in electricity and stationary energy consumption, while continued increases in transport and fugitive emissions highlight ongoing challenges for the local government area. Effective long-term strategies targeting these growing sectors will be essential to further reduce the municipality's carbon footprint.

In the 2023-24 financial year, total reported carbon emissions for Merri-bek were 881.1 kilotonnes of CO_2 equivalent. This represents a significant reduction from the previous year (1,409.5 kilotonnes) and maintains a general downward trend since 2019-20, with only one notable exception in 2022-23 when emissions spiked. Over the five years presented, emissions fell from 1,305.1 kilotonnes in 2019-20, resulting in an overall reduction of 424.0 kilotonnes or 32.5% by 2023-24.

Table 4.1 LGA Greenhouse Gas Accounts 2019–20 to 2023–24 (kt CO2–e)

		2019	2020	2021	2022	2023	2024
1. Energy	Purchased Electricity	627.1	627.6	440.5	269.7	681.3	223.7
	Natural Gas	193.7	198.4	185.2	182.8	169.3	169.6
	Other Fuel Combustion	65.7	58.8	61.6	64.0	73.6	62.1
	Transport	297.3	302.9	319.3	307.0	339.7	327.3
	Fugitive Emissions	0.3	0.3	0.3	0.6	1.3	2.3
2. Industrial Processes	Industrial Processes and Product Use	64.3	70.0	64.4	48.6	83.9	44.3
3. Agriculture	Agriculture	–2.1	–5.2	–2.2	0.2	0.3	0.3
4. Land Use, Land–Use Change and Forestry	Land Use, Land-Use Change and Forestry	51.0	52.5	50.5	61.9	60.2	51.6
5. Waste	Waste	1297.5	1305.1	1119.7	934.8	1409.5	881.1
Total	Total						

Table 4.2 LGA Greenhouse Gas Accounts – benchmark growth rates (per cent)

		Average annual change			Absolute change		
		2004–05 to 2018–19	**2004–05 to 2023–24**	**2018–19 to 2023–24**	**2004–05 to 2018–19**	**2004–05 to 2023–24**	**2018–19 to 2023–24**
1. Energy	Purchased Electricity	3.21	–3.05	–18.63	55.68	–44.48	–64.33
	Natural Gas	0.49	–0.34	–2.62	7.11	–6.21	–12.44
	Other Fuel Combustion	–1.63	–1.50	–1.15	–20.54	–24.99	–5.60
	Transport	0.81	1.10	1.94	11.94	23.21	10.07
	Fugitive Emissions	8.67	18.95	53.18	220.45	2,602.22	743.27
2. Industrial Processes	Industrial Processes and Product Use	1.28	–1.02	–7.19	19.44	–17.77	–31.15
3. Agriculture	Agriculture	n/a	–15.28	n/a	–126.78	–95.72	–116.00
4. Land Use, Land–Use Change and Forestry	Land Use, Land-Use Change and Forestry	–3.36	–2.42	0.24	–37.99	–37.26	1.18
5. Waste	Waste	1.35	–1.05	–7.45	20.59	–18.11	–32.09
Total	Total						

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4.2 ANZSIC Industry

Figure 4.2 Share of emissions by Industry class, 2023–24

64.1 %

22.0 %

13.9 %

Residential
Commercial
Industrial
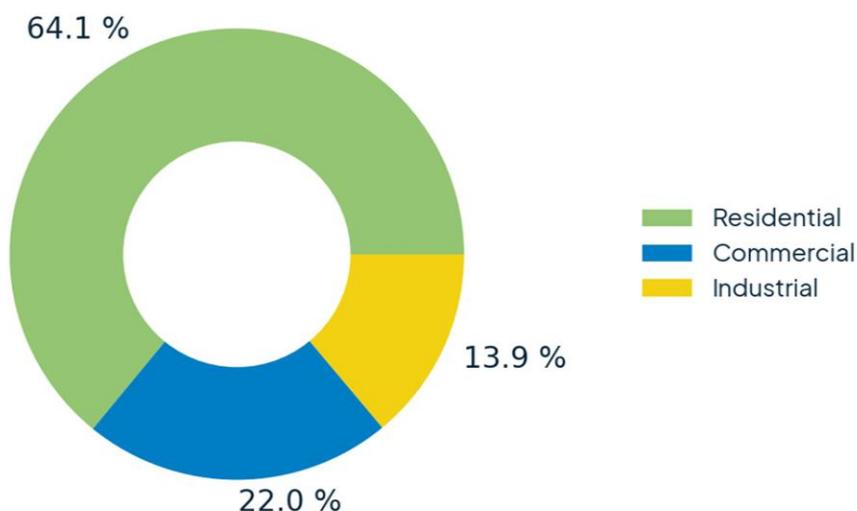
Note: Excludes Land Use, Land Use Change and Forestry

In 2023-24, Merri-bek had total emissions of 880.8 kt excluding Land Use. The contribution from each industrial class in total emissions in 2023-24 is as follows:

- Residential sector emissions of 564.5 kt
- Commercial sector emissions of 193.6 kt
- Industrial sector emissions of 122.8 kt

Business emissions from the commercial and industrial sectors are discussed in further detail by industry division and subdivision in the following sections.

4.2.1 Industry division

Figures 4.2 and 4.3 show industry emissions for Merri-bek by ANZSIC division for the commercial and industrial sectors for 2023–24. These figures exclude emissions from households and land use, land-use change and forestry.

The figures indicate that Merri-bek's commercial and industrial sector emissions profile in 2023–24 is dominated by a small number of industries, with substantial variation in both total emissions and emissions intensity by division.

Manufacturing remains the largest single source of emissions, producing 58.7 kt CO2-e in 2023–24. This sector has experienced a sustained long-term decline, with emissions

falling by 51.8% over the five years since 2018–19 alone, and average annual reductions of 13.6% in that period. This sharp drop has been even more pronounced since 2004–05, reflecting sustained structural change, shifts to service-based economic activity, and improvements in energy efficiency. Notably, the emissions intensity for manufacturing is 0.097 kg CO_2-e per dollar of output in 2023–24, also indicating improved efficiency relative to the past.

Transport, Postal and Warehousing is now the highest-emitting division at 86.2 kt CO_2-e in 2023–24. This industry's emissions increased by 15.5% from 2018–19 and about 2.9% annually over the past five years, reversing the flat or declining trends in earlier years. Emissions intensity in this sector (0.323 kg/$) is significantly higher than other large commercial sectors, suggesting limited decarbonisation progress to date.

Retail Trade (17.0 kt CO_2-e), Accommodation and Food Services (20.5 kt), and Construction (41.4 kt) have all recorded substantial decreases in emissions since 2018–19. For example, Retail Trade emissions are 67.7% below 2018–19 levels, while Accommodation and Food Services are down 58.6% and Construction down 18.6%. These declines are considerably steeper than those seen in previous decades and may reflect a combination of economic contraction, energy efficiency improvements, and changing business patterns such as increased remote work and changes to household consumption. These divisions also present moderate emissions intensity, with Construction at 0.051 kg/$ and Retail Trade at 0.035 kg/$, both below the levels seen in heavier industrial sectors.

Wholesale Trade has shown the greatest relative decline among major industries, with emissions of 6.2 kt CO_2-e in 2023–24, a 72.9% reduction since 2018–19. This is matched by a steep decline in emissions intensity, now at 0.020 kg/$, which suggests significant gains in efficiency or structural shifts away from this activity locally.

In contrast, electricity, gas, water and waste services, while a small source of absolute emissions (13.6 kt CO_2-e in 2023–24), have almost doubled compared to 2018–19 levels. This sector's emissions intensity has also risen over the past decade, now at 0.157 kg/$, potentially indicating higher carbon content in local energy or waste services, or increased energy consumption relative to economic output.

Professional, Scientific and Technical Services (11.8 kt), Health Care and Social Assistance (16.4 kt), Education and Training (6.9 kt), and Public Administration and Safety (7.6 kt) are all mid-sized emitters, but emissions from these largely service-based industries have fallen by 35–54% over the past five years. Their emissions intensity remains below heavy industry and transport, indicating relatively less emissions produced per unit of economic activity.

Within the smaller sectors, Agriculture, Forestry and Fishing (8.9 kt), Mining (0.2 kt) and Information Media and Telecommunications (3.6 kt) collectively represent a modest share of emissions, though agriculture did see a marked increase of over 200% since 2018–19, likely reflecting changes in industry activity within the LGA. Nonetheless, their absolute contributions remain much lower than manufacturing, transport, or building-related sectors.

Across all major industry divisions, downward trends in both absolute emissions and emissions intensity are evident for the majority of sectors in Merri-bek, with the notable exceptions of the Transport, Postal and Warehousing division and electricity, gas, water and waste services, which both saw recent increases. The magnitude of change in emissions for several divisions, notably manufacturing and wholesale trade, signals significant progress in decarbonisation and structural transformation in the local economy, even as some sectors lag or reverse these gains.

Figure 4.3 Emissions by ANZSIC Industry division, 2023–24
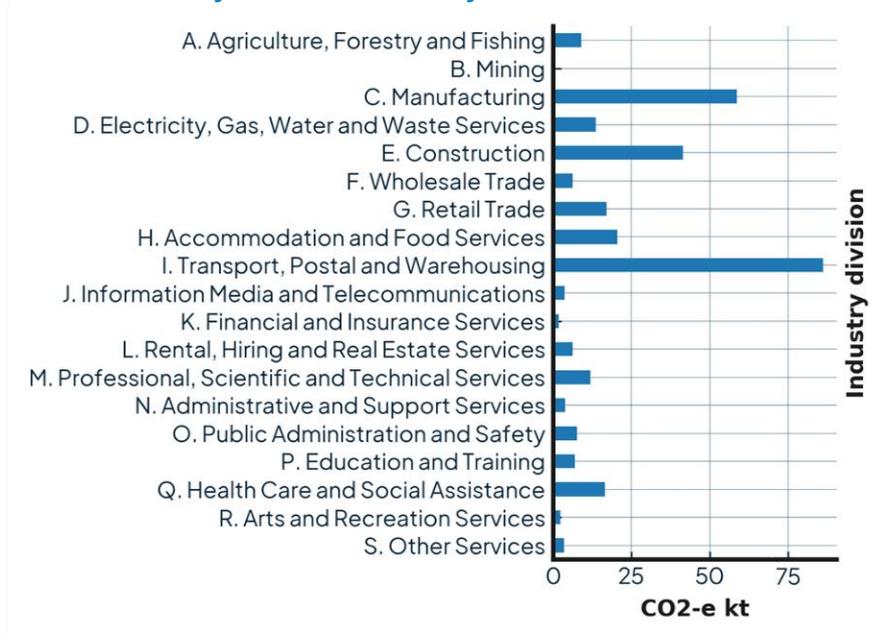
Figure 4.4 Economic emissions intensity by ANZSIC Industry division, 2023–24

Note: Industry emissions divided by industry specific value added
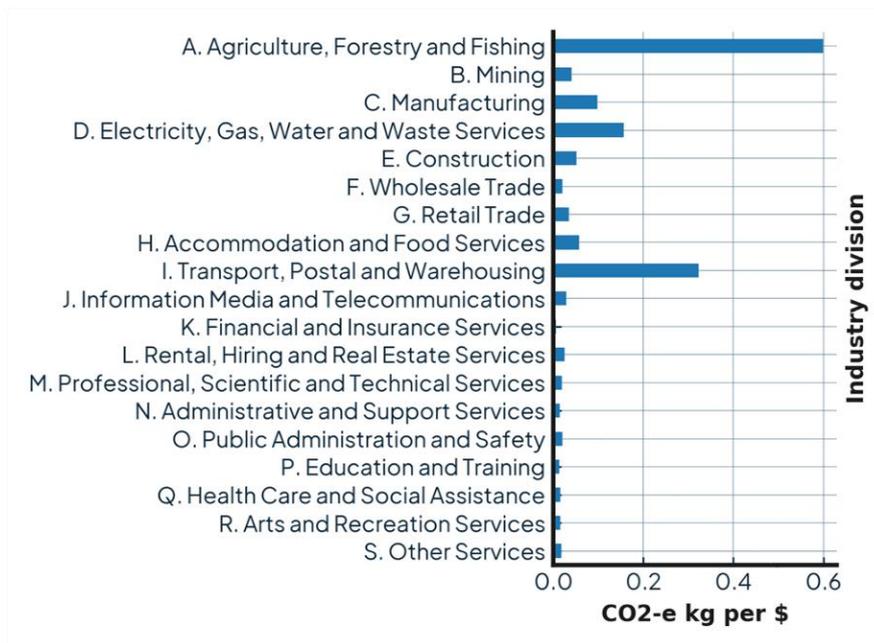
ANZSIC Industry		2018–19	2019–20	2020–21	2021–22	2022–23	2023–24
	Table 4.3 LGA Greenhouse Gas Accounts by ANZSIC division						
A	Agriculture, Forestry and Fishing	2.9	5.8	9.5	9.4	8.8	8.9
B	Mining	0.4	0.3	0.3	0.3	0.4	0.2
C	Manufacturing	121.8	113.3	89.5	66.8	105.9	58.7
D	Electricity, Gas, Water and Waste Services	12.3	12.0	9.0	7.7	23.6	13.6
E	Construction	50.9	45.2	46.2	45.6	61.2	41.4
F	Wholesale Trade	23.0	21.6	14.5	8.7	15.6	6.2
G	Retail Trade	52.5	54.0	37.7	22.1	51.0	17.0
H	Accommodation and Food Services	49.5	45.6	31.6	23.4	54.2	20.5
I	Transport, Postal and Warehousing	74.7	71.9	65.0	78.9	103.3	86.2
J	Information Media and Telecommunications	8.0	7.9	6.0	4.5	9.0	3.6
K	Financial and Insurance Services	3.3	3.6	2.6	1.8	4.0	1.7
L	Rental, Hiring and Real Estate Services	9.7	10.3	7.7	6.1	16.1	6.1
M	Professional, Scientific and Technical Services	19.8	20.5	16.1	13.1	23.1	11.8
N	Administrative and Support Services	5.2	5.2	4.1	3.7	6.0	3.7
O	Public Administration and Safety	15.3	17.0	12.9	8.6	18.9	7.6
P	Education and Training	15.1	14.5	11.0	7.7	14.6	6.9
Q	Health Care and Social Assistance	25.3	26.1	21.7	16.7	29.7	16.4
R	Arts and Recreation Services	4.7	4.2	2.9	2.8	5.4	2.3
S	Other Services	5.9	5.6	3.6	3.3	7.0	3.5
Industry Class							
	Residential	799.5	825.6	730.0	603.3	851.4	564.5
	Commercial	311.9	308.1	237.3	201.4	357.9	193.6
	Industrial	188.2	176.6	154.5	129.9	199.9	122.8
Total Emissions							
	Total Emissions (excluding Land)	1,299.5	1,310.3	1,121.8	934.6	1,409.2	880.8
	Land Use, Land-Use Change and Forestry	–2.1	–5.2	–2.2	0.2	0.3	0.3
	Total Emissions (including Land)	1,297.5	1,305.1	1,119.7	934.8	1,409.5	881.1

Table 4.4 LGA Greenhouse Gas Accounts by ANZSIC division – benchmark growth rates (per cent)

	ANZSIC Industry	Average annual change			Absolute change		
		2004–05 to 2018–19	2004–05 to 2023–24	2018–19 to 2023–24	2004–05 to 2018–19	2004–05 to 2023–24	2018–19 to 2023–24
A	Agriculture, Forestry and Fishing	–7.80	–0.13	24.91	–67.94	-2.51	204.07
B	Mining	–3.23	–4.36	–7.45	–36.82	–57.09	–32.08
C	Manufacturing	–2.83	–5.78	–13.59	–33.07	–67.75	–51.82
D	Electricity, Gas, Water and Waste Services	52.07	36.92	2.04	35,279.02	39,043.19	10.64
E	Construction	1.23	–0.18	–4.04	18.71	–3.41	–18.63
F	Wholesale Trade	–2.64	–8.46	–22.99	–31.22	–81.37	–72.91
G	Retail Trade	5.31	–2.12	–20.24	106.39	–33.38	–67.72
H	Accommodation and Food Services	7.50	0.69	–16.17	175.19	13.91	–58.61
I	Transport, Postal and Warehousing	–0.04	0.73	2.92	–0.60	14.79	15.48
J	Information Media and Telecommunications	10.80	3.39	–14.85	320.50	88.27	–55.23
K	Financial and Insurance Services	–0.15	–3.58	–12.57	–2.14	–50.00	–48.91
L	Rental, Hiring and Real Estate Services	–0.89	–3.02	–8.72	–11.82	–44.11	–36.62
M	Professional, Scientific and Technical Services	4.44	0.49	–9.77	83.59	9.78	–40.20
N	Administrative and Support Services	–1.81	–3.06	–6.49	–22.56	–44.63	–28.49
O	Public Administration and Safety	2.19	–2.04	–12.97	35.49	–32.36	–50.08
P	Education and Training	6.37	0.45	–14.44	137.33	8.84	–54.14
Q	Health Care and Social Assistance	8.93	4.11	–8.27	231.04	115.02	–35.05
R	Arts and Recreation Services	3.60	–1.17	–13.40	64.04	–20.08	–51.28
S	Other Services	1.42	–1.75	–10.11	21.85	–28.47	–41.30
Industry Class							
	Residential	1.89	–0.45	–6.72	29.97	–8.24	–29.39
	Commercial	2.57	–0.64	–9.10	42.66	–11.46	–37.94
	Industrial	–1.56	–3.35	–8.19	–19.75	–47.65	–34.77
Total Emissions							
	Total Emissions (excluding Land)	1.41	–1.01	–7.48	21.65	–17.55	–32.22
	Land Use, Land-Use Change and Forestry	n/a	–15.28	n/a	–126.78	–95.72	–116.00
	Total Emissions (including Land)	1.35	–1.05	–7.45	20.59	–18.11	–32.09

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4.2.2 Industry subdivision

Figures 4.4 and 4.5 show the equivalent for the top 20 largest emitting industries and those with the highest economic emissions intensities within Merri-bek in 2023-24. These figures exclude emissions from households and land use, land-use change and forestry.

Road Transport continued to be the largest source of industry emissions in Merri-bek for 2023-24, contributing 67.8 kt CO_2-e. This represents a decrease from the previous year's peak of 78.5 kt, but levels remain higher than any year since FY2013. The recent uptick may be linked to post-pandemic economic activity and an ongoing reliance on car travel. Despite contributing significantly to total emissions, the economic emissions intensity of Road Transport in 2023-24 stood at 0.50 kg CO_2-e per dollar value added—placing it among the highest-emitting sectors but not the most emissions-intensive in relative economic terms.

Construction Services, the second-largest industry emitter, generated 24.2 kt CO_2-e in 2023-24. This is a notable drop from 34.5 kt in 2022-23, returning to levels similar to the decade average. This fluctuation suggests the influence of large-scale projects or economic cycles on emissions, while emissions intensity for this sector was not among the highest, indicating moderate emissions relative to its value added.

An interesting case is Food and Beverage Services, whose total emissions in 2023-24 fell dramatically to 19.0 kt from 50.1 kt in the previous year—its lowest in over a decade. This sharp decline could reflect operational impacts from external shocks, such as pandemic-related restrictions, or broader sector shifts. However, while this sector produced high total emissions historically, its emissions intensity was not among the top in 2023-24, suggesting improving operational efficiency or changes in business models.

Food Product Manufacturing presents a different story, halving its emissions from 22.5 kt in 2022-23 to 11.3 kt in 2023-24, the lowest point since the start of the data series. This trend aligns with a broader decline seen across the local manufacturing sector. The industry's emissions intensity for 2023-24 was also not ranked as notably high, indicating a reduction in both total and economic emissions impact.

In terms of emissions intensity, Agriculture, Forestry and Fishing Support Services recorded the highest value in 2023-24, at 1.55 kg CO_2-e per dollar value added. This sector, while not producing high total emissions in Merri-bek, displayed a particularly emissions-intensive profile, reflecting a low value added relative to emissions output. Similarly, Primary Metal and Metal Product Manufacturing and Primary Metal and Metal Product Manufacturing continued to display relatively high-intensity values at 0.96 kg CO_2-e per dollar in 2023-24, despite a broad-downward trend and relatively minor total emissions locally.

It is notable that some transport modes such as Air and Space Transport have relatively high emissions intensities (0.54 kg CO_2-e per dollar), though their total emissions in Merri-bek are very minor. The same is true for some utilities and industrial sectors: although Water Supply, Sewerage and Drainage Services had a high economic intensity

historically, it registered low or negligible emissions in recent years, suggesting limited local operation.

The data highlights a pattern in which the largest emitters by total volume are not always the most emissions-intensive when measured against economic output. Several sectors show improvements over the decade, including in Road Transport and Construction, but remain important contributors both in absolute and relative terms. The majority of remaining industry subdivisions produce comparatively small emissions, with intensities and volumes that do not feature among the leading profiles for 2023–24.

Figure 4.5 Largest total emissions by industry subdivision, 2023-24
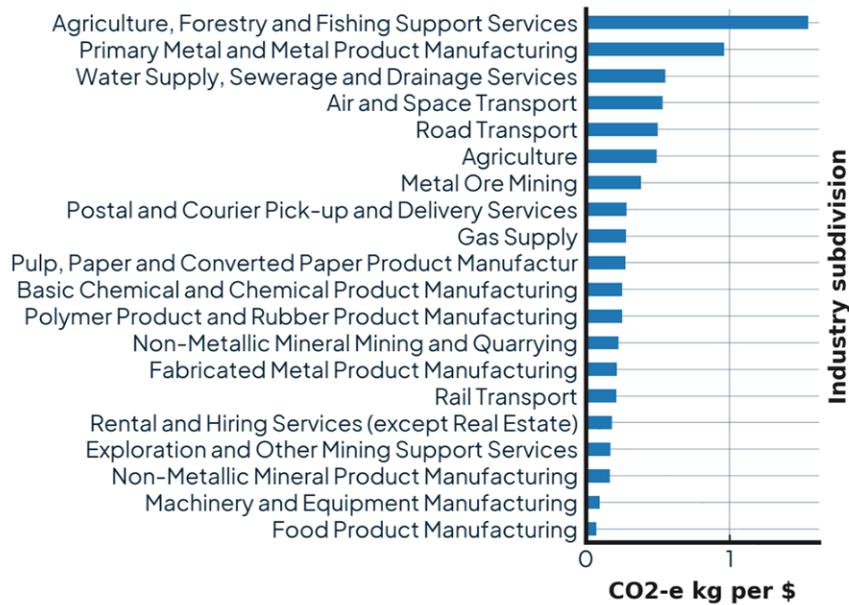
Figure 4.6 Highest economic emissions intensity by industry subdivision, 2023-24
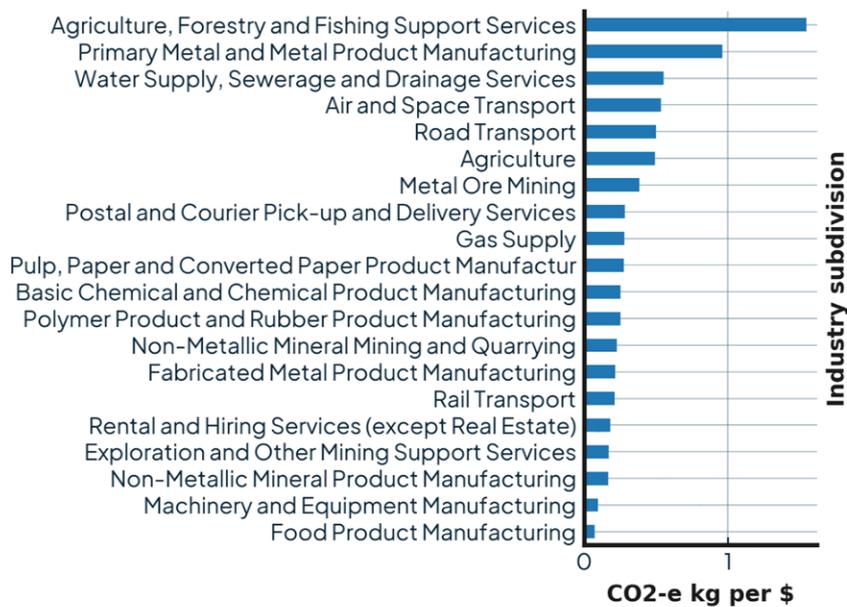
Note: Industry emissions divided by industry specific value added

5. Energy

5.1 Purchased Electricity

Purchased Electricity emissions are from the combustion of fuels used in the generation of electricity supply, such as coal and natural gas. Purchased Electricity emissions are attributed to where the electricity is consumed by the customer, rather than where it is generated. Increasing shares of renewable electricity generation, both centralised and local, have the potential to displace carbon intensive electricity sources.

Emissions from purchased electricity in Merri-bek in 2023-24 were 223.7 kt CO2-e. This represents a significant reduction when compared to earlier periods, notably the 417.8 kt CO2-e recorded in 2004-05 and the pre-pandemic level of 719.1 kt CO2-e in 2018-19. Over the two decades since 2004-05, emissions from this sector have decreased by 46.5 percent, while the drop from 2018-19 to 2023-24 is even more substantial at 68.9 percent. These changes highlight the impact of a possible transition to renewable energy, improvements in energy efficiency, and other policy or behavioural changes influencing electricity consumption in Merri-bek.

5.1.1 Electricity consumption in Merri-bek

Figure 5.1 *Electricity consumption by sector 2000-01 to 2023-24*
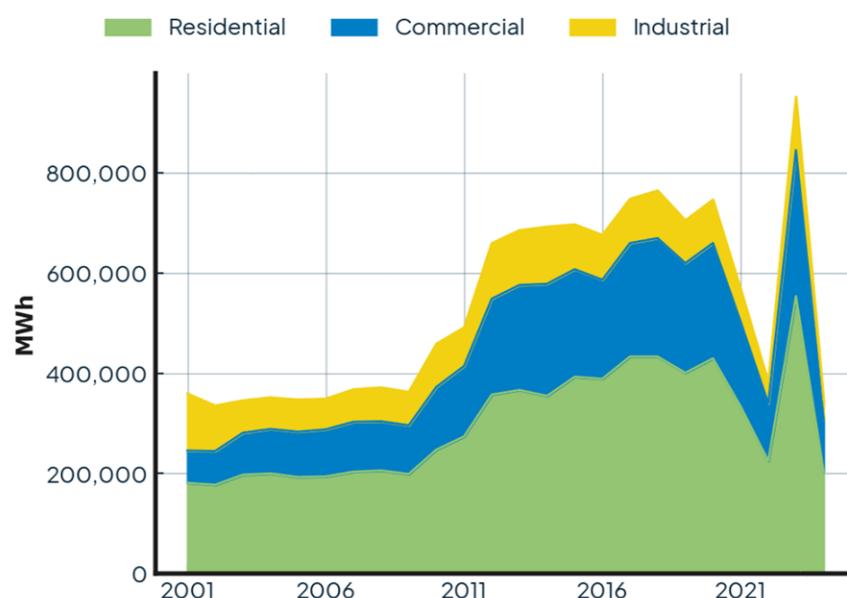
Table 5.1 Electricity energy consumption and solar systems within Merri-bek						
	Units	2019-20	2020-21	2021-22	2022-23	2023-24
Electricity consumption						
Residential	MWh	429,691.7	333,990.7	224,862.7	553,922.9	204,362.0
Commercial	MWh	230,077.2	168,713.8	114,586.7	291,564.1	103,878.3
Industrial	MWh	86,777.7	65,329.2	42,640.2	106,503.5	39,420.2
Total	MWh	746,546.7	568,033.6	382,089.6	951,990.6	347,660.5
Small-scale solar (<100kW)						
Capacity	MW	31.9	38.8	45.9	54.6	63.6
Number of systems	no.	7,480	8,493	9,496	10,510	11,606
Generation	MWh	34,718.6	42,008.0	52,413.5	61,016.9	65,443.2
Large-scale solar (=>100kW)						
Capacity	MW	1.3	1.3	1.3	1.3	1.7
Number of systems	no.	4	4	4	4	5

Note: Solar installations summarise electricity supply capacity that is installed within the region. Exports from these systems may supply regions outside of the LGA.

The total electricity consumption across all sectors in Merri-bek during 2023-24 was 347,660 megawatt-hours (MWh). This figure represents a substantial decrease compared to the previous year, which recorded 951,991 MWh. Such a marked drop suggests a significant shift in electricity demand or possible anomalies in data collection or reporting. Looking back over recent years, consumption remained relatively high and stable, with outputs above 700,000 MWh annually from 2016-17 to 2022-23. There was a sharp dip in 2019-20 and 2020-21, understandably impacted by the COVID-19 pandemic, before rebounding to pre-pandemic levels. The most recent data therefore points to an extraordinary reduction not observed in the past two decades.

In the residential sector, electricity consumption for 2023-24 was 204,362 MWh, down steeply from 553,923 MWh in 2022-23. Historically, residential demand has grown, with a rising trend from the mid-2000s through to 2018-19 where it reached 429,692 MWh. The sector showed resilience during the pandemic, as many households increased electricity usage amidst remote work and lockdowns, peaking at 553,923 MWh in 2022-23. This makes the current drop more notable, suggesting a possible return to pre-pandemic behaviours, renewed efficiencies, or increased uptake of local generation such as rooftop solar. Nevertheless, the current-year figure is markedly lower than any year in the past decade, pointing to a structural change in how and where households are sourcing or consuming electricity.

Commercial sector electricity use totalled 103,878 MWh in 2023-24, which is a significant decrease from 291,564 MWh the previous year. Over the past decade, commercial demand was relatively robust, fluctuating between 168,714 MWh and 236,316 MWh in the years leading up to the pandemic, then dropping to 114,587 MWh in 2021-22, before rebounding to 291,564 MWh in 2022-23. The 2023-24 figure represents the lowest commercial consumption recorded in the available data, suggesting either a sustained reduction in commercial activity, wider adoption of energy efficiency measures, or increased reliance on self-generated energy. This may reflect businesses continuing to operate in hybrid modes, downsizing premises, or more aggressively pursuing sustainability targets.

The industrial sector also saw a considerable reduction in electricity consumption in 2023-24, with usage falling to 39,420.2 MWh from 106,504 MWh the previous year. Industrial consumption has been declining for some time, dropping from above 110,000 MWh annually in the early 2010s to 88,242.9 MWh in 2017-18, and then further in subsequent years. Notable dips coincided with pandemic disruptions, but the ongoing downward trajectory suggests broader structural shifts away from traditional energy-intensive industries, potential relocation of industries, or sustained uptake of efficiency and renewable energy measures. The latest figure is the lowest recorded for the sector, indicating a significant transformation in industrial energy dynamics within Merri-bek.

The industry with the highest electricity consumption in Merri-bek during 2023-24 is Food and Beverage Services. The next largest consuming industries are Food Retailing, which ranks second, followed by Other Store-Based Retailing in third place. Together, these three industry subdivisions account for approximately 23.5 per cent of non-

residential electricity consumption in the local government area. This highlights their significant contribution to overall electricity demand among non-residential users in Merri-bek.

5.1.2 Electricity consumption by generation fuel type

Figure 5.2 *Electricity consumption generation fuel type 2023-24*

Legend:
- Brown coal
- Small-scale solar PV
- Wind
- Hydro
- Large-scale solar PV
- Natural gas
- Biogas
- Oil products
- Bagasse, wood

52.1 %
17.3 %
18.8 %
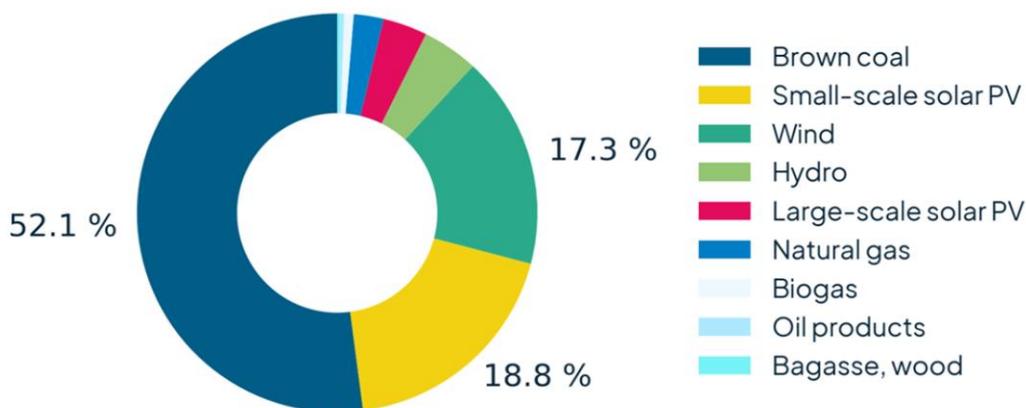
Figure 5.2 shows the mix of generation supply in total electricity consumption for Merri-bek for the 2023-24 financial year.

In 2023-24, brown coal accounted for the largest share of Merri-bek's electricity consumption at 52.1%, highlighting the ongoing reliance on non-renewable energy sources. The remainder of the generation mix included small-scale solar PV at 18.8%, wind at 17.3%, hydro at 4.5%, and large-scale solar PV at 3.6%. Smaller contributions came from natural gas (2.4%), biogas (0.8%), oil products (0.3%), and bagasse, wood (0.2%). Overall, renewable energy sources, combining wind, hydro, large-scale solar PV, small-scale solar PV, biogas, and bagasse, wood, accounted for 45.1% of Merri-bek's total electricity consumption in 2023-24, while non-renewable sources (brown coal, natural gas, oil products) made up the remaining 54.9%.

Comparing this to the 2009-10 generation mix, there has been a marked transition towards renewables. In 2009-10, brown coal dominated at 90.4%, natural gas contributed 3.0%, and oil products made up a negligible share. Renewable sources that year—wind, hydro, biogas, and small-scale solar PV—provided only 6.6% of the total, while non-renewable sources accounted for 93.4%. This demonstrates that over the past 14 years, Merri-bek has increased its share of renewables in electricity consumption by 38.5 percentage points and reduced its reliance on non-renewables by a corresponding amount.

When examining changes from 2022-23 to 2023-24, there has been a notable decrease in the share of brown coal, which dropped from 58.4% to 52.1%, a reduction of 6.3 percentage points. Similarly, the presence of wind in the supply mix decreased, falling from 20.5% in 2022-23 to 17.3% in 2023-24. However, small-scale solar PV increased significantly, rising from 6.4% to 18.8%. There was also a small increase in the share of biogas, bagasse, and wood, which collectively grew modestly. The proportion of electricity from natural gas and oil products both declined in 2023-24, continuing the trend of reduced dependence on these fuels.

Overall, Merri-bek has seen sustained progress toward a cleaner electricity supply over the past decade and a half, with the renewable energy share growing from just 6.6% in 2009-10 to 45.1% in 2023-24. This shift has been driven primarily by the accelerated uptake of small-scale solar PV, alongside increased development of wind and hydro generation, while brown coal and natural gas have accounted for a progressively smaller share of local consumption.

5.1.3 Small-scale photovoltaics

Figure 5.3 Small-scale photovoltaic systems installed in Merri-bek
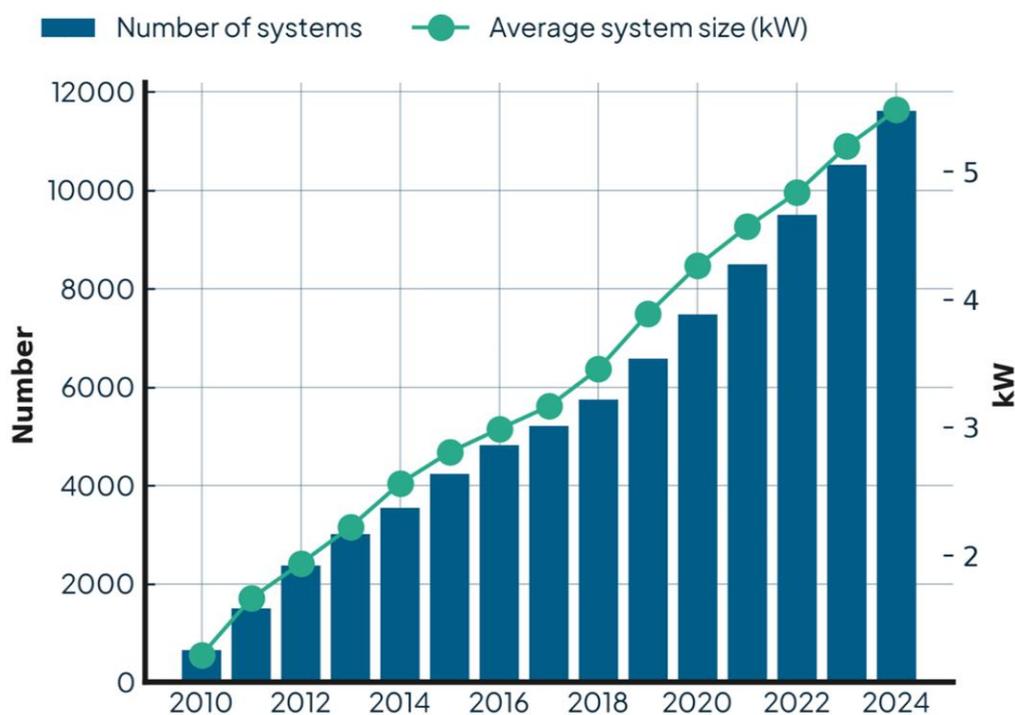
Small-scale photovoltaic systems are those with a total capacity of below 100kW. In contrast, large-scale photovoltaic systems are those with a capacity of 100kW or more.

In Merri-bek, the past five years have seen substantial growth in small-scale photovoltaic (PV) installations. Installed PV capacity increased from 25.6 MW in 2018-19 to 63.6 MW in 2023-24, representing an increase of 38.0 MW or 148.4 percent. The number of systems installed also rose significantly, climbing from 6,584 in 2018-19 to 11,606 in 2023-24, a 76.3 percent increase over this period. At the same time, the average system size has grown from 3.9 kW in 2018-19 to 5.5 kW in 2023-24. This steady increase in average system size indicates a trend towards larger PV installations on average, which suggests that both households and businesses are opting for more substantial systems, likely to better meet their energy needs or to maximise financial and environmental benefits.

In 2023-24, total generation from small-scale PV systems reached 65,443.2 MWh. This figure highlights the increasing contribution of distributed solar generation to Merri-bek's local renewable energy mix. Overall, the continued growth in both the installed capacity and average system size over the past five years reflects a strong and ongoing shift toward solar energy, likely aiding Merri-bek's efforts in lowering local government area carbon emissions.

5.1.4 Emissions profile – Purchased Electricity

Figure 5.4 Purchased electricity emissions by ANZSIC division, 2023-24 (kt CO2-e)
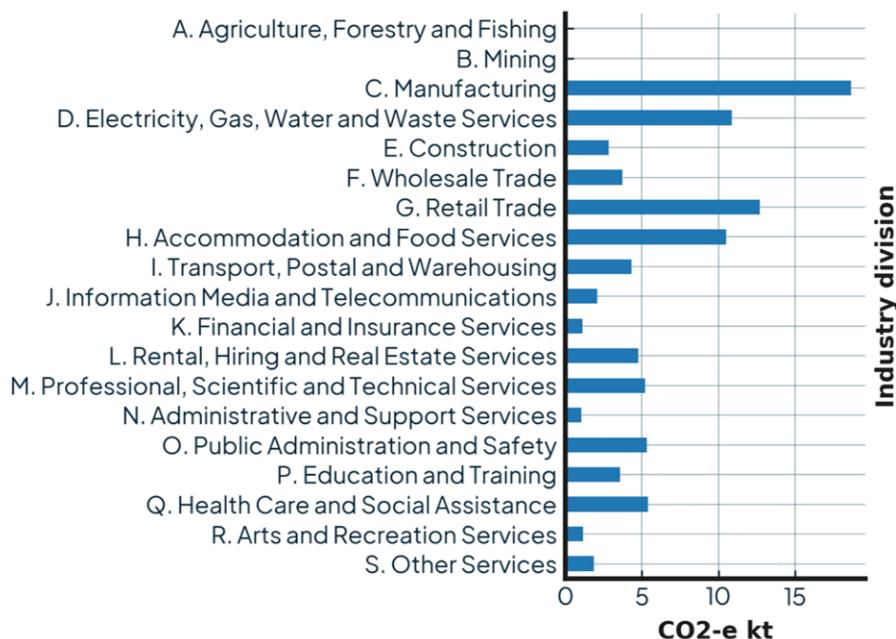
Purchased Electricity sector emissions in Moreland (C) have experienced a significant downward trend over the past two decades. In 2005-06, total sectoral emissions were 403.0 kilotonnes (kt) CO_2-e. Emissions peaked at 628.0 kt in 2019-20 before experiencing substantial fluctuations, most notably a sharp drop to 224.0 kt in 2023-24. This represents an overall reduction of 44.5 per cent since 2005-06, and an even larger decrease of 64.3 per cent since 2018-19.

On a per capita basis, emissions have followed a similarly strong decline. Emissions per capita fell from 2.9 tonnes (t) in 2005-06 to just 1.2 t in 2023-24, a drop of 58.2 per cent. Economic emissions intensity—expressed as kilograms (kg) of CO_2-e per dollar of GDP—declined by 64.0 per cent during this period, reflecting improved efficiency and decarbonisation of electricity supply and business operations. The share of Purchased Electricity emissions in total local government area (LGA) emissions has also more than halved, falling from 37.7 per cent in 2005-06 to 25.4 per cent in 2023-24.

Residential users remain the single largest contributors to Purchased Electricity emissions, accounting for 57.4 per cent of the sector total in 2023-24. Their share has increased marginally since 2005-06 and has been largely stable over the past five

years. Despite fluctuations in total volumes, the high proportion from the residential class underscores the continued importance of household electricity use within the local area.

Commercial electricity users account for 28.1 per cent of sectoral emissions in 2023-24, up by 6.3 percentage points since 2005-06 but down slightly compared with 2018-19, showing some volatility in the sector's contribution. The industrial sector's share has declined overall, from 18.3 per cent in 2005-06 to 14.5 per cent in 2023-24, although recent years have shown a 9.3 per cent increase from 2018-19. These shifts reflect both structural changes in the local economy and developments in energy efficiency and the manufacturing base.

Analysis of industry divisions in 2023-24 reveals Manufacturing remains a significant emitter among non-household sectors, though it has declined markedly from historic highs. In 2004-05, Manufacturing emissions were 74.2 kt, and by 2023-24 they had fallen to just 18.7 kt, a reduction of 74.8 per cent. This tracks the long-term contraction of manufacturing activity and improvements in industrial energy use. Other high-emitting divisions include Retail Trade, which contributed 12.7 kt in 2023-24 (down from 22.3 kt in 2004-05 and 50.2 kt in 2018-19), and Accommodation and Food Services at 10.5 kt in 2023-24—significantly lower than in the previous decade.

Of particular note is the rapid growth in emissions attributed to Water Supply, Sewerage and Drainage Services, which represented 4.3 per cent of all Purchased Electricity emissions in 2023-24, up from virtually zero in 2005-06 and a 174.9 per cent increase since 2018-19. While still a relatively small absolute emitter, the upward trend is significant compared to other divisions. In contrast, sectors like Food and Beverage Services, Food Retailing, and Other Store-Based Retailing have all seen their emissions shares either fall or fluctuate modestly, indicating competitive improvements or effective energy management. Professional, Scientific and Technical Services now represents 2.2 per cent of emissions, reflecting its growing economic significance locally, although its overall direct carbon footprint remains relatively modest.

In summary, the Purchased Electricity sector in Moreland (C) is increasingly dominated by emissions from households and service-based industries. Structural declines in manufacturing and major improvements in energy intensity have reduced overall industrial shares, while sectors such as water and waste utilities, although still relatively minor in absolute terms, are seeing the most rapid increases in their relative contributions. The data highlight the necessity of ongoing efficiency programs across all classes, especially residential, to maintain and advance the downward trend in emissions from purchased electricity.

Table 5.2 Purchased Electricity sector emissions profile for Merri–bek

		Annual Levels							Long–term absolute change (per cent)	
		2005	2019	2020	2021	2022	2023	2024	2005 to 2024	2019 to 2024
Total sector										
Total Sectoral Emissions	CO2–e kt	403	627	628	440	270	681	224	–44.5	–64.3
Total Sectoral Emissions per capita	CO2–e t per capita	2.9	3.5	3.5	2.5	1.5	3.8	1.2	–58.2	–65.4
Economic Emissions intensity	CO2–e kg per $	0.079	0.083	0.086	0.061	0.036	0.086	0.028	–64.0	–65.9
Share of sectoral emissions in LGA total emissions (exc. Land Use)	per cent	37.7	48.3	47.9	39.3	28.9	48.3	25.4	–32.7	–47.4
Share of sectoral emissions in total State sectoral emissions	per cent	0.7	1.5	1.6	1.2	0.8	2.1	0.7	–0.2	–54.9
Industry class share										
Residential	per cent	55.3	56.4	57.2	58.6	58.5	57.6	57.4	3.9	1.8
Commercial	per cent	26.4	30.3	30.0	28.7	28.7	29.2	28.1	6.3	–7.4
Industrial	per cent	18.3	13.3	12.8	12.7	12.8	13.3	14.5	–20.8	9.3
Highest emitting ANZSIC subdivisions, ranked by 2024 emissions share										
1. Water Supply, Sewerage an…	per cent	0.0	1.6	1.6	1.7	2.1	2.7	4.3	0.0	174.9
2. Food and Beverage Services	per cent	2.5	4.9	4.5	4.1	4.3	4.6	4.1	65.1	–16.1
3. Food Retailing	per cent	2.6	3.4	3.5	3.5	3.1	2.8	2.6	–0.1	–21.8
4. Other Store–Based Retailing	per cent	1.9	2.9	2.9	2.7	2.6	2.5	2.4	26.1	–18.3
5. Professional, Scientific …	per cent	1.4	2.1	2.2	2.2	2.3	2.2	2.2	56.4	1.3
Other Industries and Households	per cent	91.6	85.1	85.3	85.8	85.7	85.2	84.4	–7.8	–0.8

5.2 Natural Gas

Natural gas emissions come from the combustion of natural gas by residential, commercial and industrial end users, excluding natural gas used in the generation of electricity. Natural gas is often distribution through networks of transmission and distribution pipelines and is used where heating is required. Emissions from Natural Gas in Merri-bek in 2023-24 were 169.6 kilotonnes of CO2 equivalent. This represents a significant reduction compared to 2004-05 when emissions from natural gas were 180.9 kilotonnes, and a similar downward trend from the pre-COVID levels of 2018-19, which saw emissions at 203.4 kilotonnes. The figures indicate that efforts to reduce natural gas consumption or improve energy efficiency in the local government area have had a measurable effect, with emissions in 2023-24 being 16.8% lower than in 2018-19 and 6.2% lower than in 2004-05. This decline is consistent with broader trends in energy transition and decarbonisation, and it highlights the progress Merri-bek has made towards lowering its carbon footprint from this sector over the past two decades.

5.2.1 Natural Gas consumption in Merri-bek

Table 5.3 Energy consumption within Merri-bek – Natural Gas		2019–20	2020–21	2021–22	2022–23	2023–24
Residential	PJ	3.04	2.83	2.79	2.54	2.55
Commercial	PJ	0.32	0.33	0.37	0.38	0.37
Industrial	PJ	0.51	0.45	0.4	0.38	0.38
Total	PJ	3.86	3.61	3.56	3.3	3.3

Table 5.3 contains annual energy consumption of natural gas in Merri-bek from 2019-20 to 2023-24.

In 2023-24, the total natural gas consumption in Merri-bek was 3.3 petajoules (PJ). This maintains the same total as the previous year, signalling a stabilisation following several years of modest decline since 2019-20 when total consumption was 3.9 PJ. The period from 2019-20 to 2021-22 shows a clear decrease in consumption, with the most pronounced drop occurring between 2020-21 and 2021-22, which can likely be attributed to disruptions caused by the COVID-19 pandemic. Overall, total gas consumption in recent years has settled at a lower level compared to pre-pandemic activity.

Residential natural gas use was 2.6 PJ in 2023-24, a small increase from the previous year but lower than in 2019-20, when consumption measured 3.0 PJ. The sector experienced a marked decline over this period, with a notable dip during the pandemic years, reflecting possible changes in household energy behaviour and increased energy efficiency measures. The minor rise of 0.01 PJ over the last year may suggest a levelling out in demand after earlier reductions.

The commercial sector consumed 0.4 PJ of natural gas in 2023-24, which is constant compared to the previous year, though higher than the 0.3 PJ observed in 2019-20. The

sector displayed a small but steady upward trend post-pandemic, in contrast to the residential decline. The resilience and gradual recovery of commercial activity is evident in these numbers, likely reflecting an adjustment back to regular business operations after lockdown disruptions.

Industrial sector consumption held steady at 0.4 PJ for both 2022-23 and 2023-24, following a small but consistent downtrend from 0.5 PJ in 2019-20. The reduction in industrial consumption during the height of the pandemic is apparent, and the subsequent stabilisation at a lower level suggests persistent changes in industrial natural gas use, potentially due to ongoing efficiency improvements or shifts in production processes.

5.2.2 Emissions profile – Natural Gas

Figure 5.4 Natural Gas emissions by ANZSIC division, 2023-24
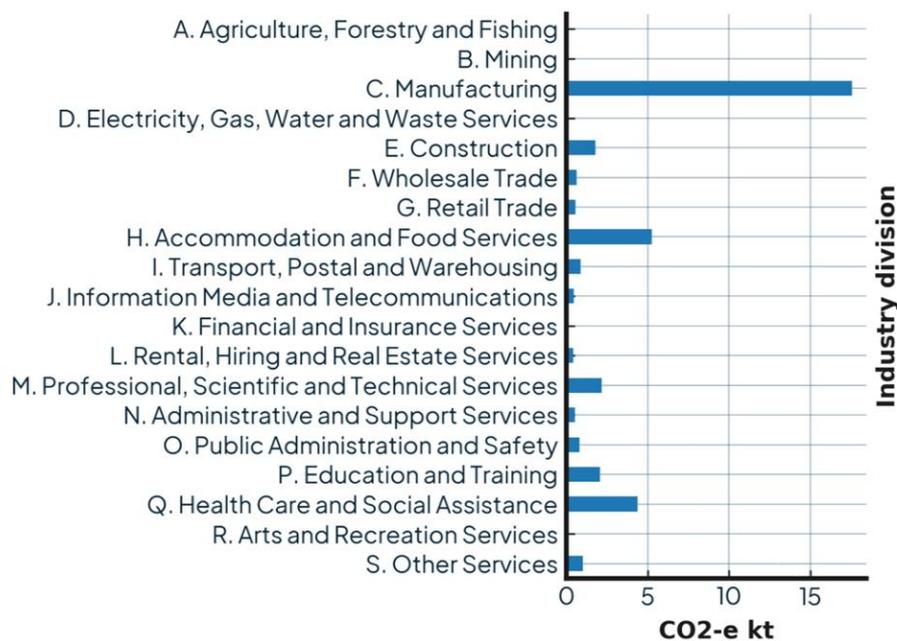
In 2023-24, total Natural Gas emissions in Moreland reached 170.0 kt CO2-e, representing a decrease of 6.2% since 2004-05 and 12.4% since 2018-19. Per capita emissions have also fallen substantially from 1.3 t in 2004-05 to 0.9 t, or 29.5%. The economic emissions intensity, measured as kilograms of CO2-e per dollar, also improved, dropping from 0.035 in 2004-05 to 0.021 in 2023-24—a 39.1% reduction. Natural Gas now accounts for 19.3% of total local government area (LGA) emissions and 2.0% of the state's sectoral emissions, showing a modest upwards trend in the proportional state share (+11.7%).

Turning to sector composition, households continue to be the dominant source of Natural Gas emissions, making up 77.2% of the total in 2023-24. This share significantly expanded since 2004-05, where it was only 63.7%, and has increased by 3.0 percentage points since 2018-19. The household share illustrates a well-established reliance on Natural Gas for residential energy needs, despite overall declining gas consumption volumes as energy efficiency and electrification increase.

Natural Gas emissions from commercial and industrial users have shifted markedly over the period. In 2023-24, the commercial sector contributed 11.3% of emissions, up 6.4 percentage points since 2004-05 and 1.7 points from 2018-19. By contrast, the industrial sector's share fell sharply from 25.6% in 2004-05 to 11.4% in 2023-24,

including a substantial 25.9% drop since 2018-19 alone. The shrinkage in industrial share reflects a long-term shift away from manufacturing and heavy industry within the LGA and possibly improved fuel switching and energy efficiency within remaining industrial sites.

Among the industry divisions, Manufacturing remains the single largest industrial contributor to Natural Gas emissions, accounting for 17.6 kt in 2023-24. However, this figure is considerably lower than the 44.3 kt recorded in 2004-05 and 24.3 kt in 2018-19. This decline affirms the overall fall in the share of industrial emissions. Other significant industrial users, such as Construction (1.8 kt), Wholesale Trade (0.6 kt), and Accommodation and Food Services (5.3 kt), all show lower emissions, with some slight fluctuations, but not enough to alter their relatively minor shares.

Analysing the highest-emitting specific industry subdivisions for 2023-24, Basic Chemical and Chemical Product Manufacturing led with a 3.4% share of total Natural Gas emissions, followed by Food and Beverage Services at 3.1%. Food Product Manufacturing (2.0%), Polymer Product and Rubber Product Manufacturing (1.3%), and Professional, Scientific and Technical Services (1.3%) made up the next most significant contributors. The trajectory since 2004-05 varies: Basic Chemical and Chemical Product Manufacturing grew its share by 42.1% but declined by 13.2% since 2018-19, while Food and Beverage Services was up 21.5% overall and 6.3% since 2018-19. Food Product Manufacturing and Polymer Product and Rubber Product Manufacturing both posted sharp declines (-66.1% and -31.8% since 2004-05).

In summary, Moreland's Natural Gas emissions have declined in absolute and per capita terms, reflecting a major contraction in industrial demand and some growth in residential and commercial shares. Among industries, Manufacturing has reduced its consumption most significantly, while the composition of top-emitting subdivisions indicates both a diversification of sources and changing industrial activity over time. Household gas use dominates the profile and continues to define the local demand for Natural Gas in the LGA.

Table 5.4 Natural Gas sector emissions profile for Merri–bek		Annual Levels							Long-term absolute change (per cent)	
		2005	2019	2020	2021	2022	2023	2024	2005 to 2024	2019 to 2024
Total sector										
Total Sectoral Emissions	CO2-e kt	181	194	198	185	183	169	170	-6.2	-12.4
Total Sectoral Emissions per capita	CO2-e t per capita	1.3	1.1	1.1	1.1	1.1	0.9	0.9	-29.5	-15.0
Economic Emissions intensity	CO2-e kg per $	0.035	0.026	0.027	0.026	0.024	0.021	0.021	-39.1	-16.3
Share of sectoral emissions in LGA total emissions (exc. Land Use)	per cent	16.9	14.9	15.1	16.5	19.6	12.0	19.3	13.7	29.2
Share of sectoral emissions in total State sectoral emissions	per cent	1.7	1.9	2.0	1.9	1.9	1.9	2.0	11.7	1.1
Industry class share										
Residential	per cent	63.7	75.0	78.6	78.5	78.4	77.0	77.2	21.2	3.0
Commercial	per cent	10.6	9.6	8.3	9.2	10.3	11.5	11.3	6.4	18.2
Industrial	per cent	25.6	15.4	13.1	12.3	11.3	11.5	11.4	-55.4	-25.9
Highest emitting ANZSIC subdivisions, ranked by 2024 emissions share										
1. Basic Chemical and Chemic…	per cent	2.4	4.0	3.8	4.2	3.6	3.4	3.4	42.1	-13.2
2. Food and Beverage Services	per cent	2.5	2.9	2.3	2.5	2.8	3.3	3.1	21.5	6.3
3. Food Product Manufacturing	per cent	5.8	2.5	2.0	1.3	1.5	1.9	2.0	-66.1	-21.6
4. Polymer Product and Rubbe…	per cent	1.9	2.9	2.2	2.6	1.6	1.3	1.3	-31.8	-55.3
5. Professional, Scientific …	per cent	1.1	1.0	0.9	1.1	1.2	1.3	1.3	15.1	28.3
Other Industries and Households	per cent	86.3	86.8	88.8	88.3	89.2	88.8	89.0	3.1	2.5

5.3 Other Fuel Combustion

This category of emissions derives from the combustion of all other fuels to the exclusion of natural gas, fuels used in the generation of electricity and fuels used in transport. The most common fuel within this category is typically diesel, depending on region and industry mix. Emissions from Other Fuel Combustion in Merri-bek in 2023-24 were 62.1 kilotonnes of CO_2 equivalent. This level represents a marked decrease compared to 82.7 kilotonnes in 2004-05, indicating a reduction of 20.6 kilotonnes over nearly two decades. When compared to pre-COVID levels, with 2018-19 emissions recorded at 65.7 kilotonnes, there has been a smaller but still notable reduction of 3.6 kilotonnes. These figures highlight a steady downward trend in emissions from this sector, reflecting the ongoing shift towards less carbon-intensive energy sources or improved efficiency in fuel use in the local government area.

5.3.1 Other fuel consumption in Merri-bek

Table 5.5 Energy consumption within Merri-bek – Other fuels		2019–20	2020–21	2021–22	2022–23	2023–24
Residential	PJ	0.22	0.2	0.21	0.22	0.22
Commercial	PJ	0.02	0.02	0.03	0.04	0.06
Industrial	PJ	0.6	0.65	0.68	0.79	0.61
total	PJ	0.84	0.88	0.91	1.05	0.88

Table 5.5 contains annual energy consumption of other fuels in Merri-bek from 2019-20 to 2023-24. The fuel consumed within this category across Australia is predominantly diesel.

In 2023-24, total other stationary energy consumption in Merri-bek reached 0.9 petajoules (PJ), up slightly from the previous year but consistent with previous years' levels. This total reflects energy use in the residential, commercial, and industrial sectors, and has shown a general increase since the dip around 2019-20 and 2020-21, a period that likely reflects COVID-19 impacts on activity and energy demand across all sectors.

Within the residential sector, other stationary energy consumption was 0.2 PJ in 2023-24. This figure is stable compared with previous years, showing little fluctuation since 2020-21, when consumption dropped slightly to 0.2 PJ. The relative consistency in residential energy use suggests limited changes in household energy behaviour or efficiency improvements in this particular category. The data does not show significant growth or decline, indicating that residential stationary energy demand has remained steady in the post-pandemic period.

The commercial sector recorded a notable increase in stationary energy consumption, rising from 0.02 PJ in 2020-21 to 0.06 PJ in 2023-24. This represents a threefold increase over this period, suggesting a strong rebound in commercial activities as pandemic-related restrictions eased. The steady growth each year since the 2020-21

low likely reflects the gradual return to normal operations, increased occupancy rates, or changes in commercial business practices leading to higher stationary energy use.

In the industrial sector, other stationary energy consumption reached 0.6 PJ in 2023-24. This is a significant increase from 0.6 PJ in 2020-21 to the peak of 0.8 PJ in 2022-23, followed by a decrease back to 0.6 PJ in 2023-24. The drop between 2022-23 and 2023-24 may indicate completion of major projects, changes in industrial processes, or improvements in energy efficiency. Despite this dip, industrial energy use remains the dominant share of total stationary energy consumption, underscoring the sector's major role in Merri-bek's energy landscape.

5.2.2 Emissions profile – Other Fuel Combustion

Figure 5.4 Other Fuel Combustion by ANZSIC division, 2023-24
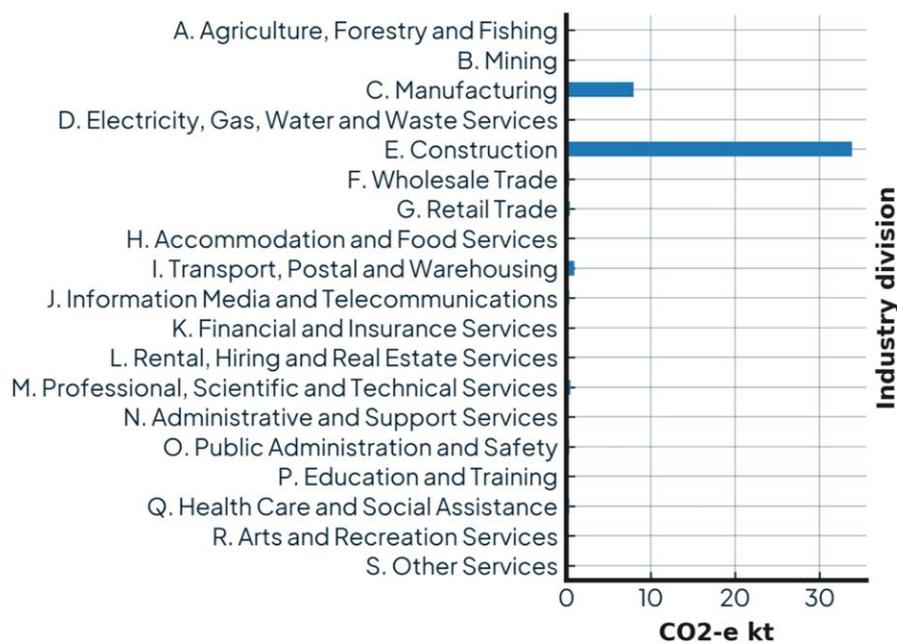
In the 2023-24 period, total emissions from the Other Fuel Combustion sector in Moreland reached 62.0 kt CO_2-e, representing a decrease of 25.0% compared to 2004-05 and a modest decline of 5.6% since 2018-19. Emissions per capita also fell over time, dropping to 0.3 t per person by 2023-24—a reduction of 43.6% since 2004-05 and 8.3% since 2018-19. Economic emissions intensity likewise declined, with sectoral emissions per dollar of economic output falling to 0.008 kg per dollar, down 51.3% over the longer term. The share of Other Fuel Combustion emissions in the municipality's total emissions was 7.0% in 2023-24, compared with 7.7% in 2004-05. However, there was a recent increase from 5.1% in 2018-19. Relative to the state, Moreland's share in total sectoral emissions rose to 1.1% in 2023-24 from 0.9% in 2004-05.

By class, the industrial sector remains the predominant contributor to Other Fuel Combustion emissions, accounting for 68.5% of sectoral emissions in 2023-24. This is slightly lower than the 72.8% share seen in 2004-05, reflecting a gradual diversification. Commercial sources made up 6.5% in 2023-24, up significantly from 4.5% in 2004-05 and more than 70% higher than the 3.8% share in 2018-19. This indicates a rising commercial sector presence in the fuel mix. The residential share in 2023-24 stood at 25.0%, a modest rise from 22.7% in 2004-05, but broadly stable since a high of 25.8% in 2020, indicating consistent residential demand.

Within the industrial sector, construction industries were the largest emitters. In 2023–24, Construction Services contributed 31.2% of total sector emissions, followed by Building Construction at 20.3%. Heavy and Civil Engineering Construction contributed a smaller share at 3.0%. While Construction Services' share has increased overall since 2004-05 (from 24.7%), there has been a small decline since 2018-19 (from 33.5%). Most other industry divisions each comprise small fractions; for example, Manufacturing divisions such as Basic Chemical and Chemical Product Manufacturing rose to 2.6% in 2023-24, with substantial growth since 2004-05 (81.6%). Meanwhile, Polymer and Rubber Product Manufacturing fell to 2.4%, declining by 12.9% over the same period. The 'Other Industries and Households' grouping, while still substantial at 40.5% in 2023-24, has become less dominant over time, falling from nearly half of emissions (48.7%) in 2004-05.

Over the long term, certain industry divisions exhibited pronounced changes. The construction-related categories, particularly Construction Services and Building Construction, have generally increased their emissions shares since 2004-05, reflecting ongoing urban growth and infrastructure activity. Basic Chemical and Chemical Product Manufacturing displayed the highest rate of growth, more than doubling its emissions share both over the long term and since 2018-19. Conversely, sectors such as Polymer Product and Rubber Product Manufacturing, and 'Other Industries and Households', saw their shares decline.

Household (residential) emissions comprise a quarter (25.0%) of Other Fuel Combustion emissions in 2023-24, signifying a steady presence within the local emissions profile. Over time, the household emission share has remained relatively stable, showing resilience despite broader sectoral shifts. However, in absolute terms and as a share of the LGA's overall total emissions, residential emissions have become marginally more prominent as industrial sources have trended down slightly.

In summary, while the Other Fuel Combustion sector's emissions in Moreland have fallen considerably since 2004-05, recent years have seen relative stability, with modest overall declines and increases in some commercial and residential shares. Industrial emissions, specifically from construction, remain central to the sectoral profile, but there are signs of a slowly evolving composition with growth in certain manufacturing segments and a slight rebalancing toward commercial and residential classes.

Table 5.6 Other Fuel Combustion sector emissions profile for Merri–bek

		Annual Levels							Long-term absolute change (per cent)	
		2005	2019	2020	2021	2022	2023	2024	2005 to 2024	2019 to 2024
Total sector										
Total Sectoral Emissions	CO2–e kt	83	66	59	62	64	74	62	–25.0	–5.6
Total Sectoral Emissions per capita	CO2–e t per capita	0.6	0.4	0.3	0.4	0.4	0.4	0.3	–43.6	–8.3
Economic Emissions intensity	CO2–e kg per $	0.016	0.009	0.008	0.009	0.008	0.009	0.008	–51.3	–9.8
Share of sectoral emissions in LGA total emissions (exc. Land Use)	per cent	7.7	5.1	4.5	5.5	6.8	5.2	7.0	–9.0	39.3
Share of sectoral emissions in total State sectoral emissions	per cent	0.9	1.0	1.0	1.0	1.0	1.3	1.1	16.6	6.3
Industry class share										
Residential	per cent	22.7	23.8	25.8	23.0	22.9	21.0	25.0	10.0	5.2
Commercial	per cent	4.5	3.8	2.8	2.8	2.8	3.6	6.5	44.8	71.3
Industrial	per cent	72.8	72.4	71.5	74.2	74.3	75.5	68.5	–5.9	–5.5
Highest emitting ANZSIC subdivisions, ranked by 2024 emissions share										
1. Construction Services	per cent	24.7	33.5	32.2	33.8	33.2	35.3	31.2	26.3	–6.9
2. Building Construction	per cent	19.7	20.9	19.3	20.3	21.2	23.2	20.3	3.2	–2.6
3. Heavy and Civil Engineeri…	per cent	2.8	3.1	3.8	3.9	3.9	3.5	3.0	9.7	–2.6
4. Basic Chemical and Chemic…	per cent	1.4	1.6	1.7	1.5	2.4	2.2	2.6	81.6	61.3
5. Polymer Product and Rubbe…	per cent	2.7	2.8	2.5	2.2	2.6	2.1	2.4	–12.9	–16.8
Other Industries and Households	per cent	48.7	38.1	40.4	38.3	36.6	33.6	40.5	–16.9	6.3

NIEIR

5.4 Fugitive emissions

Fugitive emissions are unintended leaks, releases or losses of greenhouse gases from fuel industries. Fugitive emissions can come from coal mining, fuel transformation and oil and natural gas industries. This includes fugitive emissions arising from all points of the supply chain for oil and natural gas, including exploration, production, processing, storage and distribution.

5.4.1 Emissions profile – Fugitive Emissions

Fugitive emissions in the local government area have shown a notable increase in recent years, reaching a total of 2.0 kt CO2-e in 2023-24. This growth is reflected in the change since 2004-05 and 2018-19, where total sectoral emissions have increased by 2.6 kt and 0.7 kt respectively. Although fugitive emissions represent a relatively small proportion of overall emissions in the LGA, their share of total local government emissions has risen from a negligible 0.0% in earlier years to 0.3% in 2023-24. On a state-wide basis, this sector now accounts for 0.1% of total state fugitive emissions, up from effectively zero in the preceding years.

The sectoral breakdown by industry class in 2023-24 shows that all fugitive emissions in the area are attributable to the industrial sector, with residential and commercial classes consistently contributing 0.0% throughout the years reported. This reflects a continued concentration of emissions within specific industrial activities, rather than broad-based contributions.

In terms of industry subdivisions, the Gas Supply sector is the sole contributor to fugitive emissions in 2023-24, accounting for 100.0% of emissions. This demonstrates a consolidation of emissions within this subdivision since 2018-19, where Gas Supply's share increased from 89.2% in 2018-19, through 94.6% in 2019-20, to 100.0% by 2021-22 and beyond. Correspondingly, the contribution from 'Other Industries and Households' declined sharply to 0.0% by 2021-22, compared to 10.8% in 2018-19, highlighting both the narrowing of the emissions base and the growing dominance of Gas Supply.

Overall, fugitive emissions in the area have not only increased in recent years, but have become entirely concentrated within the Gas Supply sector. Since 2004-05, there has been growth from a negligible starting point to measurable emissions, while the period from 2018-19 to 2023-24 also demonstrates a clear increase. The data suggest that any future mitigation or reduction efforts within this sector will need to focus exclusively on the Gas Supply industry.

Table 5.7 Fugitive Emissions sector emissions profile for Merri–bek		Annual Levels							Long–term absolute change (per cent)	
		2005	2019	2020	2021	2022	2023	2024	2005 to 2024	2019 to 2024
Total sector										
Total Sectoral Emissions	CO2–e kt	0	0	0	0	1	1	2	2,602.2	743.3
Total Sectoral Emissions per capita	CO2–e t per capita	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,932.7	719.0
Economic Emissions intensity	CO2–e kg per $	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1,654.2	705.9
Share of sectoral emissions in LGA total emissions (exc. Land Use)	per cent	0.0	0.0	0.0	0.0	0.1	0.1	0.3	3,177.4	1,144.2
Share of sectoral emissions in total State sectoral emissions	per cent	0.0	0.0	0.0	0.0	0.0	0.1	0.1	3,847.9	1,231.6
Industry class share										
Residential	per cent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Commercial	per cent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial	per cent	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	0.0
Highest emitting ANZSIC subdivisions, ranked by 2024 emissions share										
1. Gas Supply	per cent	0.0	89.2	94.6	98.1	100.0	100.0	100.0	0.0	12.2
n/a	per cent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	per cent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	per cent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	per cent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Other Industries and Households	per cent	100.0	10.8	5.4	1.9	0.0	0.0	0.0	-100.0	-100.0

NIEIR

5.5 Transport

Transport emissions are from the combustion of fuel used in vehicles for private and non-private purposes. This includes road transport, domestic aviation and railways. The road transport segment makes up around 85 per cent of total annual transport emissions in Australia.

Transport emissions in Merri-bek were a total of 327.3 kt CO_2-e in 2023-24.

- In 2023–24, industry-related transport emissions in Merri-bek were 63.7 kt for road transport, 1.4 kt for rail transport, and 4.1 kt for air and space transport. Road transport accounted for the vast majority of industry transport emissions, with rail and air contributing much smaller shares.
- In 2023–24, transport-related carbon emissions from households in Merri-bek were 250.5 kt.

5.5.1 Motor vehicles garaged and registered in Merri-bek

Figure 5.5 *Share of garaged motor vehicles by motive power*

Legend: Diesel, Petrol, Dual fuel, Other, Battery/Fuel-cell electric, Hybrid electric

Year	Petrol	Diesel
2021	79.8%	16.5%
2022	78.9%	17.3%
2023	78.0%	17.8%
2024	76.9%	18.1%
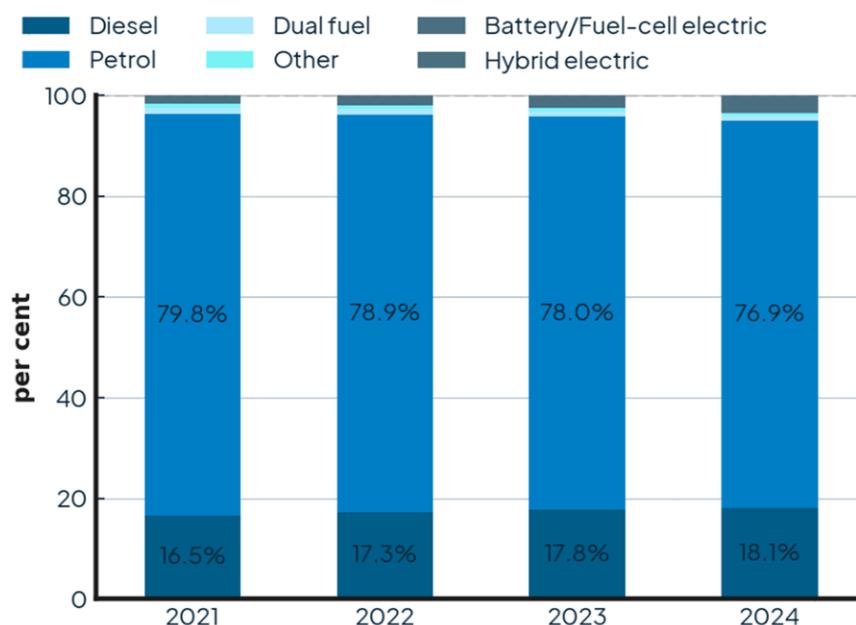
Source: BITRE, NIEIR
Note: Motor vehicles garaged as at 31st January of each respective year.

The total number of registered motor vehicles in Merri-bek has shown a steady increase from 114,566 in 2021 to 119,018 in 2024, representing a growth of 3.9% over four years. Passenger vehicles consistently make up the largest category, rising from 95,945 in 2021 to 99,336 in 2024. This equates to a 3.5% increase, maintaining their dominance in the local vehicle fleet. Light commercial vehicles and motorcycles have also shown moderate increases, with light commercial vehicles growing by 8% and motorcycles returning to a similar level in 2024 after a minor decline in 2023. Other categories, such as heavy buses, light buses, and articulated trucks, have either stayed relatively stable or declined slightly, indicating minimal changes in their contribution to the overall vehicle stock.

Analysis of motive power (fuel type) highlights the persistent dominance of petrol vehicles, although their share of the total motor vehicle stock in Merri-bek has decreased from 79.8% in 2021 to 76.9% in 2024. Diesel vehicles have seen a modest rise, comprising 18.1% of the fleet in 2024 compared to 16.5% in 2021. Notably, electric vehicles—measured as battery or fuel-cell powered—have experienced significant growth. In 2021, electric vehicles accounted for only 0.1% of the stock, but by 2024 their share had increased to 0.7%, reflecting a more than six-fold rise in absolute

numbers (from 477 to 3,565 vehicles). Similarly, the share of hybrid electric vehicles has grown from 1.6% to 2.7% over the same period. Despite these gains, zero- and low-emission vehicles remain a small proportion of the total motor vehicle stock, suggesting there is substantial opportunity for further growth and emissions reduction through fleet electrification. Key points from the analysis are as follows:

- Total motor vehicles increased by 3.9% from 2021 to 2024;
- Petrol vehicles remain dominant but their share fell by 2.9 percentage points;
- Battery electric vehicles increased from 0.1% to 0.7% of the fleet (477 to 3,565 vehicles);
- Hybrid electric vehicles increased from 1.6% to 2.7% of the fleet;
- The overall trend indicates a gradual but meaningful shift towards more sustainable vehicle technologies in Merri-bek.

Table 5.8 Motor vehicles garaged in Merri-bek by vehicle type (number)	2021	2022	2023	2024
Passenger vehicles	95,945	95,887	97,231	99,336
Light commercial vehicles	12,039	12,494	12,706	12,998
Light buses	240	231	221	214
Heavy buses	149	155	155	143
Light rigid trucks	850	887	940	976
Heavy rigid trucks	1,013	1,035	993	991
Articulated trucks	108	116	115	108
Campervans	440	434	498	504
Non-freight-carrying vehicles	122	134	144	141
Motorcycles	3,660	3,605	3,511	3,607
TOTAL MOTOR VEHICLES	114,566	114,978	116,514	119,018

Source: BITRE
Note: Motor vehicles garaged as at 31st January of each respective year.

Figure 5.6 Share of Battery and Fuel-cell vehicles on-road
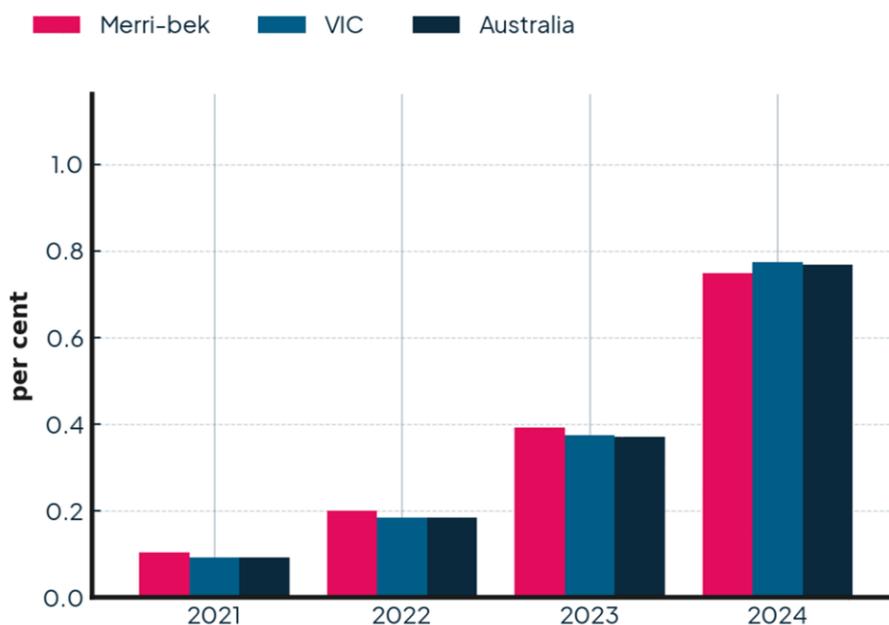
Source: BITRE, NIEIR
Note: 1. Motor vehicles garaged as at 31st January of each respective year.
2. Excludes plug-in hybrid and other hybrid electric vehicles

5.5.2 Emissions profile – Transport

Figure 5.7 Road transport carbon emissions per registered vehicle

Legend: Merri-bek — VIC — Australia

Y-axis: kg CO2-e per vehicle
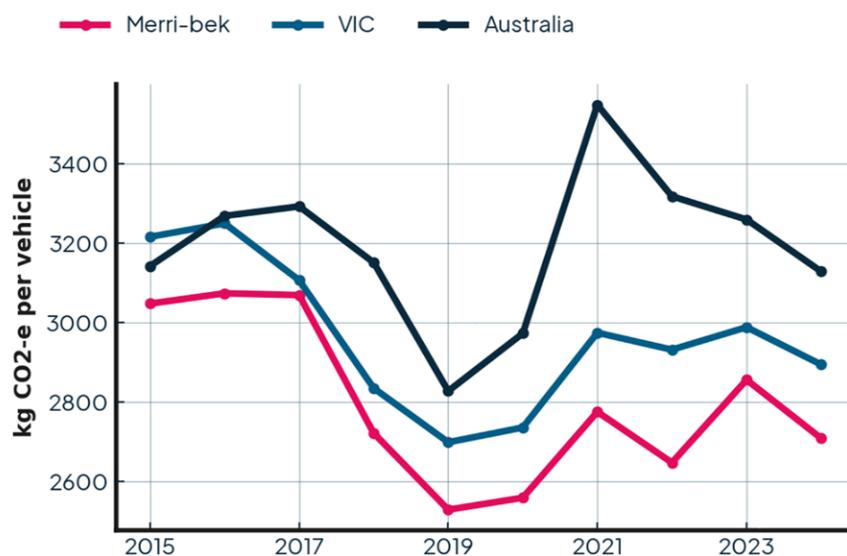
Source: NIEIR, BITRE and ABS
Note: 1. Carbon emissions from Road Transport, Postal and Courier Pick-up and Delivery Services industries and Households
          2. Transport carbon emissions are from both locally registered and from vehicles from outside of LGA travelling within LGA.

Over the past ten years, carbon emissions per vehicle in Merri-bek have displayed a clear downward trend overall. In 2014-15, average emissions per vehicle were 3048.1 kg CO2-e, but by 2023-24, this figure had decreased to 2709.1 kg CO2-e, representing an overall decline of 339.0 kg per vehicle, or 11.1%. Notably, the sharpest drop occurred between 2016-17 and 2018-19, with emissions falling from 3069.5 kg to 2529.8 kg. This trend likely reflects both lower vehicle usage and improvements in vehicle efficiency. After the onset of the COVID-19 pandemic (2020-21), there was a short-term rise in emissions per vehicle, peaking at 2776.0 kg in 2020-21, but this was not sustained, and emissions have since remained below pre-pandemic levels. Comparatively, Victoria and Australia also saw declines over the period, although both continue to have higher average emissions per vehicle than Merri-bek in 2023-24, at 2894.7 kg and 3128.7 kg respectively. This suggests that vehicles registered in Merri-bek are, on average, either more efficient or used less intensively than the state and national averages.

Turning to the summary of emissions for the Transport sector, the data indicates the respective shares by class and the ranking of industry subdivisions. The residential class makes up the largest share of total transport-related emissions in 2023-24, reaffirming the predominance of private vehicle use. Commercial and industrial classes account for smaller shares of the total, with commercial transport showing greater significance compared to the industrial component. Among subdivisions, private motor vehicle use remains the largest contributor, followed by light commercial vehicles and public transport—these rankings are consistent with previous years.

Since 2004-05, the most pronounced growth has occurred in the commercial transport segment, with emissions rising steadily, likely due to increased delivery and service activities. The industrial class, by contrast, has seen a significant decline, reflecting both structural changes in the local economy and a shift toward less-emission-intensive activities. Since 2018-19, residential sector emissions have started to plateau, with some annual fluctuations mirroring broader trends in vehicle use and travel behaviour. In summary, while overall transport emissions remain dominated by the residential fleet, the commercial sector has gained share since 2004-05, and industrial transport has continued to decline, underscoring ongoing changes in working and economic patterns in Merri-bek.

Table 5.9 Transport sector emissions profile for Merri–bek		Annual Levels							Long–term absolute change (per cent)	
		2005	2019	2020	2021	2022	2023	2024	2005 to 2024	2019 to 2024
Total sector										
Total Sectoral Emissions	CO2–e kt	266	297	303	319	307	340	327	23.2	10.1
Total Sectoral Emissions per capita	CO2–e t per capita	1.9	1.7	1.7	1.8	1.8	1.9	1.8	-7.3	6.9
Economic Emissions intensity	CO2–e kg per $	0.052	0.039	0.041	0.044	0.041	0.043	0.041	-20.0	5.2
Share of sectoral emissions in LGA total emissions (exc. Land Use)	per cent	24.9	22.9	23.1	28.5	32.9	24.1	37.2	49.4	62.4
Share of sectoral emissions in total State sectoral emissions	per cent	1.3	1.3	1.5	1.7	1.5	1.5	1.5	11.9	12.6
Industry class share										
Residential	per cent	75.9	79.6	80.8	83.0	77.3	75.2	76.5	0.8	-3.8
Commercial	per cent	24.1	20.4	19.2	17.0	22.7	24.8	23.5	-2.5	14.9
Industrial	per cent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Highest emitting ANZSIC subdivisions, ranked by 2024 emissions share										
1. Road Transport	per cent	20.5	16.8	16.2	14.5	19.3	21.0	19.5	-4.9	15.8
2. Postal and Courier Pick–u…	per cent	1.9	0.9	0.9	1.3	1.7	1.7	2.0	4.3	129.3
3. Air and Space Transport	per cent	1.0	2.1	1.6	0.6	1.0	1.4	1.2	21.9	-41.4
4. Rail Transport	per cent	0.1	0.3	0.3	0.3	0.4	0.4	0.4	205.4	67.4
5. Transport Support Services	per cent	0.1	0.2	0.2	0.2	0.2	0.3	0.3	113.0	28.1
Other Industries and Households	per cent	76.3	79.7	80.9	83.0	77.3	75.2	76.5	0.3	-4.0

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6. Industrial Processes and Product Use

Industrial Processes and Product Use (IPPU) are greenhouse gas emissions generated from non-energy sources in industrial processes or the direct use of greenhouse gases in products. Industrial processes may release greenhouse gases as a byproduct of chemical reactions, such as within the smelting of metals and chemical manufacturing. Product use can include leakage from refrigeration and air conditioning, which have both become an increasingly proportion of IPPU sector emissions in Australia over the past 20 years.

Emissions from Industrial Processes in Merri-bek in 2023-24 were 35.8 kt. This represents a substantial reduction compared to both historic and pre-pandemic levels. In 2004-05, emissions from this sector were 45.2 kt, while in 2018-19—the final full year before the impacts of COVID-19—emissions stood at 61.5 kt. The latest figure for 2023-24 indicates a 20.8% decrease from 2004-05 and a significant 41.7% decrease from 2018-19, highlighting a clear downward trend over the past two decades in emissions associated with industrial processes within the local government area.

6.1.1 Components of Industrial Processes and Product Use

Table 6.1 Industrial Processes and Product Use – detailed carbon accounts					
Account	2020	2021	2022	2023	2024
Total IPPU	64.3	55.4	39.6	75.6	35.8
Heavy Industry	9.0	9.3	7.7	8.8	8.4
Mineral Industry	0.8	0.8	0.6	0.6	0.6
Chemical Industry	0.9	0.8	0.8	0.9	0.8
Metal Industry	6.7	7.1	5.6	6.8	6.5
Other	0.6	0.6	0.6	0.6	0.5
Product uses as ODS substitutes	54.5	45.3	31.1	65.8	26.6
Commercial refrigeration	28.7	22.7	14.1	33.9	11.3
Domestic refrigeration	0.9	0.6	0.4	0.9	0.3
Transport refrigeration	1.3	1.2	1.2	1.3	1.1
Stationary air-conditioning	17.3	13.6	9.1	23.0	7.9
Mobile air-conditioning	4.2	5.2	4.6	4.8	4.3
Other	2.0	1.9	1.7	1.9	1.7
Non-energy products from fuels and solvent use	0.3	0.3	0.3	0.4	0.3
Other product manufacture and use	0.6	0.6	0.5	0.6	0.5

In the 2023-24 financial year, total carbon emissions for the Industrial Processes and Product Use (IPPU) sector in Merri-bek were recorded at 35.8 kt. This figure represents a noticeable decrease compared to the prior year, 2022-23, which saw a significant spike to 75.6 kt. The sharp increase and subsequent drop suggest an anomaly or possibly a data irregularity, as emissions from 2019-20 to 2021-22 remained within a range of 39.6 kt to 64.3 kt. Over the longer term, the IPPU sector has demonstrated substantial volatility, with emissions fluctuating from 45.2 kt in 2005-06 upward to peaks above 60 kt in several years between 2016-17 and 2021-22, before the recent volatility.

Breaking down the key sub-sectors, heavy industry emissions, including the mineral, chemical, metal, and other industries, have followed a long-term downward trajectory.

Heavy industry emissions fell from 34.1 kt in 2005-06 to just 8.4 kt in 2023-24. This decline is mainly attributed to significant reductions in the mineral and metal industry sub-accounts, both showing consistent decreases over time. For instance, the metal industry dropped from 24.4 kt in 2005-06 to just 6.5 kt in 2023-24. Similarly, the mineral industry fell from 8.2 kt to 0.6 kt over the same period. These trends indicate structural changes in the local heavy industrial base or effective mitigation strategies adopted over the years.

Emissions from the "Product uses as ODS substitutes" category, which primarily includes refrigeration and air-conditioning, have shown marked long-term growth before the recent disruption. This sub-total category rose from 9.5 kt in 2005-06, peaking at 54.5 kt in 2019-20, then fluctuated significantly, matching the sector-wide anomaly in 2022-23 with 65.8 kt, and then dropping sharply to 26.6 kt in 2023-24. Commercial refrigeration and stationary air-conditioning are the main contributors within this category. Both grew substantially over the past two decades: commercial refrigeration increased from 3.6 kt in 2005-06 to a high of 28.7 kt in 2019-20, followed by a dip to 11.3 kt in 2023-24. Stationary air-conditioning followed a similar pattern, climbing from 2.1 kt in 2005-06 to 17.3 kt in 2019-20, before dropping to 7.9 kt in 2023-24. These trends suggest increasing prevalence of refrigeration and air-conditioning equipment, likely related to urban development and higher equipment turnover rates, but the 2022-23 spike and 2023-24 fall require further investigation to understand their causes, which might include changes in reporting, equipment replacement cycles, or policy interventions. Domestic refrigeration and mobile air-conditioning emissions have remained comparatively low but show similar long-term variation, albeit on a much smaller scale.

The smaller contributors, such as non-energy products from fuels and solvent use, and other product manufacture and use, have remained relatively stable over the entire period, each accounting for less than 1 kt annually in recent years.

In summary, the IPPU sector in Merri-bek has been characterised by a long-term structural decline in heavy industrial emissions, offset by sustained and then volatile growth in emissions from refrigeration and air-conditioning uses. The sharp changes observed in 2022-23 and 2023-24 suggest the need for closer scrutiny to clarify whether these are due to real changes in activity, data quality issues, or policy impacts. The dominant role of refrigeration and air-conditioning in recent emissions underlines their importance for ongoing mitigation strategies in the IPPU sector at the local government level.

6.1.2 Emissions Profile – Industrial Processes and Product Use

Figure 6.1 Industrial Processes and Product Use by ANZSIC division, 2023-24
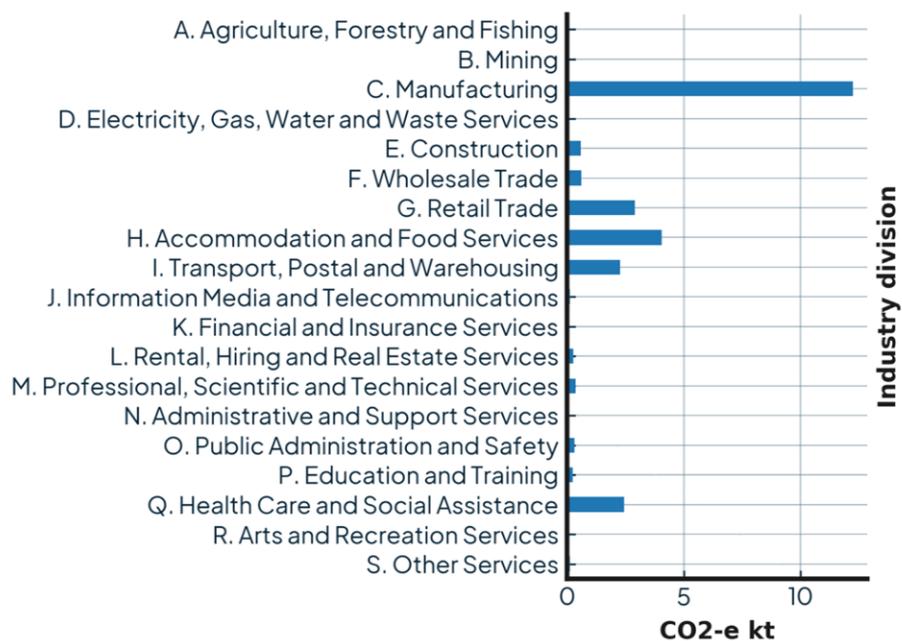
In the 2023–24 financial year, sectoral emissions from Industrial Processes and Product Use in Moreland reached 36.0 kilotonnes of CO_2-e, showing a significant decline from both 2018–19 (61.0 kt) and 2004–05 (45.0 kt). Over the longer term since 2004–05, total sectoral emissions have decreased by 20.8 per cent, with a sharper drop of 41.8 per cent evident since 2018–19. On a per-capita basis, emissions were reduced by 40.4 per cent over the longer period, indicating a broad-based improvement not only in total output but also relative to population growth. Sectoral emissions have also declined as a proportion of the LGA's total emissions, from 4.2 per cent in 2004–05 to 4.1 per cent in 2023–24, a minor decrease over nearly two decades. The sector's share of total State industrial emissions fell even more markedly, down 35.8 per cent over the same period.

Examining the shares of emissions by industry class, industrial sources historically dominated, contributing 82.3 per cent in 2004–05 and falling to just 35.9 per cent in 2023–24, reflecting a 56.4 per cent decline in share. Conversely, the commercial class expanded significantly, rising from 10.3 per cent in 2004–05 to a peak of 47.6 per cent in 2022–23, before settling at 39.1 per cent most recently—a more than four-fold increase over the period, though there has been a decline since 2018–19. The residential

class, while smaller in absolute terms, has increased steadily from 7.4 per cent to 25.0 per cent in 2023–24, an increase of 236.5 per cent. The rise in residential share over the long term is attributable to increased product use as substitutes for ozone-depleting substances, predominantly from refrigeration and air-conditioning in homes.

Industry-specific emissions highlight that, in 2023–24, the largest contributing industry divisions to emissions were not traditional heavy industrial sectors, but those tied to service provision and consumption. Within the industry divisions, Manufacturing's emissions, long the main source (36.9 kt in 2004–05), have dropped steeply to 12.3 kt by 2023–24. Sectors such as Retail Trade and Accommodation and Food Services, meanwhile, have grown in prominence, with Accommodation and Food Services accounting for 4.1 kt, and Retail Trade 2.9 kt in 2023–24. Professional, Scientific and Technical Services, along with Health Care and Social Assistance, now also play a material role relative to their 2004–05 baselines. Over the past five years, however, the Fabricated Metal Product Manufacturing subdivision—traditionally a driver of sectoral emissions—has further reduced its share of total sectoral emissions from 9.7 per cent in 2018–19 to 14.5 per cent in 2023–24, reflecting both sectoral restructuring and abatement practices. Food and Beverage Services peaked at 16.8 per cent in 2022–23 but declined to 11.2 per cent in 2023–24. Road Transport's share grew consistently, rising from 2.3 per cent in 2004–05 to 5.3 per cent in 2023–24, and showing the strongest growth since 2018–19 among major subdivisions.

Residential emissions, while comprising a minority of total sectoral emissions, have risen significantly in relative terms. Their increasing share is directly related to the expanded uptake of refrigeration and air-conditioning using alternatives to ozone-depleting substances. This is a notable shift in the composition of process emissions—moving away from traditional industrial origins towards household-based sources—reflecting broader technology trends and consumer behaviour. The residential class' relative contribution has more than tripled since 2004–05, up from 7.4 per cent to 25.0 per cent in 2023–24.

In summary, total Industrial Processes and Product Use emissions in Moreland (C) LGA have notably declined since 2004–05 and 2018–19, led by considerable reductions in classical manufacturing and industrial subdivisions. Meanwhile, commercial and residential sources have grown in importance, reshaping the emissions profile and highlighting evolving technological and economic patterns both at industry and household levels.

Table 6.2 Industrial Processes and Product Use sector emissions profile for Merri-bek		Annual Levels							Long-term absolute change (per cent)	
		2005	2019	2020	2021	2022	2023	2024	2005 to 2024	2019 to 2024
Total sector										
Total Sectoral Emissions	CO2-e kt	45	61	64	55	40	76	36	-20.8	-41.8
Total Sectoral Emissions per capita	CO2-e t per capita	0.3	0.3	0.4	0.3	0.2	0.4	0.2	-40.4	-43.4
Economic Emissions intensity	CO2-e kg per $	0.009	0.008	0.009	0.008	0.005	0.010	0.005	-48.6	-44.3
Share of sectoral emissions in LGA total emissions (exc. Land Use)	per cent	4.2	4.7	4.9	4.9	4.2	5.4	4.1	-4.0	-14.1
Share of sectoral emissions in total State sectoral emissions	per cent	1.6	1.7	1.8	1.5	1.1	2.0	1.0	-35.8	-40.7
Industry class share										
Residential	per cent	7.4	23.2	24.5	25.4	25.5	26.3	25.0	236.5	7.7
Commercial	per cent	10.3	44.5	46.7	44.5	42.6	47.6	39.1	280.3	-12.1
Industrial	per cent	82.3	32.3	28.9	30.1	32.0	26.1	35.9	-56.4	11.1
Highest emitting ANZSIC subdivisions, ranked by 2024 emissions share										
1. Fabricated Metal Product …	per cent	38.3	9.7	8.2	9.9	10.7	6.7	14.5	-62.2	50.0
2. Food and Beverage Services	per cent	1.5	14.6	14.6	13.1	12.5	16.8	11.2	653.3	-23.8
3. Food Retailing	per cent	1.6	10.1	11.5	11.2	9.1	10.5	7.2	356.2	-28.9
4. Food Product Manufacturing	per cent	3.1	6.3	6.4	5.7	5.6	6.8	5.9	91.1	-6.4
5. Road Transport	per cent	2.3	3.1	3.1	3.5	5.2	3.1	5.3	133.8	70.3
Other Industries and Households	per cent	53.3	56.2	56.3	56.6	57.0	56.2	55.9	5.0	-0.4

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7. Agriculture

Agriculture sector emissions include direct emissions from livestock and farm management practices, such as from agricultural soils and the application of fertilisers. This sector excludes Land Use, Land-Use Change and Forestry.

Emissions from Agriculture in Merri-bek in 2023-24 were 8.5 kt of CO2-e. The agricultural sector's carbon emissions in Merri-bek have remained relatively low and stable over several decades, reflecting the area's predominantly urban character and limited agricultural activity. Compared to other emission sources in the local government area, agriculture contributes only a small fraction to total emissions. This minimal contribution is consistent with trends observed in other densely populated metropolitan councils where residential and commercial land use limits extensive farming. The relatively steady trend also indicates limited change in agricultural practices or land use within the municipality.

7.1.1 Emissions Profile – Agriculture

In the 2023–24 financial year, total agricultural emissions in Merri-bek were 8.0 kt of CO2-e. This figure represents a small absolute decline of 1.8% since 2004–05, when emissions were 9.0 kt. On a per capita basis, agricultural emissions have dropped from 0.1 t per person in 2004–05 to effectively negligible amounts in recent years. Nevertheless, fluctuations between 2004–05 and 2023–24 have produced periods where emissions increased, such as a notable 198.3% rise between 2018–19 and 2023–24, reflecting the small base values and underlying changes in reported activity.

Emissions intensity has remained extremely low, declining from 0.002 kg CO2-e per dollar in 2004–05 to 0.001 kg in 2023–24. Agriculture's share of Merri-bek's total emissions is minor, at 1.0% in 2023–24, though this is up from 0.8% in 2004–05 and has varied over time due to changes in both agriculture and broader sectoral emissions. At the state level, Merri-bek's agricultural emissions remain negligible, always below 0.1% of the Victorian total.

Industry subdivision data show that in 2023–24, emissions were almost entirely attributed to the general Agriculture subdivision, which accounted for 71.9% of sectoral emissions. The remainder was from Agriculture, Forestry and Fishing Support Services, at 28.1%. The most pronounced change since 2018–19 has been a sharp increase in the share attributed to the Agriculture category (rising by 6,691.1%), while Support Services saw a steep decline (down 71.6%) over the same period. Over the entire period, Agriculture's share has grown by 4.5 percentage points, while Support Services fell by 9.9 points. Other industries and households have not contributed any measurable emissions during the period, recording zero throughout.

Overall, agricultural emissions in Merri-bek are both low and volatile on a percentage basis due to the small absolute values. The sector's relevance to the municipality's

emissions profile remains minor, and internal shifts reflect changes in the relative activity of two small industry subdivisions.

Table 7.1 Agriculture sector emissions profile for Merri–bek		Annual Levels							Long–term absolute change (per cent)	
		2005	2019	2020	2021	2022	2023	2024	2005 to 2024	2019 to 2024
Total sector										
Total Sectoral Emissions	CO2-e kt	9	3	6	9	9	8	8	-1.8	198.3
Total Sectoral Emissions per capita	CO2-e t per capita	0.1	0.0	0.0	0.1	0.1	0.0	0.0	-26.2	189.7
Economic Emissions intensity	CO2-e kg per $	0.002	0.000	0.001	0.001	0.001	0.001	0.001	-36.3	185.1
Share of sectoral emissions in LGA total emissions (exc. Land Use)	per cent	0.8	0.2	0.4	0.8	1.0	0.6	1.0	19.0	340.1
Share of sectoral emissions in total State sectoral emissions	per cent	0.0	0.0	0.0	0.1	0.1	0.1	0.1	9.0	179.8
Industry class share										
Residential	per cent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Commercial	per cent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial	per cent	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	0.0
Highest emitting ANZSIC subdivisions, ranked by 2024 emissions share										
1. Agriculture	per cent	68.8	1.1	42.6	62.0	61.1	67.1	71.9	4.5	6,691.1
2. Agriculture, Forestry and…	per cent	31.2	98.9	57.4	38.0	38.9	32.9	28.1	-9.9	-71.6
n/a	per cent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	per cent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	per cent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Other Industries and Households	per cent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100.0	-100.0

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8. Land Use, Land-Use Change and Forestry

Figure 8.1 Land use in Merri-bek, 2022-23
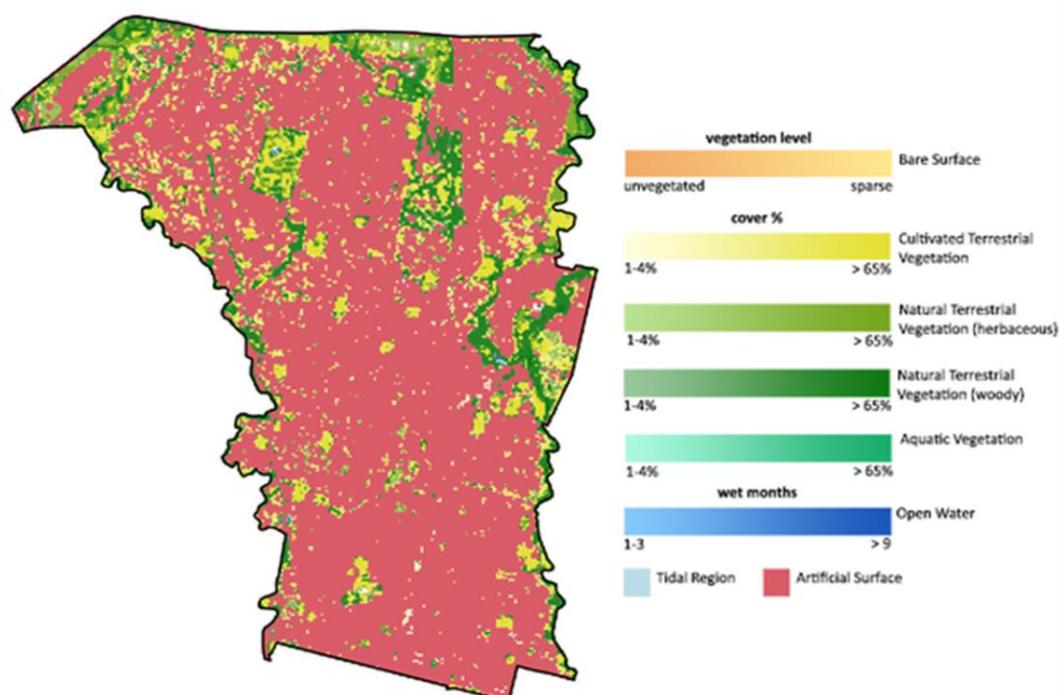
The Land Use, Land-Use Change and Forestry sector measures the net impact on emission from activities affecting land and vegetation. This sector could either be a source of emissions, or it could act as a land sink by removing emissions from the atmosphere. Land use changes, such as clearing land and harvesting forests, increase emissions. Protecting and restoring natural vegetation acts as a carbon sink that reduces emissions in the atmosphere.

The Land Use, Land-Use Change and Forestry carbon sector is based on analysis of Australian satellite imagery over the past 25 years. The satellite images display the composition of land within each region across Australia on an annual basis. Figure 8.1 shows land cover for Merri-bek in 2022-23 for bare surface, cultivated vegetation, both herbaceous and woody vegetable, aquatic vegetation and open water. The amount of artificial surface in Merri-bek can also be seen. These land cover categories were reconciled with Australia's carbon accounts, which are shown for Merri-bek in table 8.1.

The Land Use, Land-Use Change and Forestry sector for Merri-bek demonstrates a notable shift in carbon emissions over the five-year period from 2019-20 to 2023-24. In 2019-20, the sector acted as a significant carbon sink, offsetting emissions by -5.2 kilotonnes (kt) of CO_2 equivalent. This level of offset decreased considerably in subsequent years, reaching -2.2 kt in 2020-21, before switching to a slight source of emissions at 0.2 kt in 2021-22. Emissions increased marginally to 0.3 kt in both 2022-23 and 2023-24.

A closer examination of the sub-sectors reveals that the Forest Land component consistently acted as a carbon sink over the period, with net removals ranging from -1.1 kt in 2019-20 through to -0.6 kt in 2023-24. This offset was mainly attributable to both forest land remaining forest land, and land converted to forest land, with the net removal effect declining slightly each year.

Cropland and Grassland sub-sectors also consistently offset emissions, with Cropland removals increasing slightly from -0.1 kt to -0.07 kt across the period, and Grassland showing removals of up to -0.2 kt. Notably, for both cropland and grassland, the main offset effect came from remaining land, while land conversion showed a small positive emission, somewhat countering the removals.

Wetland emissions were negligible across all years, remaining at zero, signifying no appreciable change or impact from wetlands within the local government area during the reporting period.

The most variable sub-sector was Settlements. In 2019-20, settlements significantly offset emissions at -3.5 kt. However, from 2020-21 onwards, settlements switched to becoming a source of emissions, with the sector peaking at 1.4 kt in 2021-22 and remaining above 1.3 kt through to 2023-24. This change was primarily driven by land converted to settlements, which increased emissions, outweighing the consistent offset from settlements remaining settlements.

Harvested Wood Products provided a small but steady net removal of carbon, declining from -0.5 kt in 2019-20 to -0.2 kt in 2023-24.

In summary, the analysis indicates that Merri-bek's ability to offset carbon emissions through land use and land cover management has diminished over the five years to 2023-24. The rise in emissions is largely attributable to land converted to settlements, while offsets from forests, cropland, and grassland have generally decreased. Wetlands continue to play a negligible role in the municipality's carbon accounts. Overall, this trend highlights the increasing importance of land use and settlement planning for achieving local emissions reductions.

Table 8.1 Land Use, Land–Use Change and Forestry detailed carbon accounts					
Land sector	2020	2021	2022	2023	2024
Total Land Use, Land–Use Change and Forestry	–5.2	–2.2	0.2	0.3	0.3
Forest Land	–1.1	–1.1	–0.6	–0.6	–0.6
Forest land remaining forest land	–0.6	–0.5	–0.2	–0.2	–0.2
Land converted to forest land	–0.4	–0.5	–0.3	–0.4	–0.4
Cropland	–0.1	–0.1	–0.1	–0.1	–0.1
Cropland remaining cropland	–0.1	–0.1	–0.1	–0.1	–0.1
Land converted to cropland	0.0	0.0	0.0	0.0	0.0
Grassland	–0.1	–0.2	–0.1	–0.1	–0.2
Grassland remaining grassland	–0.2	–0.3	–0.2	–0.3	–0.3
Land converted to grassland	0.1	0.1	0.1	0.1	0.2
Wetland	0.0	0.0	0.0	0.0	0.0
Wetland remaining wetland	0.0	0.0	0.0	0.0	0.0
Land converted to wetland	0.0	0.0	0.0	0.0	0.0
Settlements	–3.5	–0.2	1.4	1.4	1.4
Settlements remaining settlements	–1.0	–1.0	–1.0	–1.0	–0.9
Land converted to settlements	–2.5	0.8	2.4	2.3	2.3
Harvested Wood Products	–0.5	–0.6	–0.4	–0.3	–0.2

9. Waste

Waste source emissions are primarily from the decomposition of solid waste materials that have been disposed of in landfill. This sector also includes emissions from waste water treatment, and other minor waste sectors such was incineration, open burning of waste and the biological treatment of solid waste.

Emissions from waste in Merri-bek in 2023-24 were 51.6 kt CO_2-e. This represents a substantial decrease compared to the 2004-05 level of 82.3 kt, amounting to a reduction of 37.3%. When compared to the pre-COVID year of 2018-19, where waste emissions totalled 55.5 kt, there has been a moderate decrease of 7.0%. These figures demonstrate a consistent downward trend in waste-related emissions over the past two decades, suggesting the effectiveness of local mitigation strategies and improvements in waste management practices.

9.1 Waste by stream

Table 9.1 Waste emissions by waste stream in Merri-bek (CO_2-e kt)					
	2020	**2021**	**2022**	**2023**	**2024**
Solid waste disposal					
Municipal Waste (MSW)	13.5	12.7	17.9	17.6	9.3
Commercial and Industrial (C&I)	13.2	12.8	17.1	17.0	16.9
Construction and Demolition (C&D)	1.4	1.6	1.9	2.0	1.8
Total Solid Waste	28.1	27.1	36.8	36.7	28.0
Other waste					
Total Other Waste[1]	1.1	1.0	1.1	1.2	1.2
Waste water					
Waste water treatment and discharge	23.3	22.4	24.1	22.3	22.4
Total Waste	52.5	50.5	61.9	60.2	51.6

Note: 1. Total other waste includes biological treatment of solid waste and incineration and open burning of waste.

In 2023-24, total waste emissions for the local government area were 51.6 kt CO_2-e. Solid waste accounted for more than half of this total, with combined emissions from municipal solid waste (MSW), commercial and industrial (C&I), and construction and demolition (C&D) sources amounting to 28.0 kt CO_2-e. Within the solid waste category,

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MSW contributed 9.3 kt, representing 18.0% of total waste emissions, while C&I waste produced 16.9 kt (32.8%) and C&D waste added 1.8 kt (3.5%). Together, these streams made up 54.3% of total waste emissions.

Wastewater treatment and discharge remained a significant source of emissions at 22.4 kt CO_2-e, which comprised 43.4% of the 2023-24 total. Total other waste, including minor sources, contributed 1.2 kt CO_2-e or 2.3% of total emissions.

Emissions from solid waste have fluctuated over time, peaking at 37.2 kt in 2017-18, and declining to 28.0 kt in 2023-24. This reduction was most apparent in the municipal sector, which dropped from highs of over 32.7 kt in 2004-05 to 9.3 kt in 2023-24. C&I emissions also declined from 25.1 kt in 2004-05 to 16.9 kt in the most recent year. C&D emissions, while always a smaller proportion, have stayed comparatively stable.

The data reveals that, for 2023-24, the waste emissions profile is led by C&I waste (32.8%) and wastewater (43.4%), indicating that strategies targeting these streams will have the greatest impact on reducing overall waste-related carbon emissions. Continued improvements in municipal solid waste management have significantly reduced this stream's share, though further gains are possible. The relatively minor contribution of C&D and 'other' waste streams suggests limited potential for large-scale emissions reductions from those sectors. Targeted actions in C&I and wastewater treatment, in particular, hold the key to meaningful emissions cuts at the local government area level.

9.2 Emissions profile – Waste

Figure 6.1 Waste emissions by ANZSIC division, 2023-24
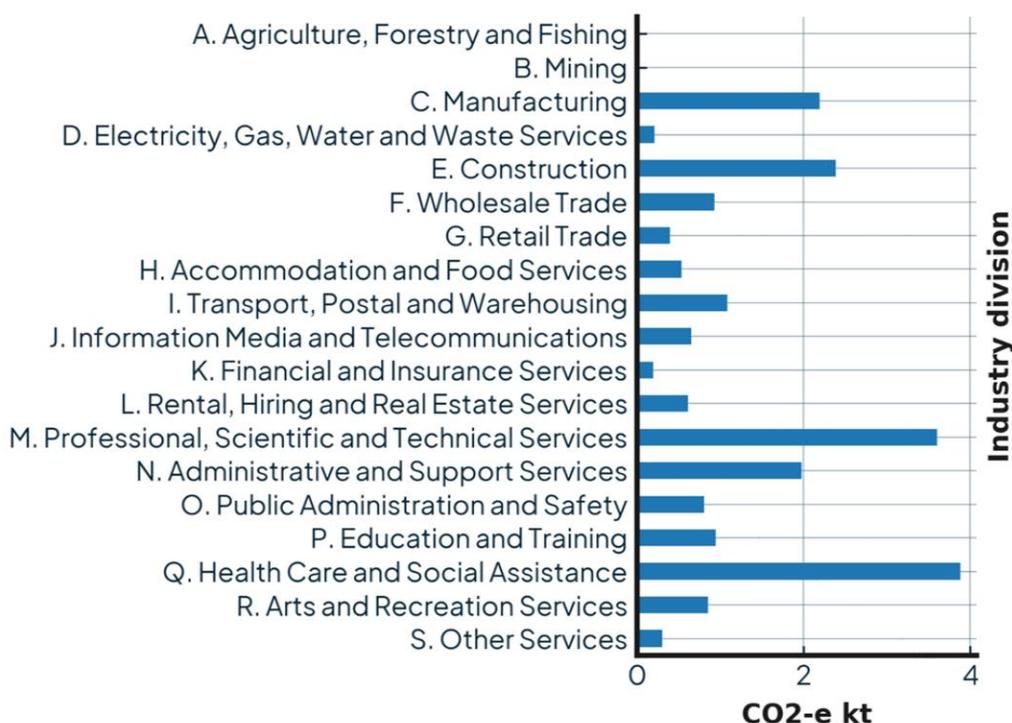
Waste sector emissions in Moreland (C) have significantly decreased over the past two decades. In 2005-06, total waste emissions stood at 82.0 kilotonnes (kt) of CO_2-e, while by 2023-24 this had dropped to 51.6 kt, marking a reduction of 37.3%. Over the same period, emissions per capita fell from 0.6 to 0.3 tonnes, down by 52.8%. Economic emissions intensity also declined, falling from 0.016 kg CO_2-e per dollar to 0.007, a drop of 59.3%, indicating improved efficiency in waste-related emissions relative to economic output. The waste sector's contribution to total local government area (LGA) emissions has decreased from 7.7% in 2005-06 to 5.9% by 2023-24. Similarly, the LGA's share of total state sectoral waste emissions declined from 2.0% to 1.6%, reaffirming a relative improvement at both local and state levels.

Household (Residential) waste emissions have consistently comprised the largest share of sectoral emissions, although this share has been declining. In 2005-06, residential sources accounted for 64.9% of total waste emissions, before peaking slightly and falling to 58.3% in 2023-24. This represents a decrease of 10.3 percentage points since 2005-06 and 12.4 percentage points compared with 2018-19, suggesting targeted progress in household waste management or diversion efforts.

The industrial and commercial classes have exhibited opposing trends. Industrial emissions accounted for 9.9% of waste emissions in 2005-06 but dropped to 9.3% in 2023-24, reflecting a slight decrease of 6.2%. Commercial emissions, by contrast, have increased substantially, rising from 25.2% in 2005-06 to 32.5% in 2023-24, a gain of 28.8%. Between 2018-19 and 2023-24, the commercial sector's share grew by 30.4%, whereas the industrial share rose modestly by 7.6%. These trends point to a relative shift from residential to commercial waste generation as share of total emissions.

Regarding industry divisions, the composition of sectoral emissions in 2023-24 is led by Professional, Scientific and Technical Services, which now account for 4.1% of sectoral waste emissions—the largest among industry divisions outside households. This division's share has grown strongly since 2005-06, with an increase of 68.3%, and 41.3% since 2018-19. Medical and Other Health Care Services have also expanded their share, reaching 3.7%, up dramatically by 168.2% since 2005-06 and 48.8% since 2018-19. Construction Services make up 3.0%, an increase of 127.7% since 2005-06, though only 12.0% since 2018-19. Computer System Design and Related Services now comprise 2.9%, with the fastest long-term growth of 269.2%, and 40.0% since 2018-19. Conversely, Building Cleaning, Pest Control and Other Support Services, while at 2.0%, saw an overall reduction in share since 2005-06, but almost doubled since 2018-19, increasing by 98.6%.

From a sectoral perspective, the most notable increase over the long term (since 2004-05) in emissions share has been in Computer System Design and Related Services, Medical and Other Health Care Services, and Construction Services. Building Cleaning, Pest Control and Other Support Services has declined, while most other industries have reduced their share as waste generation has become concentrated in fewer, but growing, industrial and commercial sectors.

In summary, Moreland's waste sector is undergoing a structural transformation, marked by overall emissions reductions, steady improvement in emissions intensity, and a shift in the composition of waste sources—from residential dominance toward rising contributions by professional, health, and technology industries. This is an important context for future waste reduction and management strategies, with ongoing opportunities to target sectors experiencing the fastest emissions growth.

Table 9.2 Waste sector emissions profile for Merri–bek

		Annual Levels							Long–term absolute change (per cent)	
		2005	2019	2020	2021	2022	2023	2024	2005 to 2024	2019 to 2024
Total sector										
Total Sectoral Emissions	CO2–e kt	82	51	52	51	62	60	52	–37.3	1.2
Total Sectoral Emissions per capita	CO2–e t per capita	0.6	0.3	0.3	0.3	0.4	0.3	0.3	–52.8	–1.7
Economic Emissions intensity	CO2–e kg per $	0.016	0.007	0.007	0.007	0.008	0.008	0.007	–59.3	–3.3
Share of sectoral emissions in LGA total emissions (exc. Land Use)	per cent	7.7	3.9	4.0	4.5	6.6	4.3	5.9	–23.9	49.3
Share of sectoral emissions in total State sectoral emissions	per cent	2.0	1.9	1.9	1.8	1.9	1.8	1.6	–20.6	–17.7
Industry class share										
Residential	per cent	64.9	66.5	66.9	66.2	64.8	63.7	58.3	–10.3	–12.4
Commercial	per cent	25.2	24.9	25.3	25.8	27.3	28.0	32.5	28.8	30.4
Industrial	per cent	9.9	8.6	7.8	8.0	7.9	8.4	9.3	–6.2	7.6
Highest emitting ANZSIC subdivisions, ranked by 2024 emissions share										
1. Professional, Scientific …	per cent	2.4	2.9	3.1	3.3	3.6	3.5	4.1	68.3	41.3
2. Medical and Other Health …	per cent	1.4	2.5	2.5	2.9	2.8	2.9	3.7	168.2	48.8
3. Construction Services	per cent	1.3	2.7	2.4	2.7	2.5	2.9	3.0	127.7	12.0
4. Computer System Design an…	per cent	0.8	2.0	2.3	2.4	2.5	2.4	2.9	269.2	40.0
5. Building Cleaning, Pest C…	per cent	3.5	1.0	1.2	1.3	1.3	1.6	2.0	–43.2	98.6
Other Industries and Households	per cent	90.5	88.8	88.5	87.5	87.2	86.6	84.2	–6.9	–5.1

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10. Benchmarking and comparative performance

This section compares the total carbon emissions of Merri-bek against comparable regions within Victoria and Australia. Total carbon emissions per capita and economic emissions intensities are compared between regions for the 2023-24 year.

The change in total emissions levels from 2004-05 to 2023-24 for Merri-bek is also compared against similar regions.

Merri-bek has the following key indicators:

- Total emissions of 881.1 kt CO2-e in 2023-24.
- Total emissions levels in 2023-24 represent a decrease of -18.1 per cent compared to 2004-05 levels.
- Total emissions of 4.78 kt CO2-e per capita in 2023-24
- Economic emissions intensity of 0.11 kg per $ of GRP in 2023-24

The following table summarises the comparative performance of Merri-bek and ranks the LGA against others within key groups. Greater decreases against 2004-05 levels are ranked highest, while lower levels of total emissions per capita and economic emissions intensities are ranked highest. This means that the first ranking LGA within each group has either the largest percentage decrease in emissions since 2004-05, or lowest levels of normalised emissions in 2023-24.

Table 10.1 Total emissions performance in 2023-24 for Merri-bek compared to other LGAs				
Merri-bek indicator		Rank		
		Within Metropolitan LGAs	*Within VIC*	*Within Australia*
Change in levels since 2004-05	-18.1 per cent decrease	19 out of 31	61 out of 80	357 out of 543
Total emissions per capita	4.78 t CO2-e per capita	2 out of 31	11 out of 80	115 out of 543
Economic emissions intensity	0.11 kg per $ of GRP	9 out of 31	20 out of 80	161 out of 543

The following chart shows how Merri-bek ranks against all other Australian LGAs for each year from 2005-06 to 2023-24.

Across the period from 2005-06 to 2023-24, Merri-bek's ranking for total emissions per capita has generally worsened relative to other Australian LGAs. In 2005-06, Merri-bek ranked 36th, placing it among the LGAs with lower per capita emissions. By 2023-24, the ranking had dropped to 115th, indicating that while Merri-bek was previously closer to the best performing LGAs, it has moved further from this position. This trend was not consistent each year, with intermediate years showing fluctuations; for example, the ranking deteriorated to 153rd in 2021-22 before improving again to 115th in the most recent year.

Merri-bek's economic emissions intensity ranking followed a similar pattern. In 2005-06, Merri-bek was ranked 90th, but moved down the ranks to 161st by 2023-24. The most significant relative drop occurred after 2011-12, when the rank moved from 131st in 2010-11 to as low as 267th in 2022-23, before recovering to 161st. This indicates that, compared to other Australian LGAs, Merri-bek's economic emissions intensity position has worsened but saw some improvement in the final year of the period.

In terms of change in emissions levels since 2004-05, the relative performance of Merri-bek has also generally worsened, indicating weaker reductions in emissions compared to other LGAs. In 2005-06, Merri-bek ranked 179th for this indicator, suggesting relatively strong reductions. This position deteriorated significantly over time, reaching 498th in 2011-12 and remaining among the bottom quartile until improving to 357th in 2023-24. While the most recent year shows Merri-bek has moved up relative to other LGAs, its long-term trend suggests that it has generally achieved weaker emissions reductions compared to the majority of other councils.

Overall, while there are periods where Merri-bek's relative position improved, the trend since 2004-05 reflects a general weakening in rank across all three indicators, particularly from 2010-11 to 2022-23. The most recent data does show some recovery, but overall, Merri-bek's performance compared to all other Australian LGAs has not kept pace, with notable room for improvement in the future.

Figure 10.1 Long-term rank of Merri-bek compared to all Australian LGAs
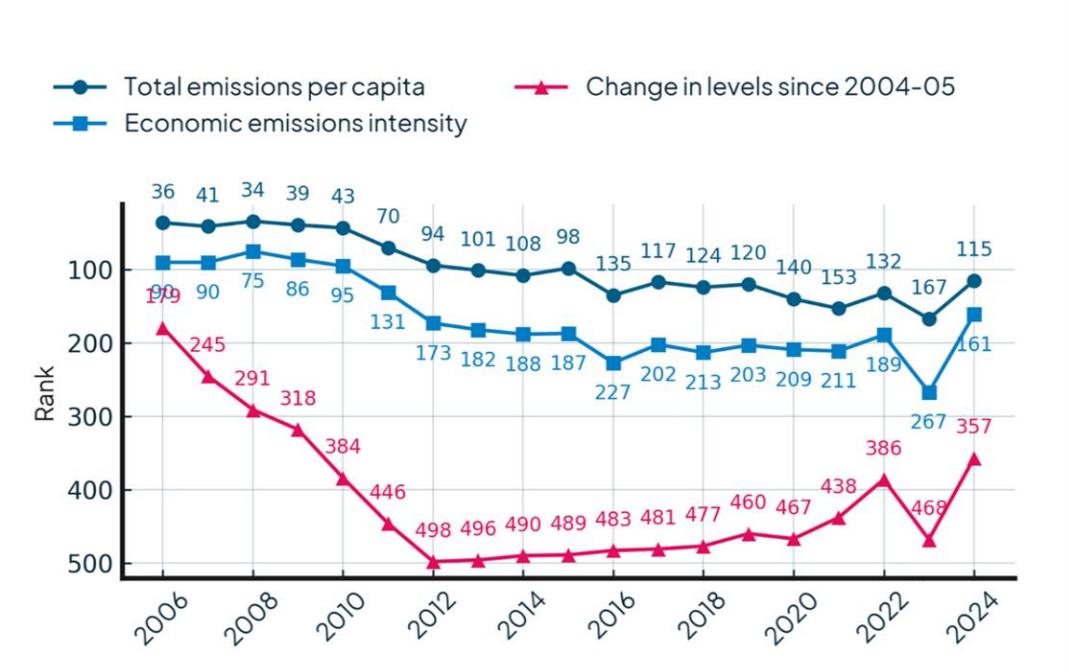
Note: All ranks include the Land Use, Land-Use Change and Forestry sector

11. Emission reduction opportunities

Sectors with Greatest Opportunity for Emissions Reduction through Electrification with Renewables

Overview

Merri-bek's carbon emissions profile in 2023–24 demonstrates that ongoing electrification and the increasing availability of renewable electricity generation create significant opportunities for further decarbonisation across several sectors. Key candidates for emissions reduction via electrification with renewables include the residential sector (including households and small businesses), the commercial sector, certain segments of light industry, and especially the transport sector, which remains a challenging and growing source.

1. Residential Sector

Household energy use accounted for 64.1% of Merri-bek's total emissions in 2023–24, up from 57.6% in 2004–05. The dominance of household emissions is primarily due to space and water heating, home appliances, and private vehicle use (the latter discussed below). Households are also the largest single contributors to purchased electricity emissions (57.4%) and are the dominant users of natural gas, responsible for 77.2% of natural gas emissions.

Electrification Opportunities:

- **Natural Gas Substitution:** The residential sector's continued reliance on natural gas for heating, hot water, and cooking suggests a substantial emissions reduction potential through electrification using high-efficiency heat pumps, induction cooktops, and all-electric appliances. As the electricity grid decarbonises, direct emissions from electricity consumption will fall, amplifying the benefit of electrification.
- **Renewable Electricity Uptake:** The rapid growth in rooftop PV installations, with the installed capacity rising from 25.6 MW in 2018–19 to 63.6 MW in 2023–24, underlines the strong uptake among households. This trend directly reduces reliance on both grid electricity and fossil fuel-based on-site energy, especially when paired with electrification of appliances.
- **Efficiency and Load Optimisation:** Continued adoption of energy-efficient appliances and home retrofits will further reduce demand, sharpening the impact of renewable-fed electrification.

2. Commercial Sector

In 2023–24, the commercial sector contributed 22.0% of Merri-bek's total emissions. Commercial users accounted for 28.1% of purchased electricity emissions and 11.3% of natural gas emissions, with a notable upward trend in gas usage following the pandemic.

Electrification Opportunities:

- **Gas Appliances and Heating:** Commercial premises—including offices, retail, accommodation, and food services—present substantial potential to switch from gas-based heating and hot water to all-electric systems powered by renewables.
- **Rooftop and Local Solar:** As in the residential sector, the steady increase in average PV system size indicates businesses are adopting larger renewable systems. This permits deeper decarbonisation of load, especially when combined with storage and flexible demand management.
- **Appliance and Building Upgrades:** Efficiency upgrades in lighting, HVAC systems, and process loads further support transition to renewable-powered electricity use.

3. Industrial and Manufacturing Sectors

By 2023–24, industrial sector emissions had significantly declined, making up just 13.9% of the total—down from 22.0% in 2004–05. Manufacturing emissions (from purchased electricity and natural gas) have halved or better since 2018–19, reflecting both a shift away from traditional heavy industry and improvements in energy intensity.

Electrification Opportunities:

- **Process Heat and Fuel Switching:** The move to electric process heating (where applicable) and replacement of gas, diesel, and other fossil fuels in industrial processes is a major area for emissions reduction, especially as grid intensity falls.
- **Direct Renewable Supply:** Manufacturing and industrial businesses are increasingly able to invest in on-site solar or access renewable electricity contracts, accelerating decarbonisation at a lower cost.
- **Residual Emissions:** For sectors where direct electrification remains challenging (such as high-temperature industrial processes), deployment of emerging technologies and continued efficiency improvements are key.

4. Transport Sector

Transport is Merri-bek's second-largest single source of emissions in 2023–24 at 327.3 kt (accounting for 37.2% of total energy sector emissions), and it is the only energy subsector to have grown since 2004–05. Residential transport emissions (mostly private vehicles) make up 76.5% of the transport sector's total, while the remainder comes from commercial and industrial transport use.

Electrification Opportunities:

- **Private Vehicle Fleet Electrification:** Uptake of battery electric vehicles (EVs) is accelerating—rising from 0.1% of registered vehicles in 2021 to 0.7% in 2024—but remains limited in scale. Transitioning the residential and commercial vehicle fleet (including light commercial vehicles, the fastest-growing segment) from petrol and diesel to electricity, especially when powered by renewables, is the largest single emissions reduction opportunity in the transport sector.
- **Public and Active Transport Electrification:** Electrifying public transport, taxis, and other shared mobility services, backed by renewables, will further drive down sector emissions.
- **Charging Infrastructure and Renewable Integration:** Expanding public and private charging supported by renewable energy, including workplace and residential sites, will amplify these benefits.

5. Construction and Other Stationary Energy

Construction service industries have remained a major contributor to Other Fuel Combustion emissions, particularly through reliance on diesel and other fossil fuels. As the electricity sector continues to decarbonise, substituting diesel equipment with electric alternatives powered by renewables (such as electric construction machinery) offers a strong pathway for further reductions.

6. Cross-cutting and Emerging Areas

- **Refrigeration and Air-Conditioning:** Emissions from the use of refrigerants in both residential and commercial refrigeration and air-conditioning, although primarily released as fugitive emissions, are also influenced by electrification and energy efficiency. Transition to ultra-low GWP (global warming potential) refrigerants and electrification of cooling through renewables can further suppress emissions.
- **Waste Management:** Although not directly an electrification target, the treatment and management of waste streams increasingly relies on electricity. As facilities electrify and the grid decarbonises, indirect emissions from waste management operations can also decline.

Summary and Prioritisation

Across Merri-bek, the greatest opportunities for emissions reduction via electrification and renewable energy are found in:

- The residential sector (household electrification and solar PV uptake),
- Commercial buildings and small businesses,
- Industrial processes suitable for electric conversion,
- The transport sector (vehicle fleet electrification).

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Electrification of stationary energy use and transport, when combined with systematic decarbonisation of the electricity grid (already at 45.1% renewable in 2023–24), will have the largest influence on Merri-bek's emissions profile going forward. Prioritising the sectors and activities described above—aligned with continued renewable energy expansion—will maximise the LGA's progress towards net zero as the underlying trend of grid and direct decarbonisation accelerates.

Appendix 1: Carbon emissions by Industry and emissions sector

These appendices contain long term statistical tables on Merri-bek's carbon emissions from 2004-05 to 2023-24. Table A.1 contains the greenhouse gas inventory for Merri-bek by sector. The remaining tables show carbon emissions from select sectors from the greenhouse gas inventory by ANZSIC industry divisions. All modelling results are available by industry at the 86 ANZSIC subdivision level.

Table A.1 Merri-bek greenhouse gas inventory by emissions sector, 2004–05 to 2023–24 (kt CO2-e)																
	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Energy																
Purchased Electricity	402.8	497.7	540.5	747.9	725.3	712.2	729.1	718.4	772.2	719.1	627.1	627.6	440.5	269.7	681.3	223.7
Natural Gas	180.9	201.3	202.0	208.1	214.3	181.8	203.4	194.4	202.1	190.8	193.7	198.4	185.2	182.8	169.3	169.6
Other Fuel Combustion	82.7	86.2	90.6	83.7	78.3	78.3	68.3	64.4	63.4	64.5	65.7	58.8	61.6	64.0	73.6	62.1
Transport	265.6	240.6	281.0	286.4	295.5	307.6	326.9	336.0	346.4	314.9	297.3	302.9	319.3	307.0	339.7	327.3
Fugitive Emissions	0.1	6.4	7.4	8.7	5.7	3.2	1.4	0.4	0.1	0.2	0.3	0.3	0.3	0.6	1.3	2.3
	45.2	44.5	49.5	56.3	56.6	59.0	55.9	56.2	60.4	61.3	61.5	64.3	55.4	39.6	75.6	35.8
Non-energy sectors																
Industrial Processes and Product Use	45.2	44.5	49.5	56.3	56.6	59.0	55.9	56.2	60.4	61.3	61.5	64.3	55.4	39.6	75.6	35.8
Agriculture	8.6	7.8	7.9	8.4	8.7	9.4	8.9	7.6	4.3	2.1	2.8	5.6	9.0	9.0	8.3	8.5
Land Use, Land-Use Change and Forestry	7.7	6.7	-0.1	0.7	4.4	3.5	3.7	-3.5	-0.8	-1.5	-2.1	-5.2	-2.2	0.2	0.3	0.3
Waste	82.3	73.8	67.1	60.9	45.2	47.2	55.4	55.5	59.2	49.1	51.0	52.5	50.5	61.9	60.2	51.6
	1068.2	1158.2	1246.0	1460.4	1429.5	1398.6	1449.3	1433.0	1508.1	1402.0	1299.6	1310.3	1121.9	934.6	1409.2	880.8
Total																
Total (excluding Land Use)	1068.2	1158.2	1246.0	1460.4	1429.5	1398.6	1449.3	1433.0	1508.1	1402.0	1299.6	1310.3	1121.9	934.6	1409.2	880.8
Total (including Land-Use)	1075.9	1164.9	1245.9	1461.1	1433.9	1402.1	1453.0	1429.5	1507.3	1400.5	1297.5	1305.1	1119.7	934.8	1409.5	881.1

Table A.2 Total greenhouse gas emissions by ANZSIC division, 2004–05 to 2023–24 (kt CO2–e)

ANZSIC Division		2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A	Agriculture, Forestry and Fishing	9.1	8.3	8.5	9.0	9.3	10.2	9.5	8.2	4.6	2.2	2.9	5.8	9.5	9.4	8.8	8.9
B	Mining	0.6	0.6	0.3	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.2
C	Manufacturing	181.9	198.0	194.9	238.8	212.9	197.0	162.2	154.3	140.4	138.1	121.8	113.3	89.5	66.8	105.9	58.7
D	Electricity, Gas, Water and Waste Services	0.0	0.8	1.0	2.3	8.3	10.5	12.0	17.3	20.9	15.3	12.3	12.0	9.0	7.7	23.6	13.6
E	Construction	42.9	40.1	43.2	36.3	37.1	41.1	45.9	48.4	50.0	48.7	50.9	45.2	46.2	45.6	61.2	41.4
F	Wholesale Trade	33.4	28.0	30.9	40.2	40.3	41.0	36.5	30.2	30.7	27.4	23.0	21.6	14.5	8.7	15.6	6.2
G	Retail Trade	25.5	40.6	45.0	63.2	67.0	67.8	60.8	57.7	62.0	59.0	52.5	54.0	37.7	22.1	51.0	17.0
H	Accommodation and Food Services	18.0	21.3	27.4	38.8	41.6	39.8	41.8	42.4	51.4	53.7	49.5	45.6	31.6	23.4	54.2	20.5
I	Transport, Postal and Warehousing	75.1	71.7	76.7	89.2	91.2	92.3	81.5	72.1	70.3	68.8	74.7	71.9	65.0	78.9	103.3	86.2
J	Information Media and Telecommunications	1.9	3.5	4.4	6.6	6.7	7.2	8.4	7.9	9.0	8.8	8.0	7.9	6.0	4.5	9.0	3.6
K	Financial and Insurance Services	3.3	2.6	3.2	4.6	4.5	4.4	3.9	3.3	3.6	3.6	3.3	3.6	2.6	1.8	4.0	1.7
L	Rental, Hiring and Real Estate Services	10.9	11.1	12.1	15.7	14.9	15.3	13.4	11.3	12.3	11.4	9.7	10.3	7.7	6.1	16.1	6.1
M	Professional, Scientific and Technical Services	10.8	15.0	16.1	19.7	19.8	19.6	20.7	19.1	21.3	21.1	19.8	20.5	16.1	13.1	23.1	11.8
N	Administrative and Support Services	6.7	6.4	6.9	8.1	7.2	7.3	7.1	5.5	6.0	5.4	5.2	5.2	4.1	3.7	6.0	3.7
O	Public Administration and Safety	11.3	16.2	17.5	23.3	22.4	22.9	20.8	15.6	17.5	16.5	15.3	17.0	12.9	8.6	18.9	7.6
P	Education and Training	6.4	9.2	10.4	13.7	14.0	13.6	14.3	15.3	17.5	16.8	15.1	14.5	11.0	7.7	14.6	6.9
Q	Health Care and Social Assistance	7.6	21.2	20.8	22.2	19.6	19.6	23.3	26.3	30.1	27.4	25.3	26.1	21.7	16.7	29.7	16.4
R	Arts and Recreation Services	2.9	3.3	3.7	4.6	3.8	3.9	4.2	4.2	4.6	4.6	4.7	4.2	2.9	2.8	5.4	2.3
S	Other Services	4.9	5.2	6.0	7.3	6.7	6.4	6.5	6.6	6.6	6.1	5.9	5.6	3.6	3.3	7.0	3.5
	Total Industry	453.2	503.1	529.0	643.8	627.5	620.2	573.0	546.0	559.1	535.2	500.3	484.6	391.9	331.2	557.8	316.3
	Households	615.1	655.2	717.0	816.6	801.9	778.4	876.3	887.1	949.0	866.9	799.5	825.6	730.0	603.3	851.4	564.5
	Total LGA	1068.3	1158.2	1246.0	1460.4	1429.5	1398.6	1449.3	1433.0	1508.1	1402.0	1299.5	1310.3	1121.8	934.6	1409.2	880.8

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Table A.3 Purchased Electricity greenhouse gas emissions by ANZSIC division, 2004–05 to 2023–24 (kt CO2–e)

	ANZSIC Division	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A	Agriculture, Forestry and Fishing	0.1	0.1	0.2	0.2	0.2	0.3	0.2	0.2	0.1	0.0	0.0	0.1	0.2	0.1	0.2	0.1
B	Mining	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.0
C	Manufacturing	73.6	89.5	80.2	118.9	105.3	105.5	82.2	80.9	75.2	75.6	63.1	59.9	41.0	23.9	58.0	18.7
D	Electricity, Gas, Water and Waste Services	0.0	0.2	0.2	1.4	7.8	10.2	11.8	17.1	20.4	14.5	11.6	11.4	8.4	6.7	21.9	10.9
E	Construction	0.2	0.2	0.3	0.3	0.4	0.3	7.7	9.0	10.4	9.0	8.5	8.6	6.2	3.6	10.2	2.8
F	Wholesale Trade	23.6	21.0	23.7	32.6	33.1	34.1	29.9	24.4	24.8	22.2	18.2	17.1	10.7	5.6	12.0	3.7
G	Retail Trade	22.9	36.1	40.1	56.9	59.7	59.9	53.2	50.2	53.5	50.8	44.3	44.7	29.8	16.9	41.0	12.7
H	Accommodation and Food Services	12.1	14.3	18.5	28.1	29.8	30.0	30.7	30.6	37.3	38.8	34.2	31.0	19.2	12.6	35.0	10.5
I	Transport, Postal and Warehousing	5.9	6.9	7.6	10.5	11.3	12.0	11.3	12.0	12.7	11.4	9.7	9.7	6.8	4.8	13.5	4.3
J	Information Media and Telecommunications	1.3	2.5	3.3	5.4	5.7	6.1	7.2	6.6	7.6	7.4	6.7	6.7	4.7	3.0	7.2	2.1
K	Financial and Insurance Services	2.8	2.3	2.8	4.1	4.0	3.9	3.5	2.9	3.2	3.2	2.9	3.2	2.2	1.4	3.5	1.1
L	Rental, Hiring and Real Estate Services	8.8	9.5	10.6	14.1	13.6	14.1	12.3	10.2	11.1	10.3	8.6	9.3	6.7	4.9	14.3	4.8
M	Professional, Scientific and Technical Services	5.8	8.9	10.0	13.9	14.5	15.2	15.8	14.2	16.1	16.2	14.5	15.1	10.5	6.6	16.3	5.2
N	Administrative and Support Services	2.2	2.7	3.1	4.4	4.4	4.7	4.3	3.3	3.6	3.4	3.1	3.1	2.0	1.2	3.2	1.1
O	Public Administration and Safety	8.9	13.2	14.5	20.1	19.6	20.6	18.6	13.8	15.5	14.6	13.4	14.9	10.9	6.6	16.3	5.3
P	Education and Training	3.9	6.0	6.9	10.1	10.4	11.0	11.4	12.0	14.0	13.3	11.6	11.3	7.8	4.4	11.0	3.6
Q	Health Care and Social Assistance	3.3	9.9	10.1	12.6	11.4	12.4	14.3	15.8	18.3	16.8	14.6	14.9	10.6	6.1	15.9	5.4
R	Arts and Recreation Services	1.8	2.2	2.6	3.5	3.1	3.3	3.4	3.4	3.7	3.7	3.6	3.2	1.9	1.4	4.0	1.1
S	Other Services	3.1	3.5	4.1	5.5	5.0	5.2	5.3	5.3	5.4	4.9	4.7	4.5	2.7	2.0	5.4	1.9
	Total Industry	180.3	229.1	238.9	342.7	339.4	348.8	323.1	311.9	333.0	316.2	273.4	268.8	182.4	111.9	289.1	95.3
	Households	222.6	268.5	301.9	405.1	385.9	363.3	406.1	406.6	439.3	402.8	353.8	359.0	258.0	157.8	392.1	128.4
	Total LGA	402.8	497.7	540.5	747.9	725.3	712.2	729.1	718.4	772.2	719.1	627.1	627.6	440.5	269.7	681.3	223.7

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ANZSIC Division		2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A	Agriculture, Forestry and Fishing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B	Mining	0.4	0.4	0.2	0.0	0.1	0.3	0.1	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
C	Manufacturing	44.3	39.8	41.3	45.6	46.4	39.1	40.5	40.7	35.4	31.5	27.7	24.3	21.2	19.0	17.5	17.6
D	Electricity, Gas, Water and Waste Services	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0
E	Construction	1.6	1.8	1.9	1.7	1.9	2.0	1.9	2.1	2.1	1.8	1.9	1.6	1.6	1.7	1.9	1.8
F	Wholesale Trade	3.2	2.3	2.5	2.4	2.5	1.5	1.4	1.2	1.1	1.0	1.0	0.8	0.8	0.7	0.6	0.6
G	Retail Trade	0.8	1.1	1.1	1.1	1.2	0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5
H	Accommodation and Food Services	4.6	4.8	5.9	6.4	6.9	4.0	4.4	4.8	5.1	5.6	5.6	4.7	4.6	5.2	5.7	5.3
I	Transport, Postal and Warehousing	1.4	1.6	1.7	1.5	1.7	0.9	0.9	1.0	0.9	0.8	0.9	0.8	0.7	0.7	0.9	0.9
J	Information Media and Telecommunications	0.2	0.2	0.3	0.3	0.4	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5
K	Financial and Insurance Services	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L	Rental, Hiring and Real Estate Services	0.7	0.6	0.6	0.6	0.6	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.4	0.4	0.4
M	Professional, Scientific and Technical Services	2.0	2.5	2.7	2.6	2.8	1.7	1.9	1.9	1.8	1.9	1.9	1.8	2.0	2.2	2.2	2.2
N	Administrative and Support Services	0.5	1.0	1.1	1.1	1.1	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5
O	Public Administration and Safety	1.1	1.3	1.4	1.4	1.4	0.8	0.8	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8
P	Education and Training	1.9	2.4	2.6	2.6	2.8	1.7	1.8	2.1	2.1	2.1	2.1	1.9	2.0	2.0	2.0	2.0
Q	Health Care and Social Assistance	1.6	5.6	5.3	4.6	4.2	2.6	3.0	3.7	3.9	3.7	3.7	3.6	3.9	4.1	4.2	4.4
R	Arts and Recreation Services	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
S	Other Services	1.2	1.2	1.4	1.3	1.2	0.7	0.8	0.8	0.7	0.7	0.8	0.7	0.6	0.9	0.9	1.0
	Total Industry	65.7	66.7	70.1	73.4	75.3	57.3	59.4	61.1	56.0	51.9	48.5	42.7	40.0	39.4	38.8	38.6
	Households	115.2	134.4	131.8	134.4	139.0	124.4	143.9	133.3	146.1	138.7	145.3	155.9	145.3	143.2	130.3	131.0
	Total LGA	180.9	201.3	202.0	208.1	214.3	181.8	203.4	194.4	202.1	190.8	193.7	198.4	185.2	182.8	169.3	169.6

Table A.4 Natural Gas greenhouse gas emissions by ANZSIC division, 2004–05 to 2023–24 (kt CO2–e)

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Table A.5 Other Fuel Combustionl greenhouse gas emissions by ANZSIC division, 2004–05 to 2023–24 (kt CO2–e)

ANZSIC Division		2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A	Agriculture, Forestry and Fishing	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.2	0.0	0.0	0.1	0.3	0.3	0.3	0.3
B	Mining	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2
C	Manufacturing	20.8	30.3	33.0	31.9	25.9	21.9	15.3	10.3	9.0	9.5	9.5	9.0	9.4	9.5	9.2	8.0
D	Electricity, Gas, Water and Waste Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.2
E	Construction	39.0	35.6	38.4	32.3	33.0	36.9	34.0	34.6	34.6	35.5	37.8	32.6	35.7	37.3	45.7	33.8
F	Wholesale Trade	1.1	0.8	0.8	0.9	0.8	0.9	0.7	0.6	0.6	0.6	0.4	0.2	0.2	0.2	0.2	0.3
G	Retail Trade	0.4	0.5	0.5	0.6	0.5	0.5	0.4	0.4	0.4	0.5	0.3	0.2	0.2	0.2	0.3	0.4
H	Accommodation and Food Services	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2
I	Transport, Postal and Warehousing	0.9	0.5	0.5	0.6	0.5	0.6	0.5	0.5	0.6	0.6	0.4	0.3	0.3	0.3	0.5	0.9
J	Information Media and Telecommunications	0.1	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.2	0.2	0.3
K	Financial and Insurance Services	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2
L	Rental, Hiring and Real Estate Services	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
M	Professional, Scientific and Technical Services	0.3	0.3	0.3	0.4	0.3	0.4	0.3	0.3	0.4	0.4	0.3	0.2	0.2	0.2	0.3	0.5
N	Administrative and Support Services	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1
O	Public Administration and Safety	0.2	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.2	0.4
P	Education and Training	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1
Q	Health Care and Social Assistance	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.2	0.3
R	Arts and Recreation Services	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1
S	Other Services	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2
	Total Industry	64.2	70.0	75.6	69.0	62.9	63.4	53.1	48.7	47.6	49.2	50.2	43.5	47.2	49.1	58.1	46.6
	Households	18.8	16.2	15.3	14.8	15.0	14.9	15.2	15.6	15.8	15.3	15.6	15.2	14.2	14.7	15.4	15.5
	Total LGA	82.7	86.2	90.6	83.7	78.3	78.3	68.3	64.4	63.4	64.5	65.7	58.8	61.6	64.0	73.6	62.1

Table A.6 Transport greenhouse gas emissions by ANZSIC division, 2004–05 to 2023–24 (kt CO2–e)

	ANZSIC Division	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A	Agriculture, Forestry and Fishing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B	Mining	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C	Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	Electricity, Gas, Water and Waste Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	Wholesale Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G	Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H	Accommodation and Food Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I	Transport, Postal and Warehousing	63.9	59.1	63.6	73.2	74.6	75.4	65.6	55.4	53.1	53.3	60.7	58.1	54.2	69.7	84.4	76.8
J	Information Media and Telecommunications	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
K	Financial and Insurance Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L	Rental, Hiring and Real Estate Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M	Professional, Scientific and Technical Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N	Administrative and Support Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O	Public Administration and Safety	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P	Education and Training	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	Health Care and Social Assistance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
R	Arts and Recreation Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S	Other Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Industry	63.9	59.1	63.6	73.2	74.6	75.4	65.6	55.4	53.1	53.3	60.7	58.1	54.2	69.7	84.4	76.8
	Households	201.7	181.5	217.4	213.2	220.9	232.2	261.4	280.5	293.4	261.6	236.6	244.7	265.0	237.3	255.4	250.5
	Total LGA	265.6	240.6	281.0	286.4	295.5	307.6	326.9	336.0	346.4	314.9	297.3	302.9	319.3	307.0	339.7	327.3

Table A.7 Fugitive Emissions greenhouse gas emissions by ANZSIC division, 2004–05 to 2023–24 (kt CO2–e)

	ANZSIC Division	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A	Agriculture, Forestry and Fishing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B	Mining	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C	Manufacturing	0.0	5.8	6.6	7.9	5.2	2.9	1.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	Electricity, Gas, Water and Waste Services	0.0	0.6	0.7	0.7	0.4	0.3	0.2	0.1	0.0	0.1	0.2	0.3	0.3	0.6	1.3	2.3
E	Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	Wholesale Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G	Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H	Accommodation and Food Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I	Transport, Postal and Warehousing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
J	Information Media and Telecommunications	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
K	Financial and Insurance Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L	Rental, Hiring and Real Estate Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M	Professional, Scientific and Technical Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N	Administrative and Support Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O	Public Administration and Safety	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P	Education and Training	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	Health Care and Social Assistance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
R	Arts and Recreation Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S	Other Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Industry	0.1	6.5	7.3	8.6	5.6	3.2	1.4	0.4	0.0	0.1	0.2	0.3	0.3	0.6	1.3	2.3
	Households	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total LGA	0.1	6.4	7.4	8.7	5.7	3.2	1.4	0.4	0.1	0.2	0.3	0.3	0.3	0.6	1.3	2.3

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Table A.8 industrial Processes and Product Use greenhouse gas emissions by ANZSIC division, 2004–05 to 2023–24 (kt CO2–e)

	ANZSIC Division	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A	Agriculture, Forestry and Fishing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B	Mining	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C	Manufacturing	36.9	28.6	30.1	30.9	28.0	25.5	20.4	19.6	18.1	19.5	19.2	18.0	16.1	12.1	19.0	12.3
D	Electricity, Gas, Water and Waste Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Construction	0.3	0.5	0.6	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.7	0.6	0.6	0.6	0.7	0.6
F	Wholesale Trade	0.7	1.0	1.3	1.8	2.2	2.8	2.8	2.4	2.6	2.4	2.2	2.4	1.7	1.0	1.8	0.6
G	Retail Trade	0.8	2.3	2.9	4.1	5.2	6.3	6.2	6.1	7.0	6.8	6.9	8.2	6.8	4.0	8.8	2.9
H	Accommodation and Food Services	0.7	1.6	2.5	3.7	4.5	5.4	6.2	6.4	8.4	8.8	9.1	9.5	7.3	5.0	12.9	4.1
I	Transport, Postal and Warehousing	1.2	2.0	2.1	2.3	2.4	2.5	2.4	2.2	2.1	2.0	2.2	2.3	2.3	2.4	2.8	2.3
J	Information Media and Telecommunications	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.1
K	Financial and Insurance Services	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1
L	Rental, Hiring and Real Estate Services	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.7	0.3
M	Professional, Scientific and Technical Services	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.5	0.4	0.8	0.4
N	Administrative and Support Services	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.1
O	Public Administration and Safety	0.1	0.2	0.3	0.4	0.4	0.5	0.4	0.4	0.4	0.5	0.5	0.6	0.5	0.4	0.8	0.3
P	Education and Training	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.4	0.3	0.5	0.2
Q	Health Care and Social Assistance	0.7	1.6	1.8	2.1	2.2	2.6	3.3	3.6	4.4	4.1	4.2	4.7	4.1	2.7	5.7	2.4
R	Arts and Recreation Services	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
S	Other Services	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.3	0.1
	Total Industry	41.7	38.6	42.7	46.9	46.6	47.5	43.8	42.8	45.4	46.5	47.1	48.9	41.2	29.8	55.7	26.9
	Households	3.4	5.9	7.1	9.4	10.1	11.5	12.2	13.5	14.9	14.7	14.3	15.7	14.1	10.1	19.9	8.9
	Total LGA	45.2	44.5	49.5	56.3	56.6	59.0	55.9	56.2	60.4	61.3	61.5	64.3	55.4	39.6	75.6	35.8

Table A.9 Agriculture greenhouse gas emissions by ANZSIC division, 2004–05 to 2023–24 (kt CO2–e)

	ANZSIC Division	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A	Agriculture, Forestry and Fishing	8.6	7.8	7.9	8.4	8.7	9.4	8.9	7.6	4.3	2.1	2.8	5.6	9.0	9.0	8.3	8.5
B	Mining	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C	Manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	Electricity, Gas, Water and Waste Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	Wholesale Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G	Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H	Accommodation and Food Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I	Transport, Postal and Warehousing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
J	Information Media and Telecommunications	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
K	Financial and Insurance Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L	Rental, Hiring and Real Estate Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M	Professional, Scientific and Technical Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N	Administrative and Support Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O	Public Administration and Safety	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P	Education and Training	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	Health Care and Social Assistance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
R	Arts and Recreation Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S	Other Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Industry	8.6	7.8	7.9	8.4	8.7	9.4	8.9	7.6	4.3	2.1	2.8	5.6	9.0	9.0	8.3	8.5
	Households	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total LGA	8.6	7.8	7.9	8.4	8.7	9.4	8.9	7.6	4.3	2.1	2.8	5.6	9.0	9.0	8.3	8.5

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Table A.10 Waste greenhouse gas emissions by ANZSIC division, 2004–05 to 2023–24 (kt CO2–e)

	ANZSIC Division	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A	Agriculture, Forestry and Fishing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B	Mining	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C	Manufacturing	6.3	4.1	3.8	3.4	2.1	2.2	2.5	2.5	2.7	2.1	2.2	2.1	1.9	2.4	2.2	2.2
D	Electricity, Gas, Water and Waste Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
E	Construction	1.8	2.0	2.0	1.7	1.3	1.5	1.8	2.1	2.3	1.9	2.1	1.9	2.1	2.4	2.6	2.4
F	Wholesale Trade	4.8	2.9	2.7	2.4	1.6	1.7	1.8	1.5	1.5	1.1	1.1	1.1	1.0	1.2	1.0	0.9
G	Retail Trade	0.6	0.6	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.4
H	Accommodation and Food Services	0.5	0.4	0.4	0.4	0.3	0.3	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.5	0.6	0.5
I	Transport, Postal and Warehousing	1.8	1.5	1.3	1.1	0.8	0.8	0.9	0.9	1.0	0.7	0.8	0.8	0.7	0.9	1.1	1.1
J	Information Media and Telecommunications	0.4	0.6	0.6	0.6	0.4	0.4	0.6	0.6	0.7	0.5	0.6	0.6	0.5	0.7	0.7	0.7
K	Financial and Insurance Services	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
L	Rental, Hiring and Real Estate Services	1.4	0.7	0.7	0.7	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.6	0.6	0.6
M	Professional, Scientific and Technical Services	2.7	3.1	2.8	2.6	1.8	1.9	2.3	2.3	2.5	2.1	2.5	2.8	2.9	3.8	3.6	3.6
N	Administrative and Support Services	3.9	2.6	2.5	2.3	1.6	1.7	1.9	1.5	1.6	1.2	1.4	1.5	1.4	1.9	1.9	2.0
O	Public Administration and Safety	1.0	1.1	1.0	1.0	0.6	0.7	0.7	0.6	0.7	0.5	0.6	0.7	0.6	0.8	0.8	0.8
P	Education and Training	0.5	0.7	0.6	0.6	0.4	0.5	0.7	0.8	0.9	0.8	0.8	0.8	0.7	0.9	0.9	0.9
Q	Health Care and Social Assistance	2.0	3.9	3.3	2.7	1.6	1.8	2.5	2.9	3.3	2.4	2.7	2.8	3.0	3.7	3.7	3.9
R	Arts and Recreation Services	0.9	0.8	0.8	0.7	0.4	0.4	0.5	0.6	0.6	0.6	0.8	0.7	0.7	1.1	1.0	0.8
S	Other Services	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.3	0.3
	Total Industry	29.3	25.4	23.5	21.1	14.0	15.1	17.8	18.0	19.6	15.3	17.1	17.4	17.1	21.9	21.8	21.5
	Households	53.4	48.6	43.5	39.7	31.1	32.1	37.6	37.6	39.5	33.8	33.9	35.1	33.4	40.1	38.4	30.1
	Total LGA	82.3	73.8	67.1	60.9	45.2	47.2	55.4	55.5	59.2	49.1	51.0	52.5	50.5	61.9	60.2	51.6