





Carbon Down



The Carbon Footprint of Victoria's Small and Medium Enterprises

A Carbon Down Research Report
April 2011





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Executive Summary

This paper provides information on the carbon footprint of Victoria's small and medium enterprises (SMEs) as a reference for program managers and policy developers in government and industry.

Calculations for SME carbon emission figures in this paper include scope 1 (direct on-premises and vehicles), scope 2 (indirect, such as electricity) and a limited selection of scope 3 (other indirect emissions, such as emissions associated with the extraction, production, transport, and transmissions of energy consumed). Emission totals are expressed as tonnes of carbon dioxide equivalent (tCO₂-e).

Total Emissions from SMEs

Overall, Victorian SMEs are significant carbon emitters, accounting for 30% of Victoria's 2009 total emissions (or 39% of the state's total business emissions), which is more than Victoria's residential sector.

Emissions by size of business

The average emission of a Victorian SME (0-199 employees) is 107.3 tonnes per annum. However emissions per enterprise vary considerably depending on business size.

- Small businesses (0-19 employees) on average emit 68.9 tonnes per annum.
- Medium enterprises (20-199 employees) on average emit 894.9 tonnes per annum.

SME Emissions Per Employee

Although medium size enterprises emit more per enterprise than small businesses, their emissions per employee are 29% lower.

- Small businesses emit on average 23.0 tonnes per employee.
- Medium size enterprises emit on average 16.3 tonnes per employee.

The manufacturing sector has the highest emissions per employee. The wholesale trade sector has the lowest.

Sources of SME Emissions

On average, electricity was the most significant source of emissions (64%), followed by diesel (19%), natural gas (9%), petrol (7%), and liquid petroleum gas (LPG) (2%). However these proportions change significantly when considered by industry sector. For example, diesel use is high in construction and the transport, postal and warehousing sectors, but not in other sectors.



Emissions by Industry

The manufacturing sector is the highest emitting sector per business, responsible for 2189.7 tonnes per annum. It emits greater than 10 times more than other industry sectors. When compared with efficiency indicators including labour and economic output the difference between the manufacturing sector and other industry sectors presented are not as large. The manufacturing sector results are:

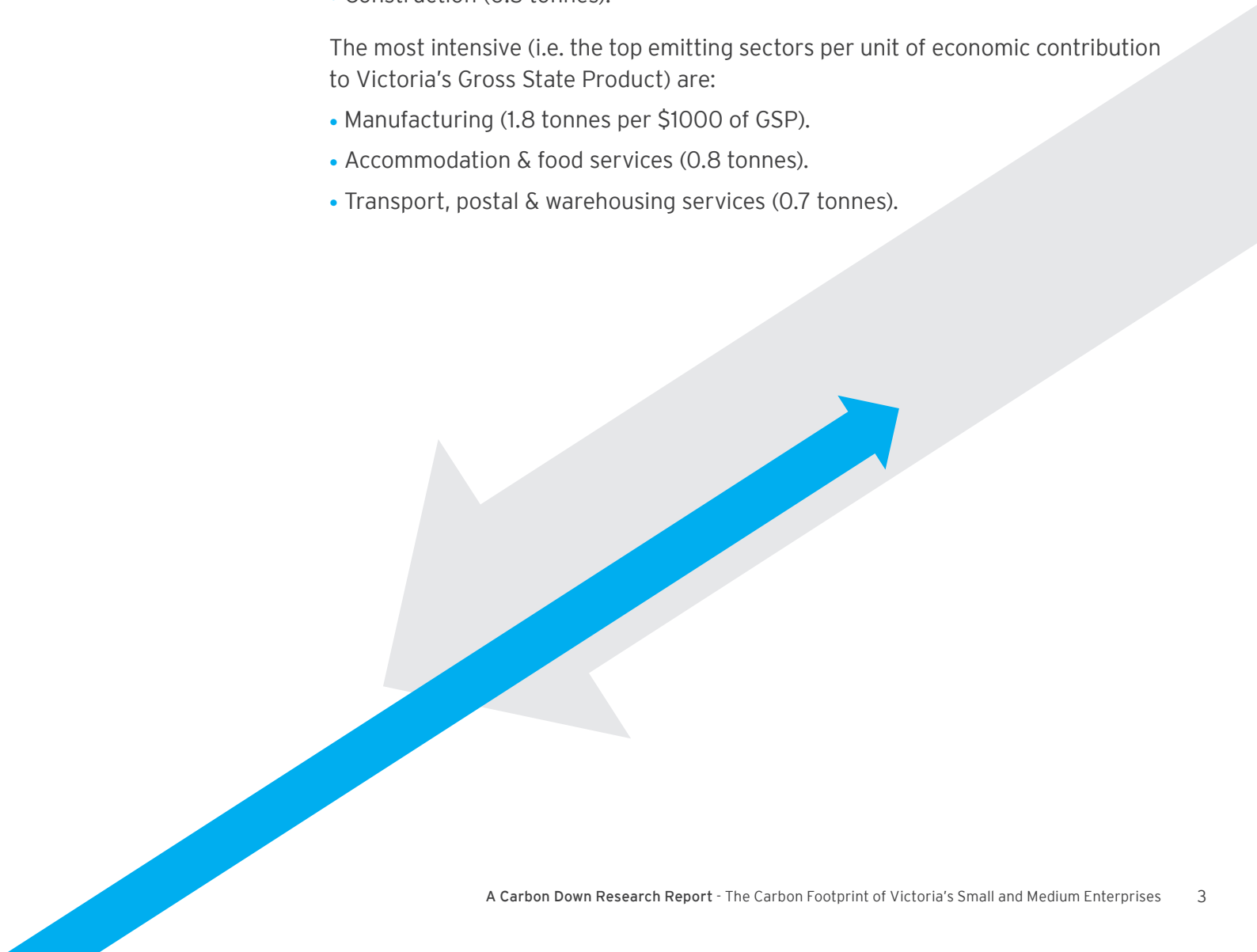
- 3.2 times greater average emissions per employee
- 2.6 times greater emissions per unit of economic activity.

Emissions Per Unit of Economic Contribution

The least intensive sectors (i.e. lowest emissions per unit of economic contribution to Victoria's Gross State Product) are:

- Other commercial services (which emits 0.1 tonnes per \$1000 of GSP).
- Wholesale trade (0.2 tonnes).
- Construction (0.3 tonnes).

The most intensive (i.e. the top emitting sectors per unit of economic contribution to Victoria's Gross State Product) are:

- Manufacturing (1.8 tonnes per \$1000 of GSP).
 - Accommodation & food services (0.8 tonnes).
 - Transport, postal & warehousing services (0.7 tonnes).
- 



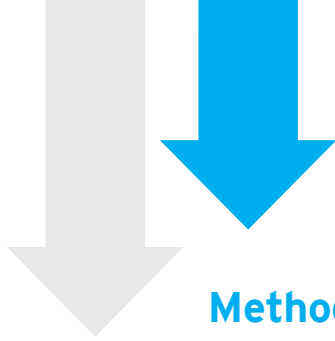
Introduction

This paper has been prepared by Carbon Down, a climate change partnership between the Victorian Employers' Chamber of Commerce and Industry and the Victorian Government.

In 2008-09 the Australian Bureau of Statistics (ABS) conducted the Energy, Water, and Environmental Management (EWEM) survey, which collected information on energy and water use, as well as the environmental management practices of Australian businesses.

By drawing on the information gathered in that survey and carrying out further analysis, this paper aims to provide policy makers and carbon reduction programs details of:

- Aggregate carbon emissions of small and medium size enterprises in Victoria.
- Average carbon footprint of Victorian SMEs by business size.
- Average carbon footprint of Victorian SMEs by industry sector.
- Carbon efficiency, assessed through economic and labour force indicators.



Methodology

Average carbon footprints have been calculated based on EWEM survey energy consumption data. Businesses participating in the survey did not respond to all of the emissions sources included in the survey. For example, slightly less than half (47%) of respondents were billed directly for their electricity, and 8% of respondents were billed directly for gas (with the remainder comprising enterprises that paid for their energy indirectly, such as home operated businesses and micro businesses). The response rate for each emissions source has been used to weight the average carbon footprint results presented. This allows the average figures determined to be extrapolated to the wider business population, not just those billed directly.

Definitions and References

- Businesses with 0-19 employees are referred to as small businesses, while those with 20-199 employees are referred to as medium size enterprises.
- To provide a simplified category structure, Australian and New Zealand Standard Industrial Classification (ANZSIC) industry divisions J through S have been classified as 'other commercial services'. This approach is broadly consistent with the Australian Greenhouse Emissions Inventory System where these divisions are grouped as commercial services.
- The footprint calculations have drawn on *National Greenhouse Accounts Factors and Methods* (July 2010).
- Extrapolated results are based on the *ABS Counts of Australian Businesses, including Entries and Exits, June 2007 to June 2009* (8165.0).
- Analyses of emissions and the economic performance of industry are based on the *ABS Australian National Accounts State Accounts* (5220.0).
- Greenhouse gas scopes are drawn from *The Greenhouse Gas Protocol (GHG Protocol)*.
- Average carbon footprints exclude emissions from coal, coke and coal by-products as use of these fuels were not highly reported.
- Where energy consumption levels were not published (diesel, petrol and LPG), energy expenditure data and average energy prices have been used to estimate consumption.



Scopes

The concept of scopes for reporting on greenhouse gas emissions (as outlined in *The GHG Protocol*) has been developed to assign responsibility for greenhouse gas emissions.

- **Scope 1** refers to direct carbon emissions produced on a business's premises (including vehicles) from production and business activities.
- **Scope 2** refers to indirect carbon emissions, such as electricity consumed by the business.
- **Scope 3** refers to other indirect carbon emissions that occur as a result of a business's activities at places not directly controlled or owned by the business, such as waste, flights, and office consumables.

The concept of scopes allows two entities to claim responsibility for emissions, however, only one takes primary responsibility and reports those emissions as scope 1. In this paper 'carbon footprints' are the sum of the average scope 1, 2 and 3 emissions for each enterprise, including scope 3 emissions associated with energy sources included in the EWEM survey. For more information on scopes, please refer to *The GHG Protocol*¹.

Limitations

The data and analysis presented in this paper have several limitations. EWEM survey data is national, as Victorian business data was not published due to standard error rates. Carbon results are calculated on this data using Victorian emissions factors where applicable to emissions sources. Actual Victorian business energy consumption may differ from the national survey results.

The EWEM survey published expenditure data for LPG, diesel and petrol. Fuel consumption has been estimated based on this data and national average fuel pump prices². Actual Victorian business energy consumption may differ from the national survey results.

Data should be used with some caution due to standard error rates of 10% to less than 25% included in a small amount of data included in the analysis. The EWEM survey also excludes some industry subdivisions that affect the analysis. This was not deemed to have a significant impact on results.

Industry analysis by business size could not be presented due to standard error rates occurring in the majority of this data.

¹ The Greenhouse Gas Protocol (<http://www.ghgprotocol.org/>)

² Average LPG price determined based on *Monitoring of the Australian petroleum industry – Report of the ACCC into the prices, costs and profits of unleaded petrol in Australia 2009* (p.140) <http://www.accc.gov.au/content/index.phtml/itemId/906872>. Petrol and diesel prices based on Australian Institute of Petroleum retail pump price data <http://www.aip.com.au/pricing/retail.htm>

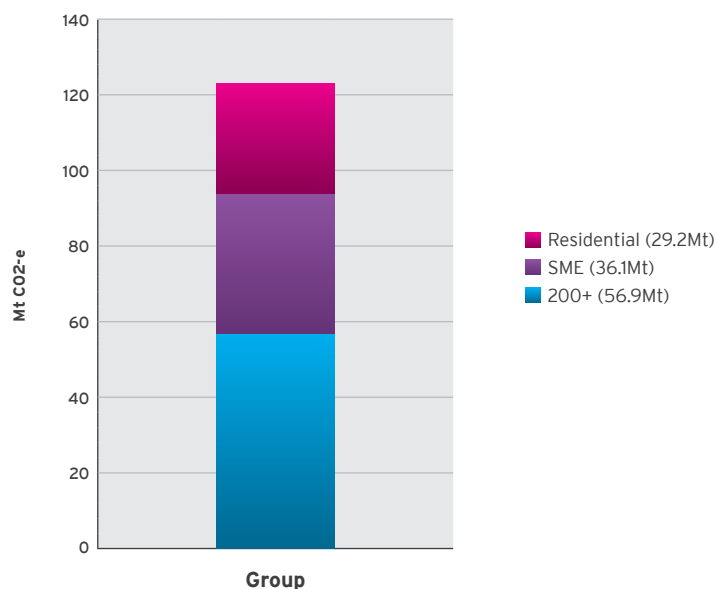
Total Emissions from SMEs

"Victorian SMEs emit approximately 36.1 million tonnes of CO₂-e per annum, which is 30% of Victoria's total emissions."

Based on the EWEM survey data, and the ABS *Counts of Australian Businesses*³, carbon footprint results can be extrapolated to estimate the SME proportion of Victoria's total CO₂-e emissions.

Victorian SMEs emit approximately 36.1 million tonnes of CO₂-e per annum, or 30% of Victoria's total emissions from Australia's 2009 National Greenhouse Accounts⁴. This figure accounts for 39% of Victoria's total business emissions and is more than emissions from the residential sector.

Figure 1
Victorian 2009 GHG Inventory Breakdown by Sector



³ Australian Bureau of Statistics, 8165.0 - Counts of Australian Businesses, including Entries and Exits, Jun 2007 to Jun 2009, <http://www.abs.gov.au/ausstats/abs@.nsf/mf/8165.0> NB. Count of Victorian Business Excludes 36% businesses from the 0-19 group to account for micro non employing businesses excluded from the EWES sample

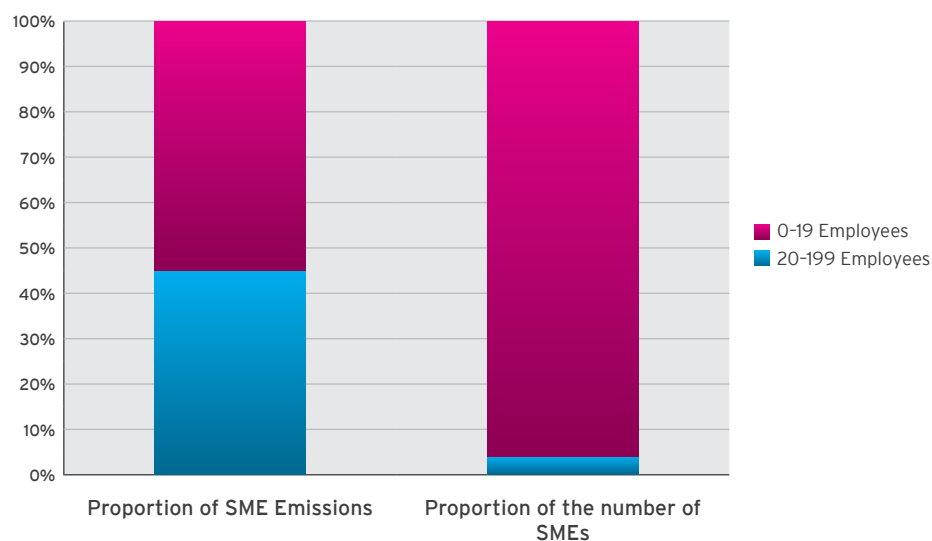
⁴ The Australian Greenhouse Emissions Information System, <http://ageis.climatechange.gov.au/>



"Medium size enterprises account for 4% of SMEs, yet emit nearly half of the total SME emissions."

Figure 2 shows that medium size enterprises in Victoria emit nearly half of the total SME emissions.

Figure 2
Breakdown of Emissions between small business and medium size enterprises alongside the breakdown of number of small businesses to medium enterprises in Victoria



"On average medium size enterprises emit 13 times more emissions than small businesses per business."

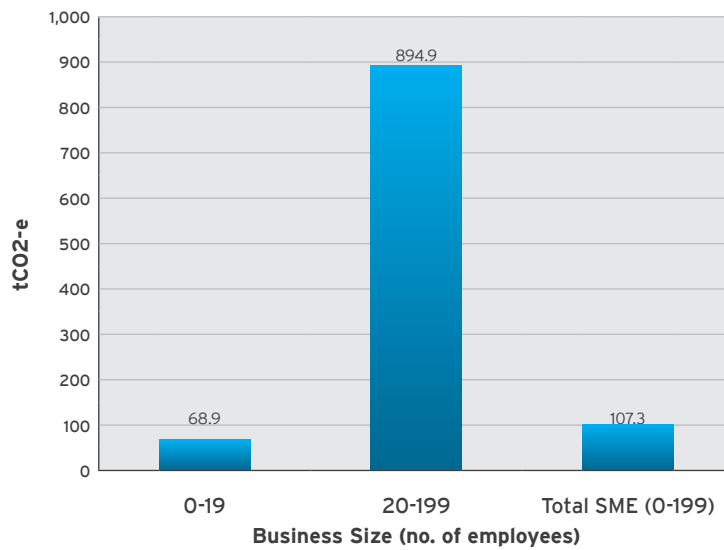
Emissions by Size of Business

While the average emission of an SME (0-199 employees) is 107.3 tonnes per annum, emissions per enterprise vary considerably depending on business size:

- Small businesses (0-19 employees) on average emit 68.9 tonnes per annum
- Medium enterprises (20-199 employees) on average emit 894.9 tonnes per annum.

Figure 3

Average Emissions by Business Size



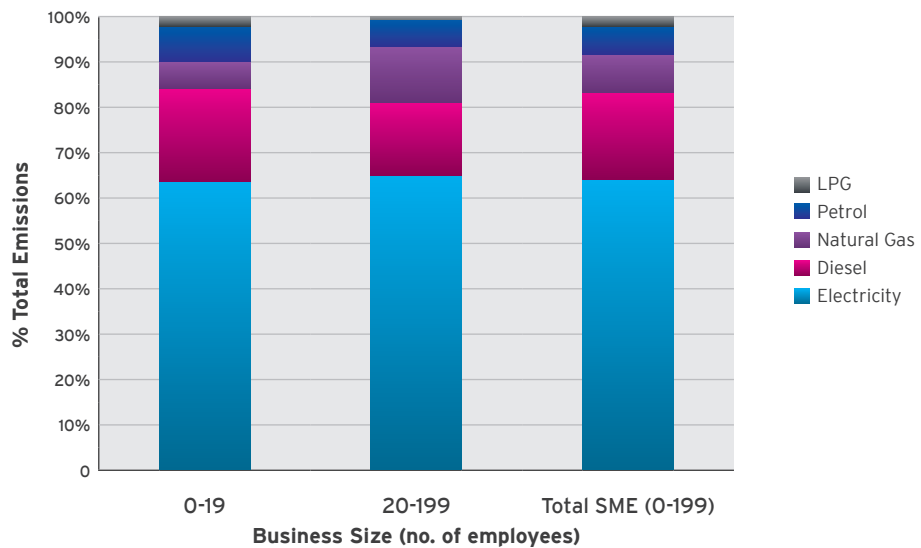
Emissions Profile by Business Size

"Most SME emissions come from electricity use."

Figure 4 shows the average emissions source profile according to business size. On average, the majority of emissions come from electricity use, accounting for 64% of emissions, followed by diesel (19%), natural gas (9%), petrol (7%) and LPG (2%). However, these proportions change significantly when considered by industry sector, as shown in the next section.

Figure 4

Emissions source breakdown by business size



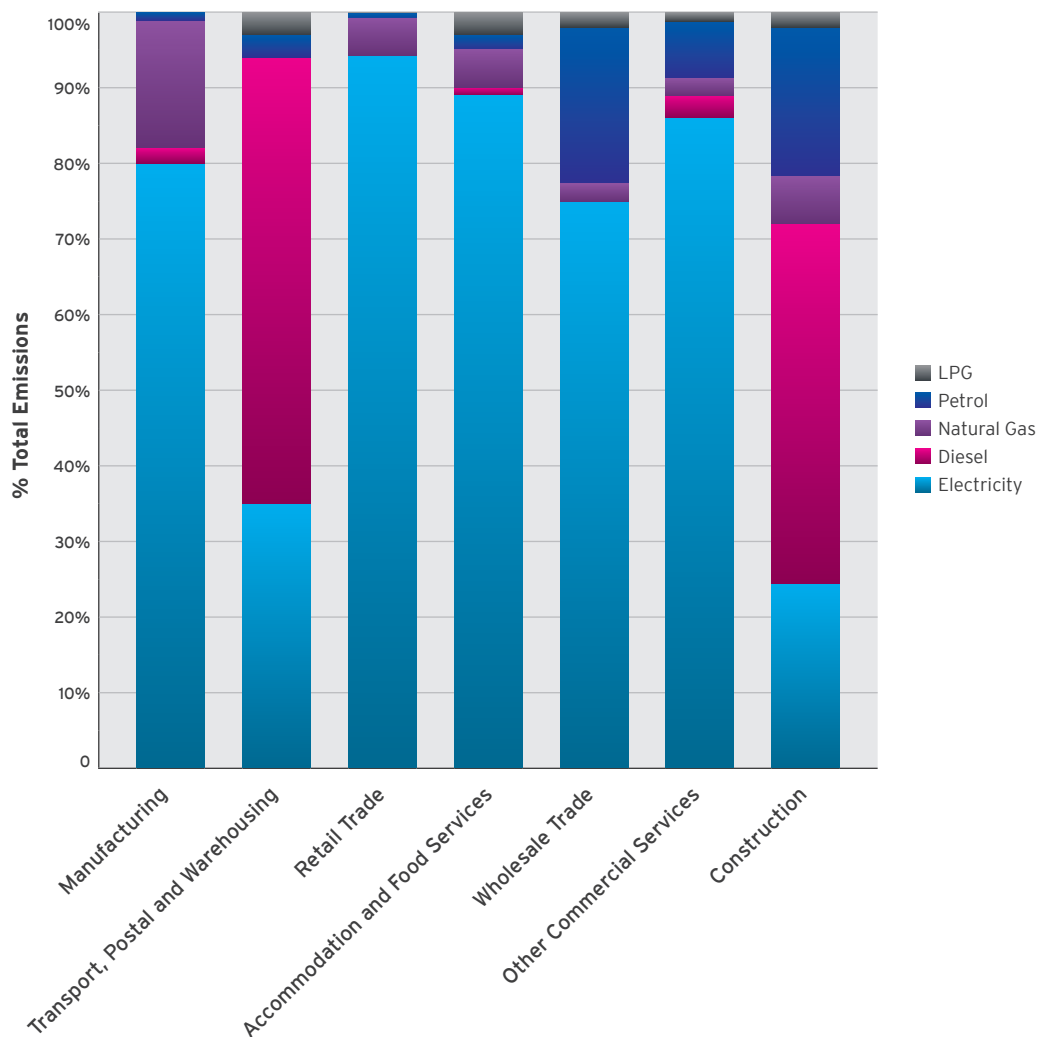
Emissions Profile by Industry

"However, in certain industries, the highest emissions come from vehicle fuels."

Emissions profiles vary depending on industry group. As shown in Figure 5, electricity is a primary emissions source for most industry sectors, accounting for 69% of emissions across all industry sectors analysed. However, its contribution ranges from 94% of emissions in the retail trade sector down to 24% of emissions in the construction sector.

Vehicle fuels account for the majority of emissions for the construction and the transport, postal & warehousing sectors. Diesel accounts for 48% of construction sector emissions, followed by petrol which accounts for 20%. Diesel accounts for 59% of the transport, postal, & warehousing sector emissions. LPG does not feature highly in the emissions profile of any industry group, with its highest contribution being 4% of the transport, postal & warehousing sector emissions.

Figure 5
Emissions source breakdown by industry

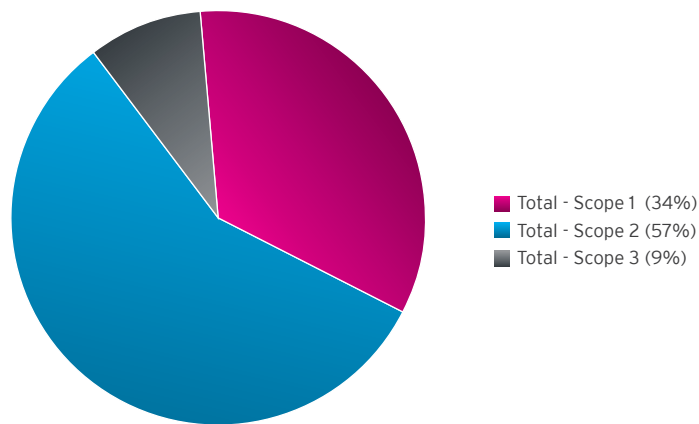


Emissions by Scope

"Scope 2 emissions (electricity) account for 57% of the average carbon footprint."

When emission profiles are shown by scope in Figure 6, 34% of the average SME carbon footprint is attributed to scope 1 emissions. Electricity, as scope 2, accounts for the 57% of an average carbon footprint and the remaining 9% of emissions are scope 3 emissions. (Scope 3 emissions included in Figure 6 are only from the emissions sources included in the EWEM survey, not an extensive list of scope 3 emissions as reported by some organisations.)

Figure 6
Average SME emissions profile by scope





Emissions by Scope and Business Size

Scope 1 and 2 emissions vary greatly according to business size, as shown in Figure 7.

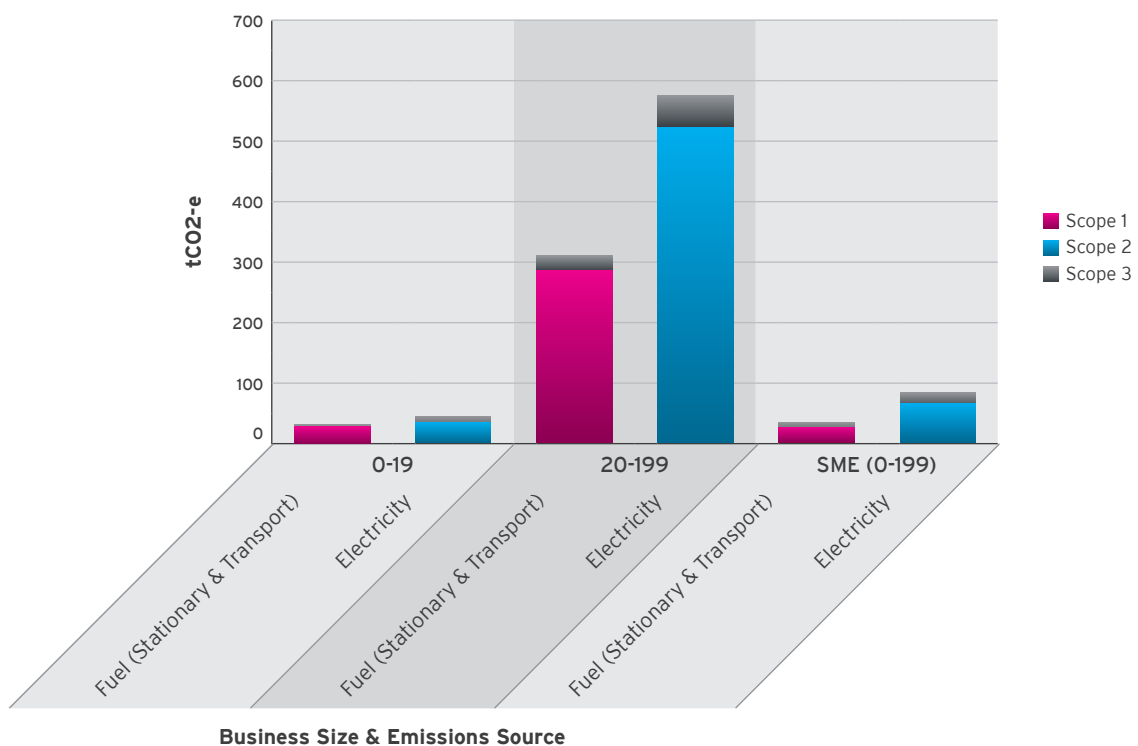
- Total average emissions are 68.9 tonnes per small businesses and 894.9 tonnes per medium enterprises.
- Scope 1 emissions are 23.8 tonnes for the small business group and 290.0 tonnes for the medium enterprise group.
- Scope 2 emissions are 38.9 tonnes per annum for the small business group and 522.3 tonnes per annum for the medium size enterprise group.

Total SME averages below are a weighted average based on these two business size segments. These results are influenced by the high proportion of small businesses, which account for more than 95% of enterprises in Australia. Based on this, the average total SME carbon footprint is 107.3 tonnes per annum. Of this total:

- Scope 1 emissions, which include natural gas and transport fuels, account for 36.2 tonnes.
- Scope 2 emissions, which include electricity, account for 61.3 tonnes per annum.
- Scope 3 emissions from sources included in the EWEM survey account for 9.7 tonnes, or 9%, of average SME total emissions.

Figure 7

Average SME emissions profile by scope (weighted)





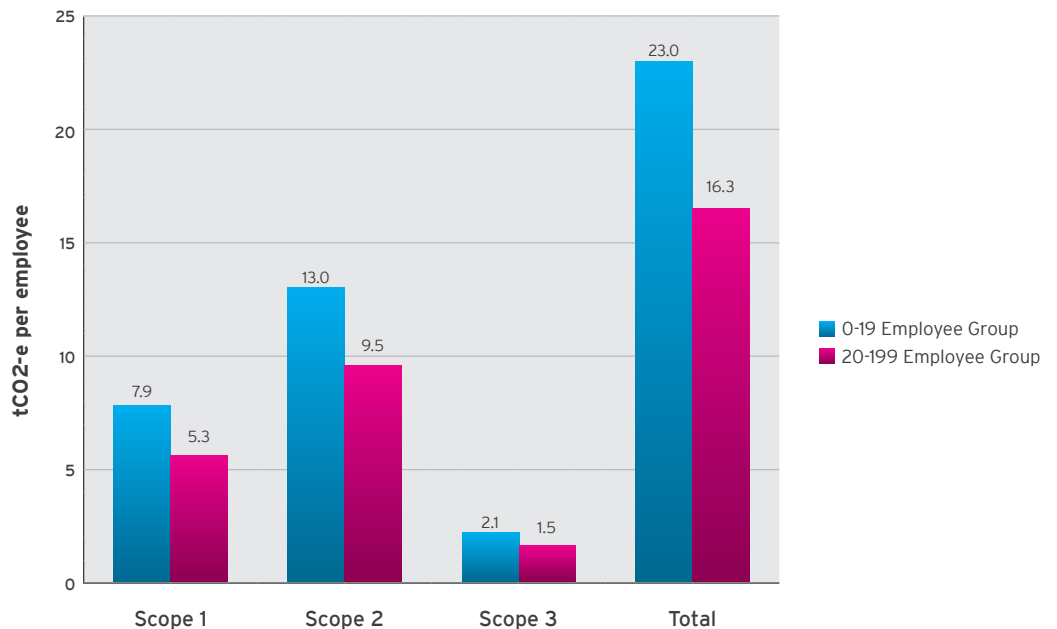
"Small businesses emit more per employee than medium businesses."

Emissions per Employee

In contrast to the average figures presented above in Figure 7, the average carbon emissions by average employee figures presented in Figure 8 are lower for the medium size enterprise group.

The medium size enterprise group emits on average 16.3 tonnes per employee, while the small business group emits on average 23.0 tonnes per employee.

Figure 8
Average carbon emissions (tCO₂-e) per employee by business size and scope (weighted)



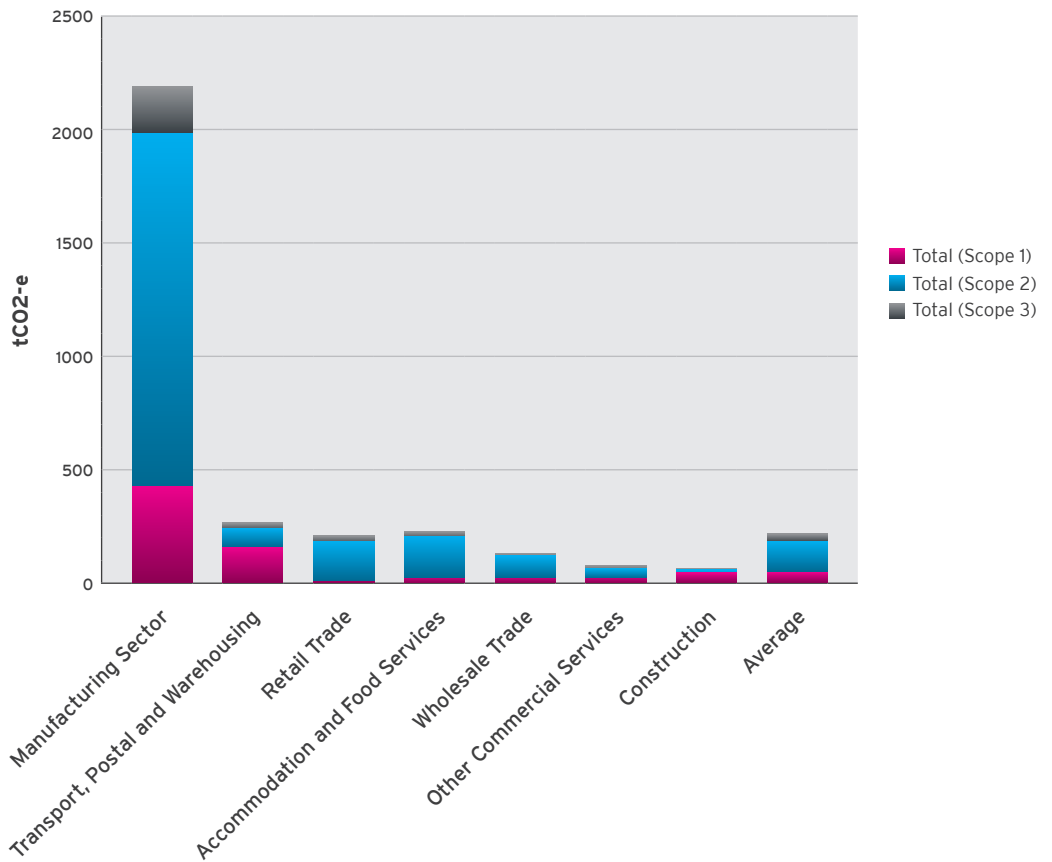
Emissions by Industry Sector

" The manufacturing sector has the highest average carbon footprint, at 10 times the average of the industry groups' total. However, the difference between manufacturing and other sectors is not as great when considering emissions per employee or per unit of economic contribution."

The manufacturing sector has the highest average carbon footprint per business, emitting 2189.7 tonnes per annum as presented in Figure 9 (with detail of other sectors shown in Figure 10). This is greater than 10 times the average of the industry groups presented.

Figure 9

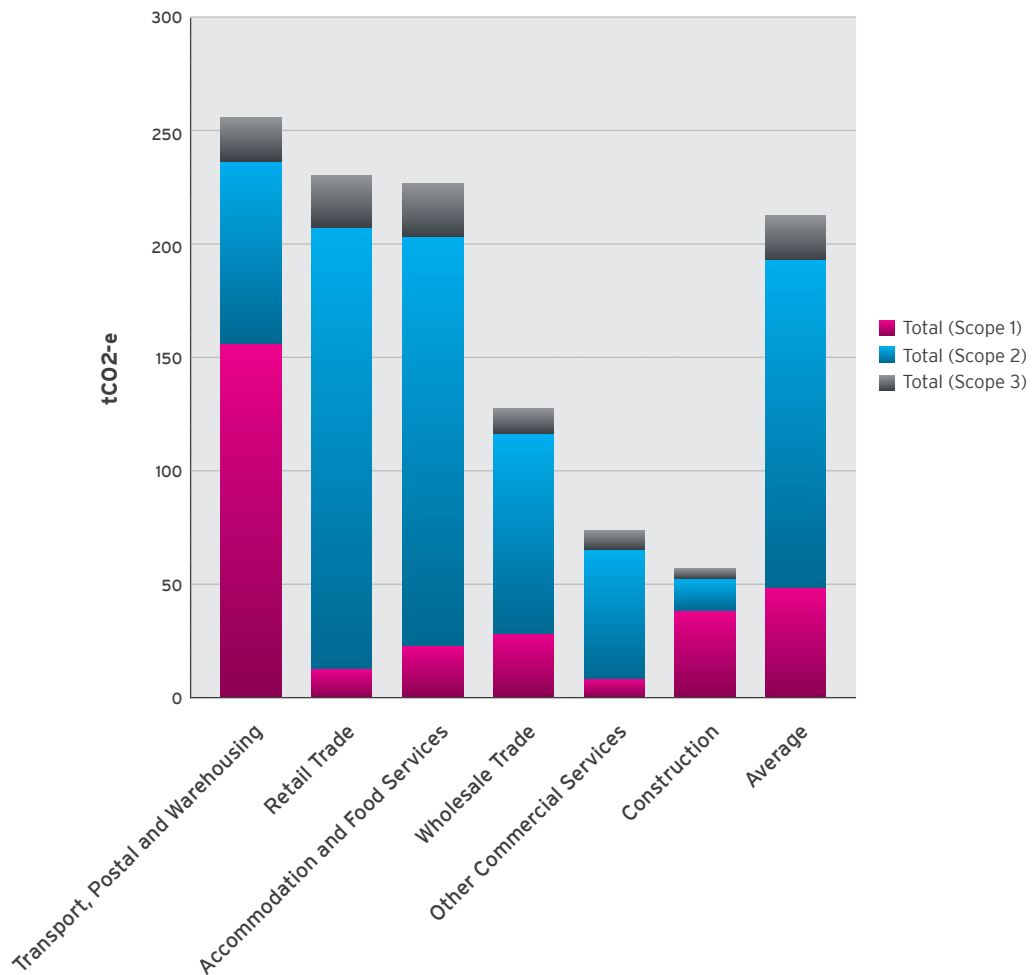
Average industry sector carbon footprint by scope (weighted)



"The construction sector has the lowest average carbon footprint per business."

The transport, postal & warehousing, and the retail trade sectors presented in Figure 10 account for the next highest sectors, averaging 257.4 and 230.8 tonnes respectively. The accommodation & food services sector accounts for 224.6 tonnes, followed by wholesale trade sector, which emits 127.3 tonnes. The other commercial services and the construction sectors average 72.9 and 55.3 tonnes per business each.

Figure 10
Average industry sector carbon footprint by scope
(excluding the manufacturing sector and weighted)



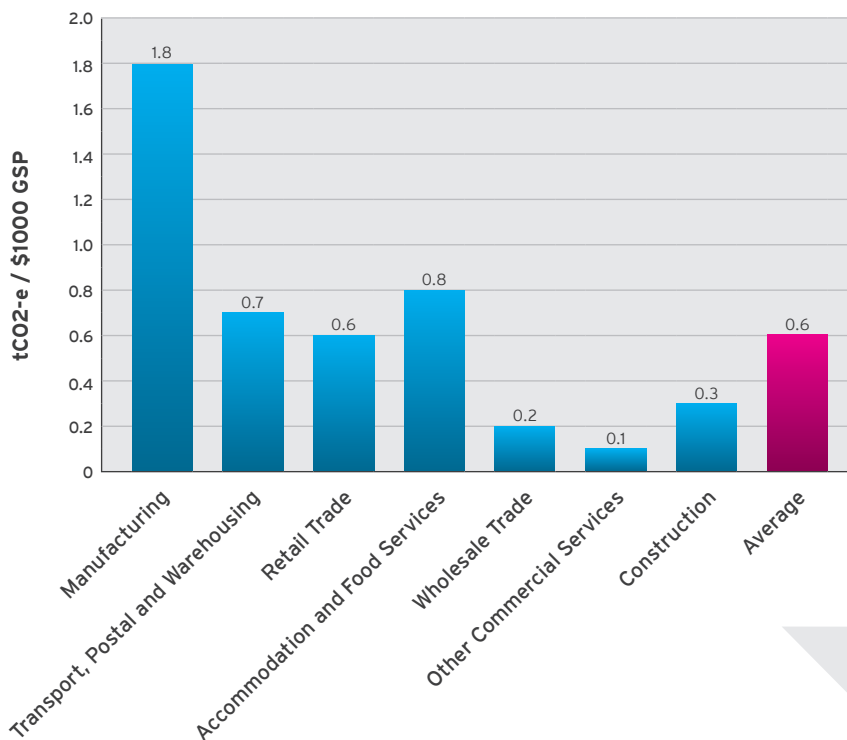
Emissions Per Unit of Economic Contribution

"The least intensive sector, in terms of emissions per unit of economic contribution, is other commercial services. The most intensive is manufacturing."

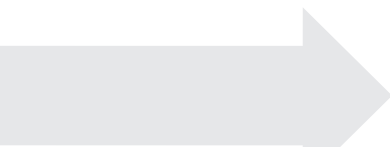
Analysis in Figure 11 shows carbon emissions by industry sectors per unit of economic contribution to Victoria's Gross State Product (GSP). The least intensive sectors are other commercial services, which emits 0.1 tonnes per \$1000 of GSP, wholesale trade (0.2 tonnes) and construction (0.3 tonnes).

The most intensive (i.e. the highest emitter per unit of economic contribution) is the manufacturing sector, emitting 1.8 tonnes per \$1000 of GSP, 2.8 times higher than the average of the industries analysed. The next highest are accommodation & food services (0.8 tonnes), transport, postal & warehousing (0.7 tonnes) and retail trade (0.6 tonnes).

Figure 11
Average total tCO₂-e per \$1000 Gross State Product (weighted)



NB: Carbon emissions per \$1000 of Gross State Product (GSP) is based on an average of 2008 and 2009 Industry Value
Add data from ABS 5220.0 Australian National Accounts: State Accounts

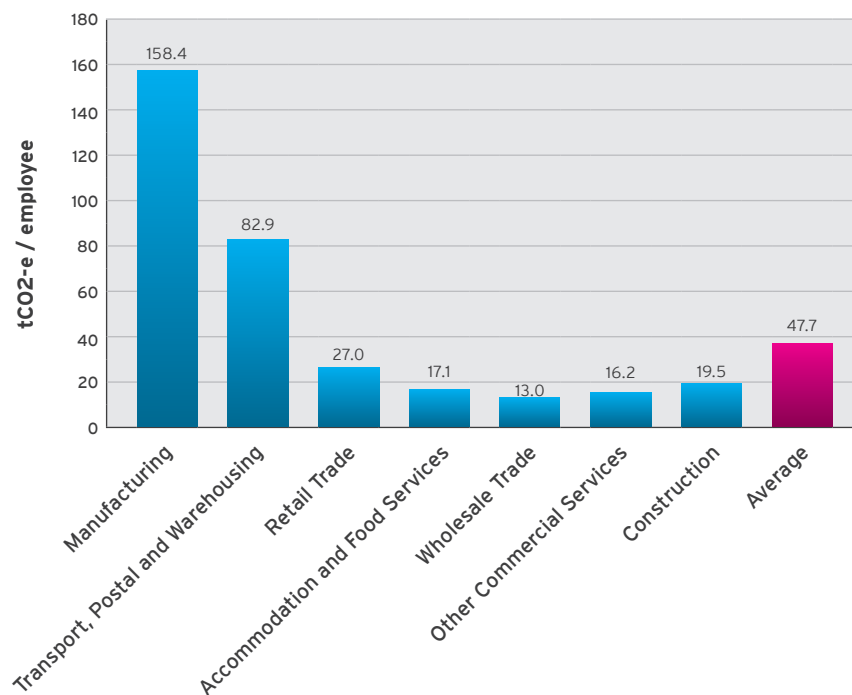


Emissions Per Employee by Sector

"The manufacturing sector has the highest emissions per employee. The wholesale trade sector has the lowest."

Figure 12 shows carbon emissions per employee by industry sector. The manufacturing sector is the highest, emitting 158.4 tonnes per employee, which is 3.3 higher than the average of the industries presented. The wholesale trade sector has the lowest emissions at 13.0 tonnes per employee.

Figure 12
Average total tCO₂-e per employee and industry (weighted)



NB: Average employee by industry figures are determined based on ABS 8165.0 *Counts of Australian Businesses, including Entries and Exits, Jun 2007 to Jun 2009*. Average employee figures for each industry are weighted and assume an average employee figure for each business size group, and the 200+ business size groups have on average 432 employees.



Conclusion

Of the key sources of emissions for SMEs, the largest single source is electricity for both the small and medium size business groups and across the majority of industries analysed. The exceptions are the construction sector and the transport, postal and warehousing sector, for which diesel is the largest emissions source.

Medium size businesses have higher carbon emissions on average when compared with small businesses, however their carbon emissions per employee are 29% lower on average than the small business group.

The manufacturing sector has the highest emissions of any of the sectors analysed, including by business average, per employee, and by emissions per unit of economic output. When compared by tonne per employee and average emissions per dollar of economic activity, the difference between the manufacturing sector and the other sectors is not as great as the difference between the average business emissions.

Individually, the average carbon footprint of small to medium size enterprises may not be considered significant. However, when aggregated, this footprint is significant, accounting for 30% of Victoria's total emissions, which is 24% larger than the total residential emissions for the same time period.



References

- 4660.0 *Energy, Water and Environment Management, 2008-09*, Australian Bureau of Statistics, July 2010.
 - 5220.0 *Australian National Accounts: State Accounts, 2009-10*, Australian Bureau of Statistics, November 2010.
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