

# Warragul Food Waste Survey

Sponsored by Sustainability Victoria, Gippsland Climate Change Network and Snowy River Innovation

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## Executive Summary

The Warragul Food Waste Survey had two principal objectives. The first was to develop an effective data collection methodology applicable to food and hospitality SMEs<sup>1</sup>. The second was to detail the volume of food waste generated by industry sector in a representative regional town in order to fill a gap in the Australian Biomass to Bioenergy Assessment (ABBA) database.

The research team focussed on 150 businesses, of which 50 were marked as high priority. Utilizing route mapping software to determine the best route to visit these businesses, they split into sub teams that focused on the CBD and the surrounding outer township. Each team conducted a brief in-person survey using Google forms, then a photographic waste assessment. They later converted the data from estimated litres of waste to kilograms using a density conversion table, then categorized by waste type and sorted by business type.

A total of 64 businesses were approached and 51 interviews and assessments were conducted. Of the businesses surveyed, an estimated 624,267 kilograms (624 tonnes) of food waste was produced per annum. This research indicated a significant proportion of food waste was diverted from landfill as local livestock or domestic animal feedstocks, composter supply, or donations to charity food providers. A high level of community interest in this project was noted.

The project produced a substantial improvement in the survey response rate over previous models and demonstrated a promising data collection methodology for this industry sector while also generating useful data insights.

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<sup>1</sup> Small to Medium Enterprises

# Introduction

The Australian government is currently undertaking a broad mapping of national renewable energy opportunities as part of the Australian Renewable Energy Mapping Infrastructure (AREMI) project. This initiative includes the Australian Biomass for Bioenergy Assessment (ABBA). Many potential biomass feedstocks have now been scoped out by ABBA, but there has been a gap in the data regarding food waste from smaller commercial operations in the food and hospitality sector. Previous efforts to collect this data produced poor response rates. The Warragul Food Waste Survey (WFWS) was funded by Sustainability Victoria (SV) to address this problem and Gippsland Climate Change Network (GCCN) was engaged to coordinate the project. Substantial additional support was provided by Snowy River Innovation (SRI) and a team of senior engineering and environmental students from Worcester Polytechnic Institute (WPI) Massachusetts, USA and Federation University, Gippsland.

The project focused on two key objectives: to develop a feasible data collection methodology to improve response rates from small to medium-sized enterprises (SME's) in the food and hospitality sector and by testing this methodology, to gather data on food waste in the representative regional township of Warragul, Victoria.

The team set a preliminary goal of between 30 and 40 waste surveys and assessments over a 3.5 day period. The survey used was originally compiled in SurveyMonkey by Sustainability Victoria. It contained 11 questions, designed to get an understanding of the current state of waste management, and then focus in on food waste management specifically. It was then adapted to a Google Form by the WPI team. Through the methodology detailed in this report, a representative data set was acquired for future analysis.

# Methodology

## Overview

The project methodology can be summarized by the following table. Each point is discussed in greater depth in the following sections.

<ul style="list-style-type: none"><li>● <b>Preparation</b><ul style="list-style-type: none"><li>○ Receive 5 hour waste audit training from waste consultant Dr. Trevor Thornton.</li><li>○ Arrive in Warragul and conduct preliminary interviews of businesses to raise awareness and schedule best times for future visits</li><li>○ Confirm reliable transportation</li></ul></li><li>● <b>Delivery</b><ul style="list-style-type: none"><li>○ Daily preliminary work<ul style="list-style-type: none"><li>■ Utilize a route mapping software to plan out routes for the coming day</li><li>■ Split into two teams, one for inside the central business district (CBD), one for outside the CBD. Each team consisted of two to three researchers.</li></ul></li><li>○ Internal CBD Team<ul style="list-style-type: none"><li>■ Walk from business to business, targeting all companies in the specific area generated by the route mapping software</li><li>■ In each business, conduct the Google Form survey and conduct a photographic waste assessment using mobile phones<ul style="list-style-type: none"><li>● Emphasize the words “free” and “short” to get the business on board</li><li>● Give a brief overview of the survey to lower level employees, and a longer description to managers</li></ul></li><li>■ Meet up with external team mid-day for lunch and a review, and at the end of the day to assess progress, compare results and plan the following day’s work</li></ul></li><li>○ External Team<ul style="list-style-type: none"><li>■ Drive to each business that is outside the CBD, determined by the route mapping software</li><li>■ In each business, apply same approach as the Internal CBD team</li></ul></li></ul></li><li>● <b>Followup</b><ul style="list-style-type: none"><li>○ Conduct visual waste assessments based on the photographs</li><li>○ Categorize the businesses into ANZSIC<sup>2</sup> codes</li><li>○ Categorize waste type</li><li>○ Convert litres into kg utilizing the conversion charts provided<ul style="list-style-type: none"><li>■ Assume ‘low’ compaction and ‘loose’ packaging for business reported food waste</li></ul></li></ul></li></ul>
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Table 1: Methodology Overview

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<sup>2</sup> Australian and New Zealand Standard Industrial Classification,

## **Preparation**

Upon arriving in Warragul, the team first canvassed the Warragul CBD, and conducted initial interactions with businesses. These interactions aimed to familiarize the team with the protocol, introduce the project to local businesses and set up appointments for later in the week for some larger businesses. The team planned to walk from business to business before getting a full understanding of the layout of downtown Warragul. However, an analysis of the list of companies revealed that this was not feasible for all of the survey sites, as many were located far from the CBD. The team had access to a truck, which was utilized in the coming days.

## **Delivery**

The team developed a day to day methodology after completing the initial work. The first task of this methodology was mapping the most efficient route to take between that day's targeted businesses. This was done using [routexl.com](http://routexl.com) and [planner.myrouteonline.com](http://planner.myrouteonline.com). These websites have a maximum of 20 addresses that can be uploaded, so the team scoped out 20 businesses to survey per day.

After conducting the route mapping the team would split up into two teams: one to conduct surveys inside the Warragul central business district (CBD) and one to survey the businesses outside the CBD. In order to get to these outside business the team was driven by survey team managers, Peter Young and John Lawrence, who had access to a truck. Splitting into two groups allowed for an average of 20 businesses per day to be surveyed.

The methodology of conducting the surveys was the same between the two groups. At first, both teams recited the recommended introduction to the first person they encountered at each business. However, the first person was generally a lower level employee. They would often be confused or overwhelmed after hearing the names of multiple government organizations in the first sentence of interaction. Therefore, the methodology changed to shorten the information given to low level employees. The team found that a few sentences of introduction were all that was needed in order to speak to a manager. In particular, the words "free" and "short" were great motivators, as well as "Sustainability Victoria". This adjustment helped move the surveying process along more effectively. After an employee brought a manager, the team asked the survey questions from the Google Form, outlined in Appendix A. Afterwards, the team asked the manager if they could look at the bins inside and outside the business, lifting the lids of the receptacles and taking photos of the total number of bins, the number of bins for each waste stream and the surface level contents of each bin. If the manager said yes, this was done. The survey and the photographs were all taken on mobile phones. Following the completion of the survey, the team would thank the manager so they knew the team had left the site.

The teams met up three times per day, first to map the route and split into smaller teams, then at lunch to compare results, and finally at the end of the day to compare notes and discuss

the data generated. At this time, the team recorded the businesses that had been surveyed in the spreadsheet to avoid visiting the same place twice.

## **Follow up**

After three days of surveying, the entire team sat down together and analyzed the photos of the bins at each site, performing a visual assessment of the percentages (by volume) of waste in each bin in accordance with the prior waste assessment training. Some of these visual assessments were deemed to be not-representative, as some businesses had recently had their waste collected. A visual assessment of a mostly empty bin could provide inaccurate data as to a good representation of 'percentage of food waste from that site'. This photo analysis process was performed as a team to reduce individual assessor bias. The data from each site was captured in a spreadsheet, and once all businesses had been surveyed, the data analysis began.

The total waste stream volume of each business was calculated by looking at the photos of waste bins at each establishment before converting this data into cubic metres. The team then compared the businesses self-reported food waste percentage to the percentage of food waste found in the visual assessment, and multiplied the total bin volume by the larger value. Doing this reduced the likelihood of inaccurate visual assessments by the surveying team. The photos of the assessment were then used to determine the levels of compactness (low, medium or high) and the type of packaging (loose/packed). These values were used in relation to the conversion density data provided by Dr. Trevor Thornton to convert the volumes of food waste into kilograms (kg). The self reported food waste was assumed to have a low level of compaction and no packaging. This was based on what was seen in the photographs, and also ensures that the data would not be an overestimation. Having the food waste in kg allows the data to be used when making a recommendation for a biomass waste to energy system, such as an anaerobic digester, as the waste food feedstock would be measured in mass rather than volume. After this, a summary section was generated to display the total kg of food waste per week for each business type. The summary also listed how many businesses of each ANZSIC code were surveyed. Complete recommendations for improving the methodology are detailed in a later section.

# Results and Discussion

## **Objective 1: Test a data collection methodology for food and hospitality SME's**

Overall, the Warragul Food Waste Survey and Assessment exceeded the initial goal set by SV and GCCN regarding the number of businesses surveyed. The group reached 65 businesses, 52 of whom were willing to partake in the survey, while 13 rejected it. This represents an 80 percent response rate. The process provides a much higher success rate than the online only survey method trialled in the past. The process confirms that the method of face-to-face surveying adopted was the most effective. The previous online survey method had a response rate of approximately three percent (14/500), with even fewer (6/14) responses containing complete and useful information.

For the businesses that responded negatively to the survey, there were multiple potential reasons for this response. Language barriers were sometimes an issue during the survey. There were few businesses (3 percent) owned by people who had difficulty with English. These language barriers resulted in the owners not understanding the purpose and free nature of the survey, resulting in these owners rejecting the survey. Some negative responses came from restaurant proprietors who stated they were too busy to answer questions, even if the brevity of the survey was mentioned multiple times. This resulted in the survey team being turned away and told to set up appointments for the following week, which was after the conclusion of the surveying effort. Also, some businesses expressed their lack of faith in the waste collection agencies. These businesses recently learned that the general waste and commingled recycling were being picked up together and both going to landfill, as opposed to recycling going to a separate recycling center. This action prompted them to question the purpose in participating in the survey. When prospective respondents questioned the validity of the survey, they would be either unhelpful in the information gathering or just turn the team away outright.

Although these negative responses are a concern, the large majority of the respondents were willing to participate in the survey. The township of Warragul and small businesses that operate in it already appear to be mindful of limiting waste in their food waste practices. Many of the businesses surveyed were doing something with their food waste other than sending it to landfill. This behaviour was matched by businesses expressing enthusiasm about taking part in the survey and sharing what they were doing.

## **Objective 2: Generate food-waste data for Warragul to fill a gap in ABBA data**

In total the SMEs surveyed and assessed generated an estimated **624,267 kilograms of food waste per year (624 tonnes)**. This waste could potentially be used in an anaerobic digester instead of being discarded to landfill. Most of the food waste is from restaurants, cafes and supermarkets, ANZSIC codes 4511 and 4110.

Below is a breakdown of the amount of waste by each ANZSIC code, as well as the number of businesses surveyed by code. A complete record of responses and assessment results has been given to Sustainability Victoria for further analysis and uploading into ABBA data.

ANZSIC Code	No. of establishments surveyed	Kg / Week	Kg / Week per establishment
Accommodation (ANZSIC 4400)	1	33	33
Bakery (ANZSIC 1174)	3	528	176
Cafés or Restaurants (ANZSIC 4511)	25	6354	254
Child Care Centre (ANZSIC 8710)	3	133	44
Church (ANZSIC 9540)	1	21	21
Community Group - Club (ANZSIC 8790)	3	593	198
Nursing Home/Aged Care Facility (ANZSIC 8601)	3	236	79
School Canteens or Take Aways (ANZSIC 4512)	8	1024	128
Supermarket (ANZSIC 4110)	4	3085	771
<b>Total</b>	<b>Businesses Surveyed</b>	<b>Kg / Week</b>	<b>Kg / Year</b>
	51	12007	624364

Table 2: Food Waste by Business Type

An example of one business survey is found below.



Figure 1: Example of one business' survey data

In addition to this quantitative data the team also amassed useful qualitative data from interactions with local food and hospitality SMEs. A selection of quotes from these interactions is found below.

Quote	Source (General)
“We are doing a lot. We have degradable bins and a large container to collect food waste next to our rubbish. However, we definitely have a long way to go.”	Local Grocer
“We don't have a lot of food waste. Most of it is taken by consumers as this is a take away place. Any green waste gets composted and any meat gets fed to the dogs.”	Take Away Owner
“The only food that goes into the rubbish are orange peels. All other lunch waste is composted in the worm bins or fed to the chickens out back.”	Childcare operator
“We try to reuse as much of our prep waste as we can, but there are limits on what we can do with table scraps once people eat it.”	Cafe Owner
“We donate all of the bread on the shelves at the end of every day to local charities. However, we can't donate the pastries that have meat or milk due to corporate regulations. We try to make less of those so that we don't throw much of them away, but that is an obstacle we are facing.”	Bakery Owner

<p>“We do not have much waste that is not recycled. We only have paper and cardboard, but all of our bottle caps are saved for local kindergarten classes. Our plastic spoons are even donated to an art student to depict how much plastic is wasted.”</p>	<p>Ice Cream Shop Owner</p>
<p>“I do not have any food waste. I have 6 large compost bins outside, as well as dogs and chickens. All of the leftover food from any of the events I cater ends up being either eaten or utilized to grow more food”</p>	<p>Local Caterer</p>

Table 3: Quotes from local businesses

Warragul is a town of approximately 14,000 surrounded by farms, agriculture and state forests. Most individuals interviewed had some connection with the farming community. These connections occurred in two forms: sometimes the business owner owned a farm, or the business owner employed someone who worked on a, or owned, a farm. Such connections allow the businesses to dispose of their food waste in a more sustainable way. For example, some businesses have specific “pig bins” for organic waste that would go home to employees’ farms or the various local piggeries as feed for the animals. Other food waste from bakeries and supermarkets was donated to local charities. On a smaller scale, a lot of employees had chickens or dogs that they would bring food scraps home for. Additionally, many child care organizations surveyed had worm composting bins. The overall result of these practices is that a relatively small amount of food waste actually ends up in landfill in Warragul and possibly many rural areas. Overall as many as 70% of the businesses surveyed used at least one of the sustainable food practices, and approximately 30% utilized multiple approach’s to deal with their food waste.

Looking beyond food waste, another highlight of the survey was that many businesses recycled their cardboard and paper in one bin, but combined their recyclable plastics with general waste. Some businesses indicated that they had limited confidence in the collection companies who throw recyclable and general waste together despite them being separated at the collection point. This, they claimed, had undermined their commitment to recycling. At some sites, there was simply no specific bin or collection system available for recyclable plastics. Most sites without a specific plastics bin mentioned they would appreciate if provided by their waste collection service.

Many employees or managers did not know the meaning of “Effective Full Time Employees”. This resulted in the managers reporting the actual number of full time employees, which was often far lower than the EFTE. This is an important point because this discrepancy can obscure the actual size of the business, which would be important to any data analysis. In future surveys, a better explanation of this term would be extremely helpful, as the team this time did not have a clear idea of what it meant until some way through the survey process. Another solution would be to ask “On average, how many employees are typically working at one time?”. This will provide a better understanding of how many people it takes to run each business.

## Recommendations

For future surveys, a few key recommendations could noticeably improve the data collection process.

1. Refine the questions currently used in the Survey Monkey model provided by SV to ensure greater clarity and ease of use if applied to digital data collection.
2. Collect in person survey responses in Google Form with results automatically transferred to a shared Google Sheets file.
3. Provide adequate time to complete the survey and particularly the waste assessment to ensure that assessments can be completed when bins are full.
4. Contact larger businesses in advance to schedule a 15 minute meeting with the kitchen manager.
5. Ensure a vehicle is available for transport between survey sites to support the survey team.

## Conclusion

This project exceeded the goals and expectations set by achieving an 80 percent survey response rate. Also, within three and a half days, the survey and waste assessment completed 51 food and hospitality SME's surveys, which far exceeded the target of 25 to 35 surveys. It therefore confirmed that the method of face-to-face surveying adopted provided a much higher success rate than the online only survey method used in the past.

The project also identified an estimated 624,267 kilograms of food waste entering the landfill per year (624 tonnes) by the businesses surveyed and did not include the West Gippsland Health Service (i.e. the hospital) as no food waste volume data was available.

A wealth of qualitative data was gathered to inform the interpretation of such figures and suggested that many Warragul businesses in the food and hospitality sector used sustainable food waste disposal. Most of the businesses, particularly smaller ones, saved their food waste for domestic animals, piggeries, or farms. This was likely due to Warragul's close proximity to numerous farms and staff having a personal connection to a farm. Other businesses donated the leftover food to charity food banks. Yet others utilized composting, either as an educational method for children at several childcare centres, or as the main waste treatment method for a small business.

Many survey respondents had good understanding of appropriately using their food waste instead of adding it to general waste. Across the board, this was more common in the smaller businesses. For these businesses the personal connections to farms in the area enabled them to have more knowledge about how their food waste was valuable for reuse. Larger companies and franchises by contrast typically showed lesser understanding of how they could use their food waste, or were limited from doing so based on regulations they perceived governing their disposal of meat and cheese products.

In general, Warragul businesses in the food and hospitality sector are interested in what happens to their waste, and are dissatisfied with the current waste collection system. Many of them wanted additional bin options for sorting waste whether for glass, plastic, or FOGO<sup>3</sup>. However, they were also cost conscious and did not want more bins if it resulted in higher waste service fees.

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<sup>3</sup> Food Organic Green Organic

# Appendices

## Appendix A: Google Form Survey

<https://docs.google.com/forms/d/e/1FAIpQLSd1E1TbF-DPm2kJoKx8IOvBzcJdlXavujfusM2Xdz1thrq6xA/viewform>

## Warragul Food Waste Assessment

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Form description

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LGA name

Baw Baw Shire

Facility Name

Short answer text

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ANZIC Facility Type

1. Bakery
2. Café
3. Catering Kitchen
4. Catering Non-commercial
5. Child Care Centre
6. Community Group - Club
7. Convenience Store
8. Delicatessen
9. Distribution Storage Warehouse

10. Food Retailer
11. Hospital
12. Nursing Home/Aged Care Facility
13. Restaurant
14. School Canteen
15. Supermarket
16. Take Away
17. Domestic Kitchen
18. Accommodation
19. Sporting Club (Seasonal)
20. Food Manufacturer
21. Mobile Community Group
  
22. Food Vehicle
  
23. Sporting Club

## Size of Facility in Square Metres/Number of Seats/Counter Service

Short answer text

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## Number of Staff (EFTE) (Full Time)

Short answer text

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## Bin Type

- General Waste
- Garden/organic
- Co-Mingled
- Paper/Cardboard
- Oil can
- Glass
- Other

## Number of Bins

Short answer text

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## Bin Size (L)

120

240

660

1100

Other...

## Collection Frequency

Short answer text

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## Percent Full

Short answer text

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## Percent Food-waste (Estimate?)

Short answer text

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## Any idea of the weight of the bins?

Short answer text

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## Notes

Long answer text

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## Appendix B: SurveyMonkey Survey Questions

<https://www.surveymonkey.com/r/S98MLBT>

## Appendix C: Density Data

### Waste Density Data

Waste Material	Density - kilograms per cubic metre		
	[L] Low	[M] Medium	[C] Compacted
Paper	76	152	228
Compacted Dry Cardboard	130	130	130
Compacted Wet Cardboard	260	260	260
Loose Dry Cardboard	55	55	55
Loose Wet Cardboard	190	190	190
Waxed Cardboard	55	92	130
Plastic Drink Containers	170	170	360
Plastic PVC	170	170	360
Polystyrene	14	21	28
Plastic – Other (specify)	170	170	360
Plastic - Bags & Film	39	78	156
Glass Drink Containers	280	280	280
Glass Containers	280	280	280
Glass – Other (specify)	280	280	280
Aluminium	120	120	120
Steel Containers	120	120	120
Metal - Ferrous	139	139	139
Metal - Non ferrous	139	139	139
Wire Bundles	70	70	70
Food - Packaged	514	1029	1029
Food – Loose Production	343	514	1029
Bags with Recyclables	65	120	220
Bags with Waste	87	170	348
Bags with Green Waste	91	227	445
Wood – (treated)	180	220	260
Wood – (untreated)	120	160	360
Wood – MDF/Chipboard	156	156	156
Wood - Fence	120	160	360
Wood - Furniture	160	170	400
Wood – Other (specify)	120	160	360
Vegetation – branches	91	227	445
Vegetation – grass clips	91	227	445
Vegetation – tree stumps /logs	150	450	900
Textiles	91	120	240
Textile - Furniture	91	120	240
Textile – Carpet / Mattress /Underlay	100	150	350
Insulation	37	37	37
Rubber Other (specify)	91	91	91

Tiles	470	550	640
Soil / Cleanfill / Clay / Dirt	922	922	922
Rocks	818	828	828
Bricks	818	828	828
Rubble > 150mm	1048	1048	1048
Concrete / Cement	1150	1150	1150
Plaster/Plasterboard	227	227	227
Cement Sheet	227	227	227
Prescribed Waste (specify)	227	440	1600
Whitegoods (detail)	105	113	120
E-waste (detail)	265	265	265
E Waste Small Appliances	265	265	265
E Waste TV, Computers, Peripherals	265	265	265
Glass - Sheet Laminated	280	280	280
Wood - Pallets	400	400	400
Wood - Sawdust	400	400	400
Foam	37	37	37
Rubber - Vehicle Tyres	263	263	263
Rubber - Hose	91	91	91
Rubber - Fan Belts	91	91	91
Glass Other - Fibreglass	37	37	37
Compacted Dry Cardboard - Books	130	130	130
Plastic - Bags & Film - Bulky Bags	39	78	156
Plastic - Bags & Film - Shrinkwrap	39	78	156