Final Report

AUSTRALIAN MEAT PROCESSOR CORPORATION

Environmental Performance Review 2024

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1.0 Abstract

This report continues the series of environmental performance reviews of the red meat processing industry that began more than 25 years ago, presenting results for the financial year ending June 30, 2024. This year, 43 sites participated, an increase of 38% over the previous survey in 2022, representing more than 68% of national production. The individual sites were located across Australia, ranged greatly in size, and included sites processing beef cattle as well as sheep, lamb and other small animals. This level of industry coverage can be regarded as excellent. Overall, the 2024 results saw improvements across many indicators. For example, water intake decreased from 8.0 to 7.3 kL/t HSCW, energy use decreased from 3435 to 2897 MJ/t HSCW, and GHG emissions decreased from 447 to 330 kg CO_2e/t HSCW. Some indicators showed little change. The main exception was an increase in solid waste to landfill which increased from 17.3 to 21.5 kg/t HSCW. Reductions in GHG emissions intensity were related to site energy efficiency improvements, reductions in the GHG emissions intensity of electricity, a shift in the energy mix from coal to natural gas, and reductions in wastewater treatment emissions with such measures as the installation of covered anaerobic lagoons. The increasing levels of industry participation over time are evidence that the review is valuable in consolidating industry performance, in enabling benchmarking of individual sites, and in guiding strategic investment to improve sustainability outcomes. The report includes metrics for the Australian beef and sheep sustainability frameworks.

2.0 Executive summary

This report continues the series of environmental performance reviews of the red meat processing industry that began more than 25 years ago, presenting results for the financial year ending June 30, 2024.

In total, 43 sites committed voluntarily to participate in this review, representing the highest level of participation to date, and a 38% increase in participation over 2022. This is evidence of increasing commitment to sustainability by the red meat industry. Participating sites represented more than 68% of national production.

In terms of scope of operations, on average sites produced carcases and carcase parts (13.7%), primals (82.1%) and retail ready cuts (4.1%). Around half of products left site chilled and the rest frozen. Hides and skins were produced green (42.1%), salted, cured or brined (53.6%), and tanned (2.4%). Sites were also engaged in blood processing (81%), offal production (95%), rendering (70%), and the production of other products (77%). These other products included compost, hair, intestines, and products for medical and specialty use. New or increased production of co-products was noted at several sites.

The methods used were consistent with previous reviews. To meet the reporting requirements of the Australian beef and sheep sustainability frameworks, some results were calculated separately for beef cattle and for sheep. Some sites processing sheep also processed goats and other smaller animals.

Overall, the 2024 results saw improvements across many indicators.

- Water intake was 7.3 kL/t HSCW, an 8.9% reduction compared to 2022 and a 22.5% reduction since 2010. As was the case in 2022, water intake was marginally higher for beef cattle processors than for processors of sheep, lamb and other smaller animals.
- Untreated wastewater quality results were mixed, being marginally higher than in 2022 for phosphorus, nitrogen and biological oxygen demand, but lower in the case of fats, oils and grease. That said, the results reflect a broadly steady or downward trend over time and need to be viewed in the context of overall lower levels of wastewater generation and increasing levels of wastewater treatment as a source of biogas for use

within the site. Few sites discharged treated wastewater directly to the aquatic environment. Importantly, where this was the case, discharge of nitrogen and phosphorus were lower than in all previous surveys.

- Energy use was 2897 MJ/t HSCW, a 15.7% reduction compared to 2022 and a 29.5% reduction since 2010. The level was lower for processors of sheep, lamb and other small animals than for processors of beef cattle. Changes in the energy mix were evident. Use of coal as an energy source continued to decline. In contrast, use of natural gas increased to become the largest component of the energy mix at 36.6%. Use of biomass and biogas from wastewater treatment remained at similar levels compared to 2022. There was an increase in use of solar PV with several sites reporting new installations or planned installations.
- GHG emissions were 330 kg CO_2e/ t HSCW, a 26.1% reduction since 2022 and a 40.4% reduction since 2010. GHG emissions intensity was marginally higher for beef cattle processors than for processors of sheep, lamb and other smaller animals. In large measure, reductions in GHG emissions intensity were related to overall reductions in energy use intensity. Also contributing was a 9.8% reduction in GHG emissions intensity of electricity, and a 5.1% reduction in GHG emission intensity of other components of the energy mix. The emissions intensity of wastewater treatment (per t HSCW) also fell by more than 30% with such measures as the installation of covered anaerobic lagoons.
- Waste sent to landfill was 21.5 kg/t HSCW, an increase compared to 2022. The amount was substantially less for beef cattle processors, and substantially more for processors of sheep, lamb and other smaller animals. In this survey, a subgroup of sites reported disposing of large quantities of organic waste to landfill due to a lack of other local beneficial processing options. In a few cases, sites reported that solid waste this year included demolition and construction waste related to construction projects.
- Regarding local amenity, odour and noise complaints continued to be low (2.6 and <1 per site per year, respectively)

While it is difficult to generalise because individual red meat processing sites have their own unique characteristics, large variations in environmental performance were evident between sites. This suggests that there remains ample opportunity for further gains in environmental improvement across the industry. Environmental target setting is common across the industry. However, sites with environmental targets did not necessarily achieve superior environmental performance compared to sites without targets. While sustainability can be viewed through the lens of corporate social responsibility, it seems that the leading driver of sustainability is the need for resource use efficiency as a business imperative linked to profitability and competitiveness.

Some sites reported sustainability improvements linked to major capital works, such as the upgrading of wastewater treatment facilities to include covered anaerobic lagoons, works to facilitate biogas utilisation within the site, and investment in solar PV. Other sites noted that sustainability improvements were more linked to “taking small wins consistently” through process improvement and practice changes. Some sites highlighted AMPC programs and others were working with government agencies such as ARENA.

Environmental performance indicator results also tended to be more variable among smaller sites, with these sites recording some of the best and some of the worst results. It may be that some smaller sites lack resources necessary to implement environmental improvement initiatives. Some smaller sites may also be at an early stage in their sustainability journey. Either way, small-to-medium sized processors could be a focus for programs aiming to support environmental improvement in the industry.

Finally, it is also important to acknowledge that the production of this report depended on the voluntary participation of individual red meat processors and their willingness to confidentially share environmental performance data. The increasing levels of industry participation over time are evidence that the review is valuable in consolidating industry performance, in enabling benchmarking of individual sites, and in guiding strategic investment to improve sustainability outcomes.

A summary of indicator results for the Australian Beef and Australian Sheep Sustainability Frameworks follows:

Indicator results for the Australian Sheep Sustainability Framework

Indicator	Description	2022	2024
3.2.2a	Water intake, kL/t HSCW	7.2	6.7
3.2.3a	Solid waste to landfill, kg/t HSCW	29.8	68.1
4.1.1d	GHGE (Scope 1&2), kg CO_2e/t HSCW	364	308

Indicator results for the Australian Beef Sustainability Framework

Indicator	Description	2022	2024
10.4	GHGE (Scope 1&2), kg CO_2e/t HSCW	476	339
10.5	Energy demand met by biogas, %	10.5	10.3
11.2	Water intake, kL/t HSCW	8.3	7.5
12.1	Solid waste to landfill, kg/t HSCW	12.7	3.6

3.0 Introduction

Red meat processing is a major Australian industry, contributing more than 138,000 full time jobs in Australia, with around 80% of employment in regional Australia, outside of capital cities (AMPC, 2024). The industry is a trusted source of high-quality protein foods to Australian and international consumers (RMAC, 2019). Australia is the world's largest sheep and goat meat exporter, and the third largest beef exporter after Brazil and the USA. Red meat and livestock exports reached $17.7 billion in 2022-23 (AMPC, 2024). For this important industry, continual improvement in resource use efficiency and sustainability is a priority (RMAC, 2019). Energy and water use efficiency impact on production costs, profitability and competitiveness. In addition, the industry is seeking to meet community expectations in terms of climate action, the protection of water quality, and local amenity.

The Australian red meat processing industry has a long history of environmental performance assessment and improvement. Individual red meat processing plants work to improve resource use efficiency and environmental performance with the support of a portfolio of strategic research undertaken by AMPC (2020). Industry-wide environmental performance reviews have been undertaken since 1998 (GHD, 1998) and have been repeated regularly (URS, 2005; GHD, 2011; Ridoutt et al., 2015; All Energy, 2021; Ridoutt and Sikes, 2023). These industry-wide surveys have served a variety of purposes, including:

- Benchmarking individual site environmental performance
- Supporting the development of applications for new and expanded red meat processing sites
- Building trust with communities and stakeholders
- Demonstrating commitment to ongoing environmental performance improvement
- Informing strategic research investment and the development of management tools and resources

Taking a whole of supply chain approach, the red meat processing industry also coordinates with the Australian beef and sheep sustainability frameworks (ABSF, 2024; SSF, 2024) and is committed to biennial environmental performance reviews.

This report continues the series of environmental performance reviews, presenting results for the financial year ending June 30, 2024.

It is also important to note that the scope of this report is environmental performance. There are additional economic, social, and animal welfare aspects to the broader subject of sustainability.

4.0 Project objectives

The project objectives specified in the Agreement are:

- Revise the EPR 2022 survey instrument to improve data quality with respect to byproducts, wastewater / waste / bioresource materials categories, and to achieve alignment with the requirements of ABSF and ASSF sustainability frameworks
- Undertake statistical modelling to resolve differences in site environmental performance based on variation in animal / species mix, as well as sub-processes undertaken (e.g., by-products, render v non-render, render type, thermal energy management)
- Assess critical variables having a major influence on environmental performance metrics (e.g., size of operation, location)

- Include questions to enable processor guidance around ASIC introduced Climate Related Financial Disclosures
- Collect evidence-based metrics (where offered) to enable case studies for sectoral high performers
- Prepare an updated Environmental Performance Review of the red meat processing industry

5.0 Methodology

5.1 General approach

This Environmental Performance Review of the red meat processing industry followed the same approach as the previous review. AMPC contacted red meat processing facilities and invited their voluntary participation. An incentive for participation was the offer of a follow up appointment with an environmental consultant to discuss site-specific environmental improvement opportunities. The aim was to recruit as many sites as possible and obtain a broad sample that varied in terms of size of operations, animal mix, and location across Australia.

Participating sites were sent a Microsoft Excel-based survey instrument. Completion of the survey instrument was supported by telephone and email discussions. Throughout the data collection process, data quality assessment took place, unusual data entries were explored, and additional qualitative information was gathered to aid interpretation as needed. While all red meat processing facilities share common features, they also have their own unique characteristics.

To enable assessment of environmental performance change over time, the environmental aspects included in the review were the same as in previous reviews, with a focus on six key aspects as listed in Table 1. This year, additional questions were added relating to scope of site operations as well as questions to enable processor guidance around ASIC introduced Climate Related Financial Disclosures.

Table 1: Environmental performance indicators

Aspect	Description	Indicator
Water use	Water is a limited natural resource. As with all industrial facilities, there is a need to use water efficiently, especially in regions that experience scarcity. Water recycling can be used to reduce water demand, subject to food safety and other regulations.	Water use efficiency (intake/t HSCW) Demand met by recycling (%)
Water quality	Red meat processing facilities can generate wastewater streams rich in nutrients and organic matter. Good operating practices can limit wastewater contamination and subsequent treatment can be used to limit harmful emissions to the environment.	Untreated quality – P (mg/L) Untreated quality – N (mg/L) Untreated quality – BOD (mg/L) Untreated quality – FOG (mg/L) Emissions to environment – P (mg/L) Emissions to environment – N (mg/L)
Energy use	Red meat processing facilities can be large energy users, associated particularly with refrigeration, the	Energy use efficiency (MJ/t HSCW) Energy demand met by biogas (%)

	production of steam and hot water, and rendering operations. Energy consumption is associated with a range of environmental impacts and is an important cost of production.	Energy demand met by solar PV (%)
GHG emissions	The red meat processing industry has committed to reducing GHG emissions. The current focus is on direct emissions (Scope 1) and emissions associated with purchased electricity (Scope 2). Red meat processors have less agency over other supply chain emissions (Scope 3), and these are currently not included.	GHG emissions intensity (kg CO_2e/t HSCW)
Waste to landfill	Red meat processing facilities can generate large quantities of organic waste that have the potential to be beneficially recycled into new products. In addition, the production of other miscellaneous wastes can be limited to reduce demand for new materials and the environmental impacts associated with solid waste disposal.	Waste to landfill (kg/t HSCW)
Local amenity	Red meat processing facilities have the potential to emit odours and noise that can impact the amenity of the surrounding community.	Odour complaints (number/site/year) Noise complaints (number/site/year)

5.2 Sample

In total, 43 red meat processing sites participated in this Environmental Performance Review, an increase of 38% over the previous survey in 2022 (Fig. 1). These sites were diverse in size (Table 2) and collectively they produced 2.25 Mt HSCW, representing around 68% of industry production (Table 3). The sites were located across Australia. Twenty-two sites processed beef cattle only, 14 only processed lamb or other small animals, and 7 processed a mixture of large and small animals. Thirty of the sites operated rendering plants. As such, this is the most representative environmental performance review undertaken by the AMPC with an industry coverage that would generally be regarded as excellent.

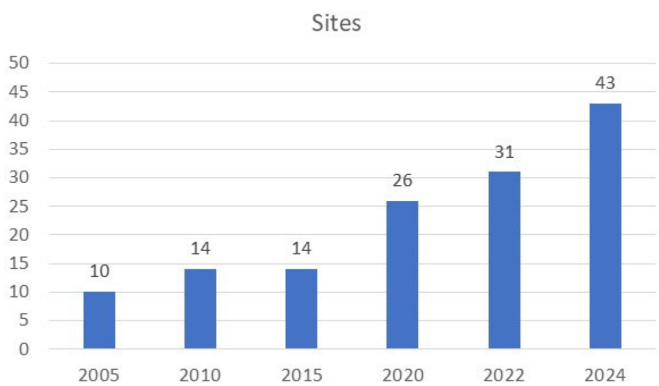

Figure 1: Number of sites participating in the AMPC Environmental Performance Review

Table 2: The diverse characteristics of sites included in the sample

Parameter	Range
Annual production	From below 5,000 to almost 140,000 t HSCW
Animal mix	Beef cattle (22), Lamb[1] (14), Mixed (7)
Location	NSW (9), QLD (9), SA (3), TAS (3), VIC (11), WA (8)
Operations	Rendering (30), Without rendering (13)

[1] Some sites also processed goats and other small animals

Table 3: Red meat production undertaken at the sample sites compared to total Australian production

Production (2023/2024)	Sample sites	Sector[1]	%
Beef cattle, Mt HSCW	1.62	2.38	68.1
Mutton and lamb[2], Mt HSCW	0.63	0.92	68.3
Total processing, Mt HSCW	2.25	3.30	68.2

[1] ABS 7215 – Livestock Products Australia (ABS, 2024)

[2] Some sites also processed goats and other small animals

In terms of scope of operations, on average sites produced carcases and carcase parts (13.7%), primals (82.1%) and retail ready cuts (4.1%). Around half of products left site chilled (50.4%) and the rest frozen (49.6%). Hides and skins were produced green (42.1%), salted, cured or brined (53.6%), and tanned (2.4%).

Sites were also engaged in blood processing (81%), offal production (95%), rendering (70%), and the production of other products (77%). These other products included compost, hair, intestines, and products for medical and specialty use.

New or increased production over the past 2 years was noted for processing of carcases into primals (7 sites) and retail ready cuts (5 sites), products produced frozen (6 sites), production of hides and skins (8 sites), and blood processing for fertilizer (1 sites), medical/laboratory use (2 sites) and other specialty applications (4 sites). New or increased production of offal for human consumption or pet food was also noted (6 sites) and rendered tallows and meat and bone meal (5 sites). Two sites noted new or increased production of compost. Four sites noted new or increased production of intestines. One site noted new or increased production of products for medical or other specialty use. Overall, what can be seen is that red meat processors are managing the production of a broad and increasingly diverse range of products with increasing levels of value adding to both meat and co-products.

The majority of sites currently met the NGER reporting threshold (86%). A preliminary assessment suggests that 86% of sites are also likely to meet the threshold for mandatory climate-related financial disclosure. More than half of sites expressed interest in further support from AMPC around this topic.

5.3 Model development

Sites varied in the mix of animals processed, with some sites processing single species and other sites processing a combination of beef cattle and smaller species. To provide separate reporting of environmental indicator results for the Australian beef and sheep sustainability frameworks, and to provide a reliable estimate of the red meat processing industry's overall performance (independent of the proportions of beef cattle and sheep-meat processing included in the sample), linear regression modelling was undertaken with quantity of beef cattle processed and quantity of small animals processed as input variables. Similarly, some sites operated energy-intensive rendering plants whereas others did not. Some sites rendered material taken in from other processors in addition to their own materials. To calculate indicator results for energy use and GHG emissions, linear regression modelling was undertaken with quantity of beef cattle processed, quantity of small animals processed, and quantity of material rendered as input variables. GHG emissions related to anaerobic wastewater treatment were calculated following National Greenhouse and Energy Reporting methods. Australian National Greenhouse Account Factors were used to calculate GHG emissions related to the use of fuels, refrigerants, and purchased electricity (DCCEEW, 2024).

5.4 Analysis of impacting variables

Further statistical analysis of the dataset explored relationships between environmental performance indicator results and a variety of site variables. These site variables included size of operation (t HSCW processed), whether performance targets had been set (e.g., water use efficiency, energy use efficiency, GHG emissions reduction, solid waste reduction), and whether the site had installed water submetering.

6.0 Results

6.1 Water use

This indicator tracks performance in reducing water intake, which is a shared objective in all parts of Australian industry, and especially in regions that can experience water scarcity.

On average, water intake was 7.3 kL/t HSCW, an 8.9% reduction compared to 2022 and a 22.5% reduction since 2010. As was the case in 2022, water intake was marginally higher for beef cattle processors than for processors of sheep, lamb and other smaller animals (Table 4).

Table 4: Comparison of water intake over time (kL/t HSCW)

Water intake	2010	2015	2020	2022	2024
Red meat processors	9.4	8.6	7.9	8.0	7.3
Beef cattle processors				8.3	7.5
Sheep and lamb processors[1]				7.2	6.7

[1] Some sites also processed goats and other small animals

Water intake varied between sites from 2.5 to 14.8 kL/t HSCW.

Town water was the most important source of water intake (77%), followed by local groundwater (bore water) at 15%, and direct withdrawal from surface water (8%). This is similar to results reported in 2022. Recycled water met 16% of water demand, a level higher than in previous years (Table 5).

Table 5: Water demand met by recycled water (%)

Recycled water	2010	2015	2020	2022	2024
Red meat processors	11	13	11	12	16

Water use efficiency targets were reported by 60% of sites. The use of water submetering was also reported by 60% of sites. These results suggest that water use efficiency is a current focal area for improvement across the red meat processing industry. However, sites that had adopted targets and installed submetering did not necessarily achieve greater water use efficiency that those that had not.

Similarly, there was no evidence that facility size was an impacting variable. However, it was observed that smaller sites were more variable in water use efficiency.

Examples of new initiatives to improve water use efficiency included:

- Water pressure reduction in washing bays and in cleaning operations
- Recycled water used in non-food contact operations
- Harvest and fabrication room process improvements
- Wastewater reused to wash down stock yards
- Installation of water submeters
- Flow limiting nozzles on hand wash stations
- Operational improvements in rendering and washdown practices
- Fixing of leaks
- Automated sensor installed in biofilter system to minimise water wastage
- Awareness programmes for staff coupled with water use monitoring
- Trialling of electric knife sterilisation

6.2 Wastewater

This indicator tracks performance in reducing the various environmental burdens associated with wastewater treatment and release. Good operating practices can limit wastewater contamination and subsequent treatment can limit harmful emissions to the environment.

On average, water discharge was 6.5 kL/t HSCW (89% of water intake). The amount was marginally higher for beef cattle processors (6.8 kL/t HSCW; 90% of intake), but lower for processors of sheep, lamb and other smaller animals (5.7 kL/t HSCW; 86% of intake).

The average untreated wastewater profile was: phosphorus (40 mg/L), nitrogen (239 mg/L), biochemical oxygen demand (BOD, 2344 mg/L), and fats, oils and grease (FOG, 959 mg/L), higher in some cases than in 2022, but continuing a broadly steady or downward trend over time (Table 6).

Table 6: Comparison of untreated water quality over time (mg/L)

Indicator	2010	2015	2020	2022	2024
Phosphorus	42	33	30	36	40
Nitrogen	233	250	175	169	239
Biological oxygen demand	3707	2657	2257	2171	2344
Fats, oils and grease	1593	1780	1143	1256	959

Wastewater was discharged mainly via irrigation (50%) or sewer (41%). Lesser amounts of treated wastewater were discharged to rivers (9%).

Importantly, the average nutrient content of treated wastewater discharged to rivers was phosphorus (13 mg/L) and nitrogen (23 mg/L), with nutrient loadings decreasing over time (Table 7).

Table 7: Nutrients discharged to rivers via wastewater (mg/L)

Indicator	2010	2015	2020	2022	2024
Phosphorus		28	44	18	13
Nitrogen		47	99	31	23

Examples of new initiatives to improve wastewater treatment and use included:

- Upgrading of primary wastewater treatment equipment for oil and grease reduction
- Installation of new solid separation equipment
- Daily monitoring and monthly testing programme
- New radial flow clarifier to aid in phosphorus removal
- Refurbishment of ponds
- Installation on ammonia control on BNR
- Upgrade to tertiary treatment to include coagulant dosing, media filtration and UV treatment
- Flowmeters connected to new SCADA and real time reporting system
- Implementation of ammonia and dissolved oxygen PID control loop

6.3 Energy use

This indicator tracks performance in energy use efficiency. Energy consumption is associated with a range of environmental impacts and is an important cost of production.

On average, energy use intensity was 2897 MJ/t HSCW, a 15.7% reduction compared to 2022 and a 29.5% reduction since 2010. Processors of sheep, lamb and other small animals had lower overall energy use intensity (2673 MJ/t HSCW) than processors of beef cattle (2983 MJ/t HSCW; Table 8).

Table 8: Comparison of energy use over time (MJ/t HSCW)

Energy use	2010	2015	2020	2022	2024
Red meat processors	4108	3005	3316	3435	2897
Beef cattle processors				3420	2983
Sheep and lamb processors[1]				3477	2673

[1] Some sites also processed goats and other small animals

Total energy use was disaggregated into energy use for processing (2055 MJ/t HSCW) and energy use for rendering (842 MJ/t HSCW).

Energy use efficiency varied between sites from 864 MJ/t HSCW (for a site not performing rendering) to a high of 7655 MJ/t HSCW.

The mix of energy sources is shown in Table 9. For the first time, natural gas became the largest source of energy used. The proportion of energy derived from biomass and biogas was similar to 2022. Solar PV supplied 0.3% of total energy demand, amounting to 1.1% of electrical energy demand.

Energy use efficiency targets were reported by 50% of sites. Variation between sites was large and sites that had adopted targets did not necessarily achieve greater energy use efficiency compared to sites that had not.

Similarly, there was no evidence that facility size was an impacting variable. However, it was observed that smaller sites were more variable in energy use intensity.

Examples of new initiatives to improve energy use efficiency included:

- Process improvements to control steam and hot water usage
- Installation of steam boiler economiser
- Installation of LED lighting
- Upgrading of refrigeration compressors and water pumps
- Automation upgrades to improve efficiency
- Solar system installation
- Plant electricity submetering
- Installation of covered anaerobic lagoons to supply biogas
- Biogas system improvements to increase utilisation
- Render plant upgrade to install new energy efficient equipment

Table 9: Energy use by source (%)

Energy source	2020	2022	2024
Electricity from grid	34.6	32.0	30.8
Natural gas	30.3	30.3	36.6
Coal	19.5	14.5	10.9
Biomass	3.6	8.3	7.3
Biogas from wastewater treatment	5.8	7.7	7.4
Fuel oil	2.6	3.3	2.3
Diesel	1.8	1.9	0.9
LPG	1.6	1.9	3.4
Wind, solar	-	0.1	0.3
Unleaded petrol	0.04	0.1	0.1

6.4 Greenhouse gas emissions

This indicator tracks performance in reducing the intensity of GHG emissions associated with red meat processing. By limiting GHG emissions, red meat processors can contribute to the shared challenge of limiting the increase in global average temperature to well below 2 °C above pre-industrial levels as expressed in the Paris Agreement. Improvements in GHG emissions intensity also contribute to reducing the carbon footprint of red meat products, although the contribution of red meat processing is small in relation to the full product life cycle.

On average, GHG emissions were 330 kg CO_2e/ t HSCW, a 26.1% reduction since 2022 and a 40.4% reduction since 2010. GHG emissions intensity was marginally higher for beef cattle processors than for processors of sheep, lamb and other smaller animals (Table 10).

Table 10: Comparison of GHG emissions over time (kg CO_2e/ t HSCW)

GHG emissions	2010	2015	2020	2022	2024
Red meat processors	554	432	397	447	330
Beef cattle processors				476	339
Sheep and lamb processors[1]				364	308

[1] Some sites also processed goats and other small animals

Total GHG emissions were disaggregated into emissions related to processing (278 kg CO_2e/ t HSCW) and emissions related to rendering (52 kg CO_2e/ t HSCW).

GHG emissions intensity varied between sites from 72 kg CO_2e/ t HSCW (for a site voluntarily purchasing 100% of electricity from renewable origin and not operating any anaerobic wastewater treatment) to a high of 742 kg CO_2e/ t HSCW (a site using coal in their energy mix and operating a deep anaerobic lagoon for wastewater treatment).

On average, electricity from the grid made the greatest contribution to GHG emissions (Table 11). The next most important GHG emissions sources were Scope 1 - energy (associated with fuel combustion on site), followed by wastewater treatment. Refrigerant gases made only a very small contribution. That said, the combinations of GHG emission sources varied considerably between sites.

Table 11: GHG emissions by source (%)

Source	Electricity from grid	Scope 1 - energy	Wastewater treatment	Other
Red meat processors	52.5	29.8	16.9	0.8

GHG emission reduction targets were reported by 36% of sites. Variation between sites was large and sites that had adopted targets did not necessarily achieve lower GHG emissions intensity compared to sites that had not.

There was no evidence that facility size was an impacting variable. However, it was observed that smaller sites were more variable in energy use intensity.

Examples of initiatives to reduce GHG emissions included:

- Installation of covered anaerobic lagoon
- Substitution of natural gas sourced from grid with biogas
- Energy use efficiency actions
- Purchase of certified carbon neutral electricity
- Installation of solar PV system

6.5 Waste to landfill

This indicator tracks performance in reducing solid waste production and landfill burden. By reducing waste sent to landfill, red meat processors can limit demand for new materials, the environmental impacts associated with solid waste disposal, and contribute to a circular economy.

Most waste generated by red meat processors is organic, comprised mainly of paunch solids, manure and yard wastes, as well as sludge and pond crusts from wastewater treatment plants. Organic waste is almost entirely processed into other beneficial products, such as compost. In rare cases, often related to scale and location and where rendering is not possible, organic waste can also include non-commercial animal parts.

Scrap metals and waste oil are also typically recycled. Solid waste sent to landfill typically includes miscellaneous mixed waste for which local recycling pathways have not been found. One site noted the recycling of worn-out end-of-use garments.

On average, waste sent to landfill was 21.5 kg/t HSCW, an increase compared to 2022. The amount was substantially less for beef cattle processors, and substantially higher for processors of sheep, lamb and other smaller animals (Table 12).

Table 12: Comparison of waste sent to land fill over time (kg/t HSCW)

Waste to landfill	2010	2015	2020	2022	2024
Red meat processors	11.3	5.9	11.9	17.3	21.5
Beef cattle processors				12.7	3.6
Sheep and lamb processors[1]				29.8	68.1

[1] Some sites also processed goats and other small animals

These results are largely explained by a subgroup of processor disposing large quantities of organic waste to landfill due to a lack of local composing options. In a few cases, sites reported that solid waste this year included demolition and construction waste related to construction projects. It is also noted that reporting varied across sites, with some sites able to supply a detailed categorisation of solid waste produced and other sites describing only “general waste”. There may be benefit from having an agreed standardised approach to waste management record keeping across the industry. This could improve the comparability of data over time.

Around 27% of sites had a solid waste reduction target, similar to 2022. Variation between sites was large and sites that had adopted targets did not necessarily achieve lower levels of solid waste sent to landfill compared to sites that had not. Local waste recycling opportunities seemed to be an important factor.

There was no evidence that facility size was an impacting variable. However, it was observed that smaller sites were more variable in waste sent to landfill.

Examples of new initiatives to reduce waste to landfill included:

- Participation in container recycling programmes
- Replacement of non-recyclable expanded polystyrene with corrugated cardboard
- E-waste collection programme
- Greater segregation of wastes
- Investigating alternative digester and composting options for organic waste
- Working with waste contractors to expand local recycling pathways

6.6 Local amenity

This indicator tracks performance in reducing complaints about odour and noise. By controlling odour and noise emissions, red meat processors can support local amenity and a positive relationship with local communities.

An issue facing some red meat processors is encroachment by residential development, bringing an increased number of sensitive neighbours into closer proximity. In such cases, odour and noise abatement is an increasingly important environmental issue.

6.6.1 Odour

Odour complaints averaged 2.6/site/year, a marginal increase over 2022, but still below the levels recorded in previous surveys (Table 13).

Table 13: Comparison of odour complaints over time (number/site/year)

Odour complaints	2010	2015	2020	2022	2024
Red meat processors	8.9	7.1	3.8	1.7	2.6

Greater than 90% of odour complaints came from residential neighbours. In some cases, the source of odour complaints were unable to be defined. Where the source was defined, the most common sources were rendering (57%) and animal manure (34%).

The incidence of odour complaints varied greatly. Around 60% of sites recorded no odour complaints. More than 60% of total complaints were associated with just four of the sites. In one case, a site received 33 odour complaints over 15 days while corrective actions were undertaken. A single incident can therefore give rise to multiple complaints. In another case, odour complaints were investigated and found to arise from an unrelated facility.

Examples of initiatives to reduce odour emissions included:

- Installation of biofilters
- Improved management of waste transport trucks
- Improved management of wastewater ponds
- Development of an air quality management plan
- Frequent washdown of cattle yards
- Upgrade of odour abatement at rendering facility

6.6.2 Noise

Noise complaints were uncommon, averaging less than 1/site/year as was the case in previous surveys (Table 14).

Table 14: Comparison of noise complaints over time (number/site/year)

Noise complaints	2010	2015	2020	2022	2024
Red meat processors	<1	<1	<1	<0.1	<1

All the noise complaints came from residential neighbours. Most sites (85%) recorded no noise complaints. The most common source of noise complaints was trucks. Other sources included earthmoving equipment, exhaust fans, and boiler steam blowdown.

Examples of initiatives to reduce noise emissions included:

- When purchasing new equipment, noise is a consideration
- Installation of acoustic lagging
- Limiting operating hours for certain activities
- Regular inspection of exhaust fans and other equipment
- Site noise testing conducted for the purpose of OHS management
- Monitoring of known sources of noise

7.0 Discussion

This Environmental Performance Review of the red meat processing industry describes results obtained for the financial year 2024, from July 1st, 2023 to June 30th, 2024. It follows the previous review covering the financial year 2022.

In 2024, the red meat processing levels were 30% higher than in 2022 when difficulties in the operating environment prevailed that included people shortages, challenges in livestock supply, and disruptions in export supply chains (AMPC 2022). As such, during that period, many plants were operating well below capacity, potentially undermining resource use efficiency and environmental performance. In making comparison to the 2022 results, these factors need to be considered. Operating conditions were more favourable in 2024, with production reaching 3.30 Mt HSCW, a 9% increase compared to 2020 when environmental performance was also reviewed (Table 15).

Table 15: Red meat processing industry output

Production[1]	2020	2022	2024	Increase (%)
Beef (excl veal), Mt HSCW	2.35	1.87	2.38	+27.6
Mutton and lamb, Mt HSCW	0.69	0.68	0.92	+35.1
Total, Mt HSCW	3.04	2.55	3.30	+29.6

[1] ABS 7215 Livestock Products, Australia

Overall, the 2024 Environmental Performance Review saw improvements across many indicators. For example, water intake has decreased from 8.0 kL/t HSCW in 2022 to 7.3 kL/t HSCW, energy use has decreased from 3435 MJ/t HSCW in 2022 to 2897 MJ/t HSCW, and GHG emissions have decreased from 447 kg CO_2e/t HSCW in 2022 to 330 kg CO_2e/t HSCW. Some indicators showed little change. The main exception was an increase in solid waste to landfill which increased from 17.3 kg/t HSCW in 2022 to 21.5 kg/t HSCW (Table 16).

Table 16: Summary of Environmental Performance indicators

Indicator	2010	2015	2020	2022	2024
Water intake (kL/t HSCW)	9.4	8.6	7.9	8.0	7.3
Water demand met by recycling (%)	11	13	11	12	16
Untreated wastewater (mg/L)					
Phosphorus	42	33	30	36	40
Nitrogen	233	250	175	169	239
Biological oxygen demand	3707	2657	2257	2171	2344
Fats, oils and grease	1593	1780	1143	1256	959
Nutrients discharged to rivers (mg/L)					
Phosphorus		28	44	18	13
Nitrogen		47	99	31	23
Energy use (MJ/t HSCW)	4108	3005	3316	3435	2897

Energy demand met by biogas (%)			5.8	7.7	7.4
GHG emissions (kg CO_2e/t HSCW)	554	432	397	447	330
Waste to landfill (kg/t HSCW)	11.3	5.9	11.9	17.3	21.5
Local amenity					
Odour complaints (no/site/year)	8.9	7.1	3.8	1.7	2.6
Noise complaints (no/site/year)	<1	<1	<1	<0.1	<1

Regarding water use, overall water demand was 8.9% lower than in 2022. Apart from 2022, water use efficiency has improved continuously since 2010 (Table 16). Many sites reported water use efficiency targets and the use of water submetering to improve understanding of water flows within the site. Many also reported being actively engaged in water use efficiency projects. These projects were diverse in nature including flow and pressure reduction and improvement in practices. Several sites reported greater utilization of recycled water in non-food contact applications. Water demand met by recycling reached a new high of 16%. It is also to be noted that water use efficiency has been a longstanding focal area for improvement in the AMPC strategic plan (AMPC, 2020). As was the case in 2022, water intake was marginally higher for beef cattle processors than for processors of sheep, lamb and other smaller animals (Table 4).

Untreated wastewater quality results were mixed, being marginally higher than in 2022 for phosphorus, nitrogen and biological oxygen demand, but lower in the case of fats, oils and grease. That said, the results reflect a broadly steady or downward trend over time and need to be viewed in the context of overall lower levels of wastewater generation and increasing levels of wastewater treatment being used as a source of biogas for use within the site. The improvement in fats, oils and grease is probably related to the impact these have on the performance of covered anaerobic lagoons. Few sites discharged treated wastewater directly to the aquatic environment. Importantly, where this was the case, discharge of nitrogen and phosphorus were lower than in previous surveys.

Energy use intensity in 2024 was substantially lower than in 2022 (Table 16). Reductions were achieved for both the processing of beef cattle as well as sheep, lamb and other small animals (Table 8). Reductions were also achieved across both processing and rendering. Changes in the energy mix were also evident. Use of coal as an energy source continued to decline. In contrast, use of natural gas increased to become the largest component of the energy mix at 36.6% (Table 9). Use of biomass and biogas from wastewater treatment remained at similar levels compared to 2022. There was an increase in use of solar PV with several sites reporting new installations or planned installations. It is estimated that there is now 19.5 MW of solar PV installed in the red meat processing industry as well as 2.5 MWh battery energy storage (Lister, 2025). It has also been estimated that solar PV installed by the red meat processing industry generated around 22 GWh of electricity in financial year 2024 (Lister, 2025). This report draws attention to the differences between red meat processors in terms of roof area and vacant land available for installations. It also notes that uptake has been greatest where government support programmes have been in place. However, energy use efficiency improvements appear to be broadly based, ranging from upgrades to boilers, rendering plants, and refrigeration systems, and including lighting and automation. This probably reflects the importance of energy as a cost of production and energy use efficiency being an important factor in overall profitability and competitiveness.

GHG emissions intensity in 2024 was also substantially lower than in 2022 and in comparison to all previous environmental performance reviews (Table 16). Reductions were achieved for both the processing of beef cattle as well as sheep, lamb and other small animals (Table 10). Reductions were also achieved across both processing and rendering. In large measure, reductions in GHG emissions intensity were related to overall reductions in energy use intensity, which improved by 15.7% since 2022. Also contributing was a 9.8% reduction in GHG emissions intensity of electricity, and a 5.1% reduction in GHG emission intensity of other components of the energy mix. As discussed above, the energy mix shifted to include a lesser proportion of coal and a greater proportion of natural gas. The emissions intensity of wastewater treatment (per t HSCW) also fell by more than 30% with such measures as the installation of covered anaerobic lagoons. This is consistent with the variety of improvement measures reported by sites. These results also align with the industry's strategic focus on energy use efficiency and bioenergy adoption (AMPC, 2020).

Purchased electricity, fuel combustion and wastewater treatment were the major sources of emissions, though the combinations of GHG emission sources varied considerably between sites. For example, some sites undertake only limited wastewater treatment to meet requirements for discharge to a municipal wastewater treatment plant. In such cases, emissions related to anaerobic wastewater treatment are outside the scope of the review. On the other hand, anaerobic treatment of wastewater within the site can contribute substantially to overall site emissions without biogas capture and either flaring or reuse within the plant. There are also important differences in GHG emissions intensity of purchased electricity with variation more than 4-fold between state grids, with the highest emissions in Victoria and the lowest emissions in Tasmania (DCCEEW, 2024). One processor reduced their site GHG emissions by purchasing certified carbon neutral electricity. That said, higher energy use associated with running retail-ready production lines and expanding on-site chilling and freezing capacity will tend to elevate GHG emissions reported by red meat processors. Such factors complicate the comparison of indicator results over time. Overall, the variation in GHG emissions intensity between sites was large, suggesting major opportunities for improvement at some sites.

Solid waste to landfill increased during the current assessment period, reaching 21.5 kg/t HSCW, around 24% more compared to 2022 (Table 16). Organic wastes such as paunch solids, yard waste, pond crusts and sludge from waste treatment are usually processed into beneficial products, such as compost, and not sent to landfill disposal. Non-commercial animal parts are also usually rendered to produce beneficial products. In this survey, a subgroup of sites reported disposing of large quantities of organic waste to landfill due to a lack of other local beneficial processing options. In a few cases, sites reported that solid waste this year included demolition and construction waste related to construction projects. Solid waste reporting was found to be variable, with some sites reporting well disaggregated data and other sites reporting only general waste. There may be benefit in having an agreed standardised approach to waste management record keeping across the industry. This could improve the comparability of data over time and support the development of strategies to reduce landfill wastes.

Regarding local amenity, odour and noise complaints continued to be low (Table 16), supported by a variety of abatement measures.

7.1 Beef and sheep sustainability framework metrics

The AMPC Environmental Performance Review contributes to the Australian beef and sheep sustainability frameworks (ABSF, 2024; SSF, 2024). The relevant indicators are summarised in Tables 17 and 18.

Table 17: Indicator results for the Australian Sheep Sustainability Framework

Indicator	Description	2022	2024
3.2.2a	Water intake, kL/t HSCW	7.2	6.7
3.2.3a	Solid waste to landfill, kg/t HSCW	29.8	68.1
4.1.1d	GHGE (Scope 1&2), kg CO_2e/t HSCW	364	308

Table 18: Indicator results for the Australian Beef Sustainability Framework

Indicator	Description	2022	2024
10.4	GHGE (Scope 1&2), kg CO_2e/t HSCW	476	339
10.5	Energy demand met by biogas, %	10.5	10.3
11.2	Water intake, kL/t HSCW	8.3	7.5
12.1	Solid waste to landfill, kg/t HSCW	12.7	3.6

8.0 Conclusions

The 2024 Environmental Performance Review of the red meat processing industry is now the 8th review completed since the initiative began in 1998. This year attracted the highest level of participation, with input from 43 sites representing more than 68% of national production. The individual sites were located across Australia, ranged greatly in size, and included sites processing beef cattle as well as sheep, lamb and other small animals. This level of industry coverage can be regarded as excellent, and the results are considered broadly representative of the industry overall. The increasing levels of industry participation over time are also evidence that the review is valuable in consolidating industry performance, benchmarking individual sites with industry norms, and in guiding strategic investment to improve sustainability outcomes.

Overall, the 2024 Environmental Performance Review saw improvements across many indicators. For example, water intake has decreased from 8.0 kL/t HSCW in 2022 to 7.3 kL/t HSCW, energy use has decreased from 3435 MJ/t HSCW in 2022 to 2897 MJ/t HSCW, and GHG emissions have decreased from 447 kg CO_2e/t HSCW in 2022 to 330 kg CO_2e/t HSCW. Some indicators showed little change. The main exception was an increase in solid waste to landfill which increased from 17.3 kg/t HSCW in 2022 to 21.5 kg/t HSCW.

While it is difficult to generalise because individual red meat processing sites have their own unique characteristics, large variations in environmental performance were evident between sites. This suggests that there remains ample opportunity for further gains in environmental improvement across the industry. Environmental target setting is common across the industry. However, sites with environmental targets did not necessarily achieve superior environmental performance compared to sites without targets. This suggests that resource use efficiency has become a business imperative linked to profitability and competitiveness.

Some sites reported sustainability improvements linked to major capital works, such as the upgrading of wastewater treatment facilities to include covered anaerobic lagoons, works to facilitate biogas utilisation within the site, and investment in solar PV. Other sites noted that sustainability improvements were more linked to “taking small wins consistently” through process improvement and practice changes. Some sites highlighted AMPC programs and others were working with government agencies such as ARENA.

Environmental performance indicator results also tended to be more variable among smaller sites, with these sites recording some of the best and some of the worst results. It may be that some smaller sites lack resources necessary to implement environmental improvement initiatives. Some smaller sites may also be at an early stage in their sustainability journey. Either way, small-to-medium sized processors could be a focus for programs aiming to support environmental improvement in the industry.

It is also important to acknowledge that the production of this report depended on the voluntary participation of individual red meat processors and their willingness to submit environmental performance data. Naturally, the quality of the results being reported depends on the quality of the site environmental performance data supplied. In this regard, it was apparent that some red meat processors had better environmental data systems than others. This was especially evident with the reporting of wastes produced, where the reporting seemed particularly variable in detail and quality. There may be a benefit in developing a common protocol for environmental data management and reporting. This could increase the preparedness of the industry to participate in future environmental performance reviews and improve the reliability and comparability of results. This might also benefit smaller processors and sites that are not part of a corporate structure. A standardised approach might also simplify the task for processors and reduce costs.

9.0 Recommendations

To support ongoing progress in red meat industry sustainability performance, the following recommendations are made:

- Options for organic waste. A minority of sites were disposing of organic waste in landfill due to the absence of options for processing into beneficial products in the local area. There may be a role for AMPC to support in addressing this challenge.
- Climate-related financial disclosure. While some corporates are well positioned to comply with new disclosure requirements, more than half of sites expressed interest in support from AMPC around this topic.
- Sustainability is often viewed as a corporate social responsibility. However, it is now becoming more closely aligned with business performance, profitability and competitiveness, and there may be a role for AMPC to normalise this way of thinking across the industry.
- Since environmental performance was more variable among smaller sites, small-to-medium sized processors could be a focus for programs aiming to support environmental improvement across the industry.
- To improve the quality of environmental performance data submitted to the EPR, there may be a benefit in developing a common protocol for environmental data management and reporting. This may be of particular value to smaller processors and facilitate greater future participation. A standardised approach might also simplify the task for processors and reduce costs.
- Finally, to improve the comparability of Environmental Performance Review results over time, it is critical that consistent methods are used to calculate indicator results from one survey to the next.

10.0 Project outputs

Project outputs are listed below:

- Milestone 2 report (October 2024)
- Milestone 3 report (February 2025)
- Copies of completed surveys (excel spreadsheets)
- Final consolidated results (excel spreadsheet)
- Final report (March 2025)
- Snapshot Report (March 2025)
- Webinar presentation (PowerPoint)

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