



Carbon Footprint Report

Final 1.0

March 2023

For **Edith Cowan University**

1 January 2022 to 31 December 2022

carbonneutral 

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Abbreviations

CH ₄	Methane
C & I	Commercial and Industrial
CO ₂	Carbon dioxide
CO ₂ -e	Carbon dioxide equivalent
CTI	Corporate Travel Management
DBEIS	Department for Business, Energy & Industrial Strategy (UK)
EF	Emission factor
EPiC	Environmental Performance in Construction
FY	Financial year
GHG	Greenhouse gas
GJ	Gigajoule
HVAC	Heating, Ventilation and Air Conditioning
Kg	Kilogram
kL	Kilolitre
kWh	Kilowatt-hour
L	Litre
ML	Mega litre
N ₂ O	Nitrous oxide
NGA	National Greenhouse Accounts
NO _x	Nitrogen oxides
PFC	Perfluorinated compound
p.km	Passenger kilometre
RFI	Radiative forcing index
t	Tonnes
t CO ₂ -e	Tonnes carbon dioxide equivalent emission
t.km	Tonne kilometre
WBCSD	World Building Council for Sustainable Development
WRI	World Resources Institute
WTT	well to tank

Executive Summary

This Organisational Greenhouse Gas Inventory report has been prepared to assist Edith Cowan University (ECU) understand its carbon footprint.

This document describes the calculation boundaries, calculation methodologies, assumptions, measurement results, and key references used to prepare the Calendar Year 2022 (CY22) greenhouse gas (GHG) inventory.

This report outlines the scope 1, 2 and 3 GHG emissions in Edith Cowan University' operations and value chain that have been included.

ECU's total organisational GHG emissions have been estimated at 19,074.88 tonnes of carbon dioxide equivalent (t CO₂-e) for

the period 1 January 2022 to 31 December 2022.

This is a decrease on total CY22 emissions of 19,517.54 t CO₂-e.

The main GHG emitting activities were associated with electricity use followed by stationary equipment fuel use (See figure 1).

10.0% of GHG emissions resulted from ECU's Scope 1 (direct) fuel consumption in fleet vehicles and stationary equipment and refrigerant leaks.

67.7% of GHG emissions were related to grid-supplied electricity use at ECU operated facilities (scope 2).

22.3% of GHG emissions resulted from Scope 3 activities associated with ECU's supply chain.

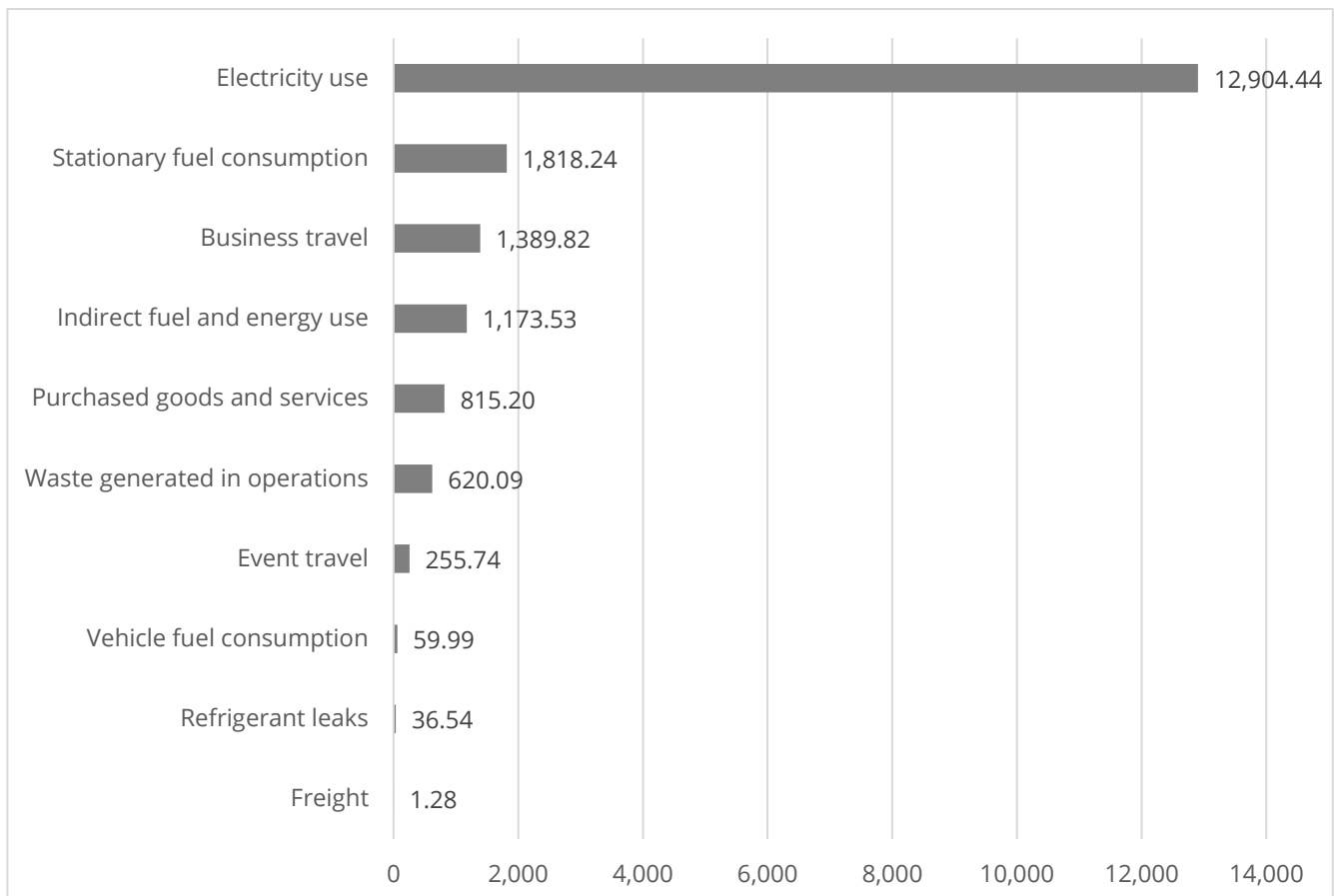


Figure 1 Summary of Edith Cowan University's total GHG emissions - CY22

About Carbon Neutral

Carbon Neutral is a respected, Australian owned carbon solutions consultancy and offsets provider. We have over 20 years of experience and we have worked with over a thousand partners and organisations to deliver tangible climate change solutions.

Carbon Neutral assists organisations across Australia to minimise their impact on our environment by measuring, reducing and offsetting greenhouse gas emissions. Carbon Neutral is a market leader, has built a strong reputation within the low carbon economy and was the developer of the first web-based vehicle emissions calculator in Australia.

Carbon Neutral's services include Carbon Consulting and Reduction Programs, carbon calculators, retailing of carbon offsets, developing biodiverse reforestation projects, energy and water auditing, and Environmental Management System development and implementation. To date, Carbon Neutral has planted 30+ million trees in rural Australia.

Carbon Neutral is a long-standing, award-winning organisation that works with partners and businesses of all sizes to enrich landscapes, reduce the effects of climate crisis and deliver practical carbon solutions.

We are an independently certified (Climate Active) carbon neutral organisation.



About Edith Cowan University

Edith Cowan University (ECU) is a tertiary education provider that produces research at quality international standards.

The university operates under an environmental policy that sets the strategic scope of ECU's commitment to sustainability in the appropriate management of the organisation and its operations, the engagement of students and staff in principles and applications of sustainability and the engagement of and collaboration with the broader community.

ECU has retained its 5-star rating by graduates for teaching quality as reported in the Good Universities Guide. It has also also been ranked Australia's best university for overall experience by our international undergraduate students.

This carbon footprint report covers the campus facilities located in Joondalup, Mount Lawley, and Bunbury.

Organisational Boundary

ECU's GHG emissions scope and organisational boundary have been determined in accordance with the GHG Protocol (World Business Council for Sustainable Development, World Resources Institute, 2004).

The boundary follows the operational control model and includes the aspects of ECU's supply chain that they have influence over. GHG emissions from the organisation have been included and reported on where activity data was captured and recorded.

The business is deemed to have had operational control over the entities and facilities shown in figure 2 during the reporting period.

The boundary excludes emissions associated with the use of Manea College (SW campus) as well as off-campus facilities such as the ECU Health Centre in Wanneroo.

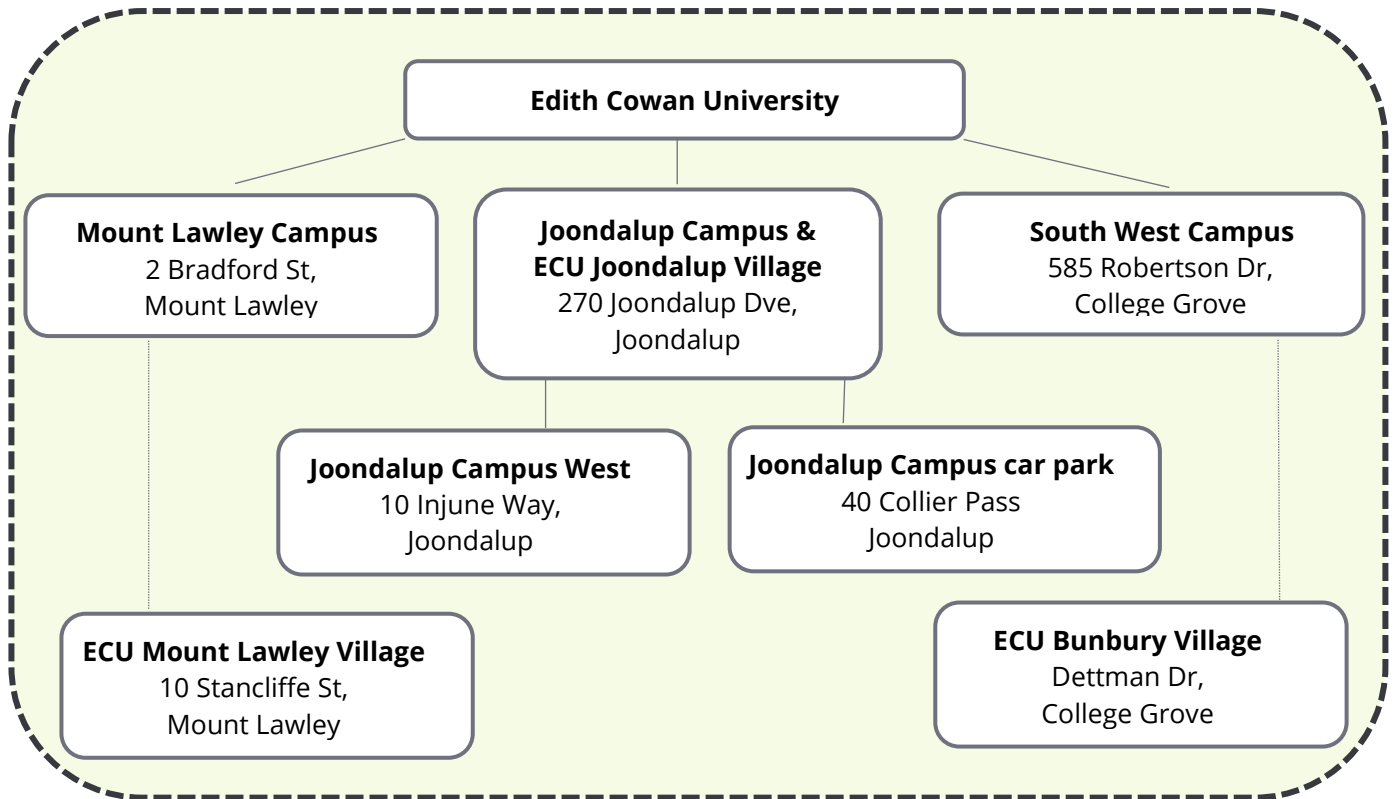


Figure 2 Organisational boundary of Edith Cowan University CY22 emissions inventory

Emissions Scope

The seven key greenhouse gas sources recognised by the IPCC have been considered in this assessment, and include:

- + Carbon dioxide (CO₂),
- + Methane (CH₄),
- + Nitrous oxide (N₂O),
- + Hydrofluorocarbons (HFCs),
- + Perfluorocarbons (PFCs),
- + Sulphur hexafluoride (SF₆) and,
- + Nitrogen trifluoride (NF₃)

All different sources are included and reported on as units of carbon dioxide equivalents (CO₂-e). This provides the ability to compare various greenhouse gasses as a single unit.

Classification Method

The GHG Protocol categorises GHG emissions into three 'scopes' (Figure 3).

Scope 1

Direct GHG emissions from operations owned or controlled by the reporting company (e.g., emissions from fuel consumed by vehicles under the control of the organisation).

Scope 2

Indirect emissions from the generation of purchased electricity or steam consumed by ECU.

Scope 3

Other indirect emissions (not included in Scope 2) that occur in the value chain of ECU.

Activities that can be included in this GHG emissions inventory are shown in Figure 4.

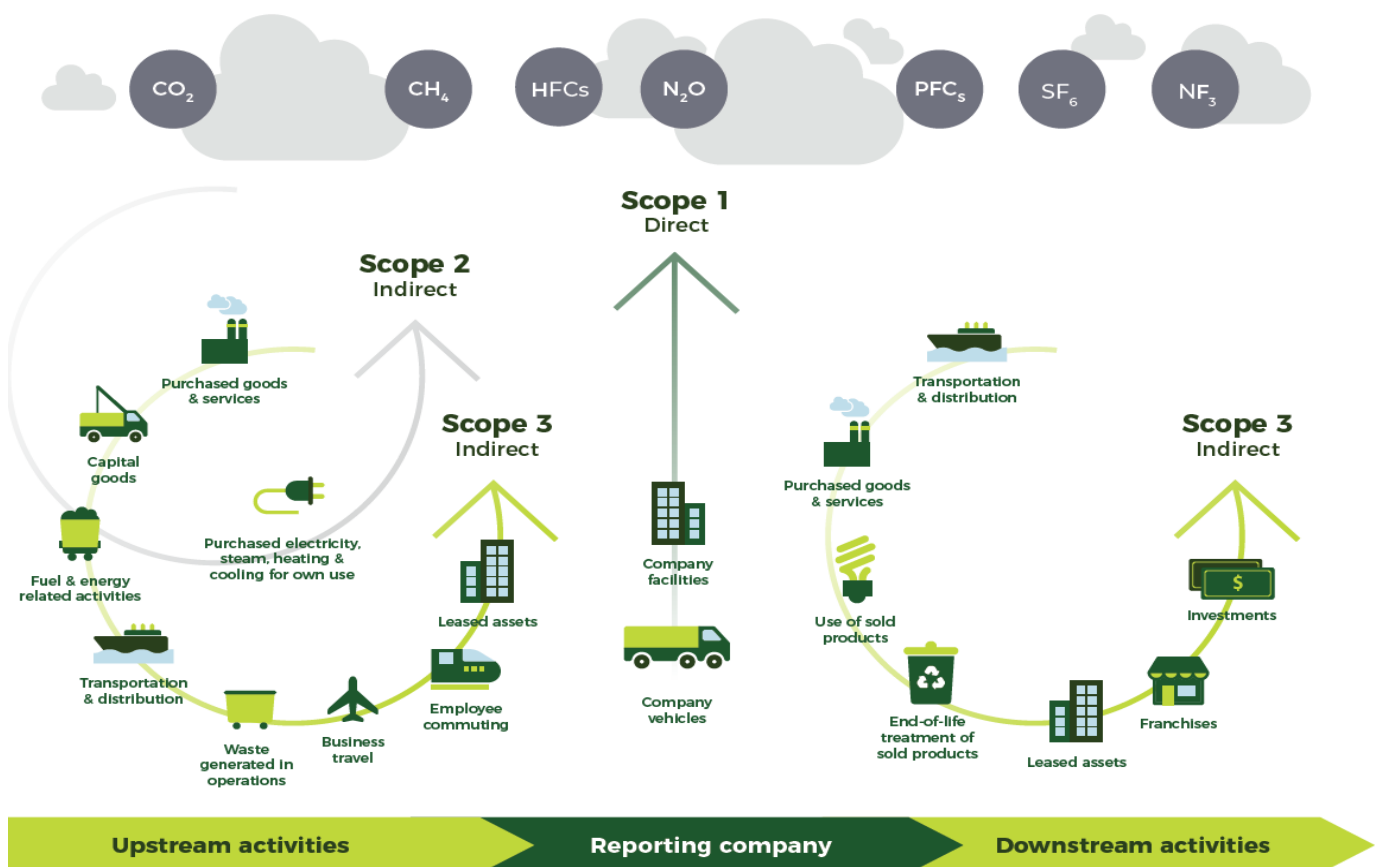


Figure 3 Diagram of scope by source

Emission Boundary

	Quantified	Not measured
Scope 1	Stationary equipment fuel consumption	
	Vehicle fuel consumption	
	Refrigerant leaks	
Scope 2	Electricity use	Imported steam
Scope 3	Purchased goods and services <ul style="list-style-type: none"> - Stationery & paper - Water use & disposal - Events 	Capital goods
	Freight <ul style="list-style-type: none"> - Removalists 	Staff & student commuting
	Indirect fuel and energy use	Upstream leased assets
	Waste generated in operations	Processing of sold products
	Business travel <ul style="list-style-type: none"> - Airt ravel - Event travel 	Use of sold products
		End-of-life treatment of sold products
		Downstream leased assets
		Franchises
	Investments	

Figure 4 Activities included and excluded in Edith Cowan University’s CY22 GHG emissions inventory

Methodology, Data Sources & Assumptions

Except where otherwise stated, scope 1 and 2 emissions have been calculated using the methodology and emission factors presented by the Australian Government's Australian National Greenhouse Accounts (NGA) Factors (Australian Government, Department of the Environment and Energy, November 2022).

Scope 3 emissions are often more complicated to quantify due to their varied and indirect nature. For scope 3 emissions, a variety of sources have been used, with methodologies following the guidance of the GHG Protocol Corporate Value Chain (Scope 3) Standard.

Calculation methodologies specific to each emission category are referenced in the corresponding category sections in this report. The most common calculation

methodologies include the Supplier-Specific Method, Hybrid Method, Average-Product Method and Average-Spend Method.

Sources include the UK government's GHG Conversion Factors for Company Reporting 2022 (UK Government's Department for Business, Energy & Industrial Strategy, Department for Environment, Food & Rural Affairs, 2022), the University of Melbourne's Environmental Performance in Construction (EPiC) database (Crawford, 2019), Australian Bureau of Statistics and Bureau of Meteorology (ABS, 2020).

Where the Economic Input-Output methodology was used, Carbon Neutral considered inflation and used the Reserve Bank of Australia's inflation calculator (Reserve Bank of Australia, 2022).

All energy and activity data provided ECU is taken to be complete and accurate. Carbon Neutral did not independently verify the completeness or accuracy of this data.

Data Collection & Quality

Business activities outlined under the GHG Protocol Standard are reported against where suitable activity data and emission factors are available and as agreed by the client ECU.

Carbon Neutral endeavours to ensure that reliable and accurate data is used. Assumptions are outlined where appropriate.

The following process was followed:

1. Carbon Neutral provided ECU with a list of data required to gather information about potential GHG emission activity sources.
2. ECU provided Carbon Neutral with data relating to GHG emitting activities.
3. Carbon Neutral reviewed the supplied activity data.
4. Carbon Neutral sought clarification of activity data where necessary and provided advice and guidance to staff as required to ensure that the most complete, accurate and robust data sources were used where available.
5. Carbon Neutral applied suitable methodologies and emission factors to the supplied activity data to determine the organisational GHG emissions of ECU for the reporting period.
6. Carbon Neutral calculated the GHG emissions of ECU in accordance with the GHG Protocol Standard and AS ISO 14064.1 – 2018 Greenhouse gases Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals.
7. Carbon Neutral prepared this Organisational Greenhouse Gas Emissions Inventory (Carbon Footprint) Report for ECU for the reporting period 1 January 2022 to 31 December 2022.

The veracity of the data provided by ECU is taken to be complete and accurate and has not been audited or independently verified.

A site visit of the locations was not conducted as part of this assessment.

Carbon Neutral acknowledges the assistance of the following ECU personnel for the provision of data and information relating to activity data used for the carbon footprint assessment:

- Ghaleb Jabado – Co-ordination of data, Electricity and Natural Gas consumption;
- Jas Ghaleigh – Stationery; ISS fuel use; waste; office paper
- Toni Conti Nibali – Event;
- Julie Hogarth – Air travel;
- Shelley Criddle – Fleet fuel consumption and removalists;
- Carl Overbye – Grounds equipment fuel use, grounds waste and mulch;

Total Emissions Summary

The total gross GHG emissions for Edith Cowan University for the Calendar Year 2022 period have been estimated at 19,074.88 t CO₂-e.

A breakdown of GHG emissions by scope is presented below in Table 1 and Figure 5.

Table 1 Total GHG emissions

GHG emissions scope	Emissions (t CO ₂ -e)	Percentage
Scope 1 Emissions	1,914.78	10.0%
Scope 2 Emissions	12,904.44	67.7%
Scope 3 Emissions	4,255.67	22.3%
Total Emissions	19,074.88	100%

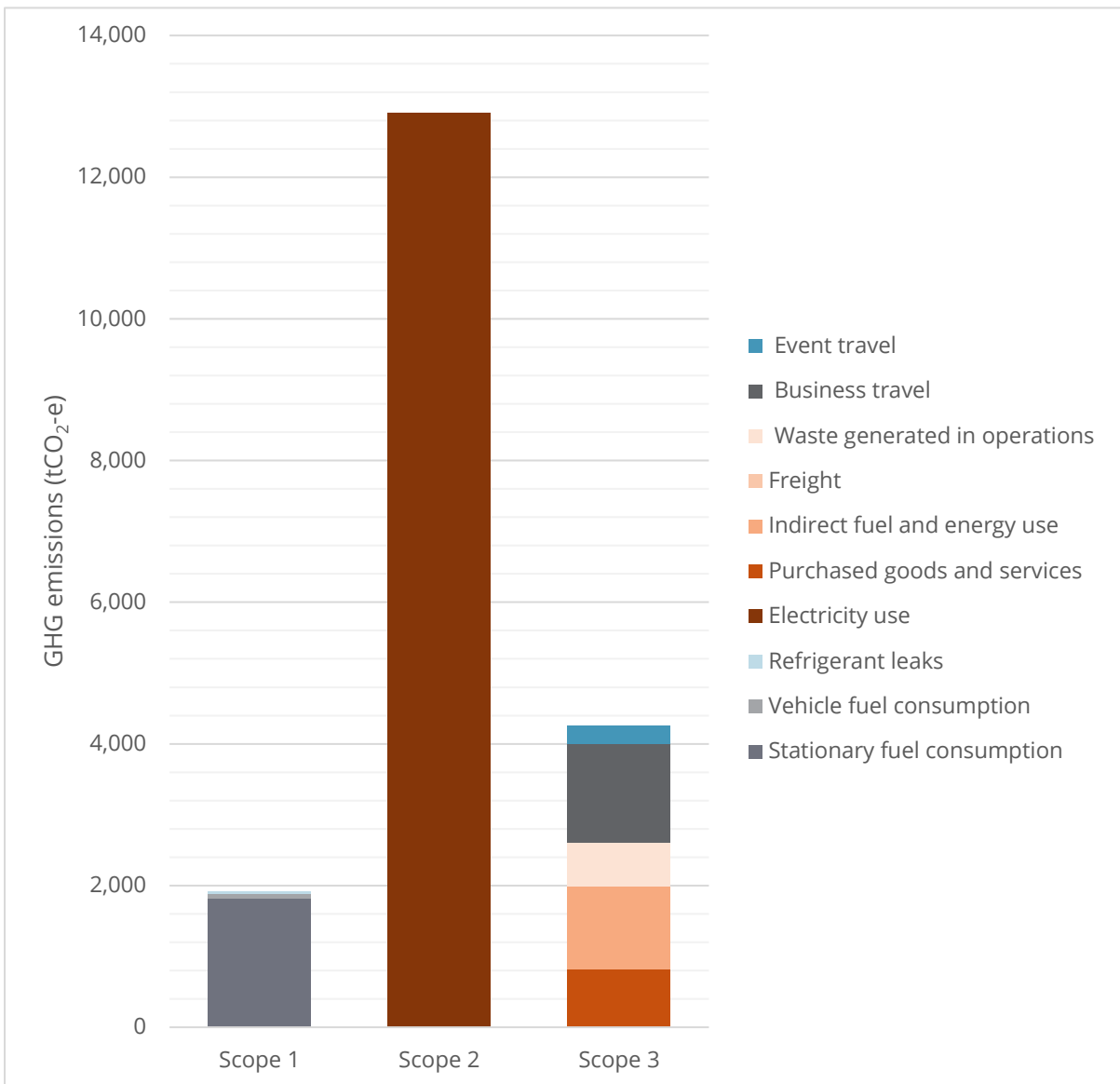


Figure 5 FY22 GHG emissions by scope for Edith Cowan University CY2022

Scope 1 Emissions

Scope 1 GHG emissions are released directly from sources that are controlled or operated by ECU.

Scope 1 emissions for ECU are estimated at **1,914.78 t CO₂-e**.

Table 2 Scope 1 emissions summary

Scope 1 activity	Activity data	Emissions (t CO ₂ -e)	Percentage
Natural gas consumption			
Joondalup campus	23,454.17 GJ	1,208.59	63.12%
Mount Lawley campus	11,374.12 GJ	586.11	30.61%
South West campus	273.06 GJ	14.07	0.73%
Fuel consumption (fleet vehicles)			
Petrol use	20,190.75 litres	46.69	2.44%
Diesel use	4,022.47 litres	10.91	0.57%
Fuel consumption (stationary equipment)			
Petrol use	1,200 litres	2.78	0.15%
Diesel use	600 litres	1.63	0.08%
Fuel consumption (ISS vehicles)			
Petrol use - Joondalup	740 litres	1.72	0.09%
Diesel use - Mt Lawley	294 litres	0.68	0.04%
Fuel consumption (ISS equipment)			
Petrol use - Joondalup	220 litres	0.51	0.03%
Diesel use - Mt Lawley	135 litres	0.31	0.02%
Petrol use - SW	40 litres	0.09	0.00%
Diesel use - All facilities	1,530 litres	4.15	0.22%
Refrigerant leaks (replenishments)			
R438A	4 kg	12.98	0.68%
R404A	5 kg	19.72	1.03%
R410A	2 kg	3.85	0.20%
	TOTAL	1,914.78	100.0%

Natural gas consumption

Natural gas used in campuses operated by ECU.

Carbon Neutral used 2022 NGA Factors to calculate emissions from natural gas consumption in ECU facilities (Australian Government, Department of the Environment and Energy, November 2022).

Fuel consumption (fleet vehicles & ISS utilities)

Fuel used in fleet vehicles.

Carbon Neutral used 2022 NGA Factors to calculate emissions from fuel consumption in ECU fleet vehicles (Australian Government, Department of the Environment and Energy, November 2022).

Consumption data for ISS vehicles was not available and was based on using a vehicle fuel efficiency of 11.1 L/100km petrol for a Toyota Hilux utility (Toyota, 2023).

Fuel consumption (stationery equipment)

Fuel used in ground equipment.

Carbon Neutral used 2022 NGA Factors to calculate emissions from fuel consumption in grounds equipment (Australian Government, Department of the Environment and Energy, November 2022).

Refrigerant leaks

Leaks from chiller refrigerant gases.

Carbon Neutral used 2022 NGA Factors to calculate emissions from refrigerant gas in ECU facilities (Australian Government, Department of the Environment and Energy, November 2022).

Calculation methodology:

- Natural gas, Stationery equipment fuel, Fleet fuel, ISS fuel.

Estimates of emissions from the combustion of individual fuel types are made by multiplying a (physical) quantity of fuel combusted by a fuel-specific energy content factor and a fuel specific emission factor for fuel used in stationary equipment and vehicles.

- Refrigerant leaks.

Estimates of emissions from refrigerant leakages are based on replenishment weights of refrigerant gases used during the year which are multiplied by the global warming potential of individual refrigerants.

Emission factors and allowances are shown in [Appendix A](#).

Data source	References
Natural gas consumption ECU Gas and EC_Data-2022 Consumption spreadsheet	(Australian Government, Department of the Environment and Energy, November 2022) - Table 3 Direct (Scope 1) emissions from consumption of gaseous fuels including liquefied natural gas
Fuel consumption (fleet & ISS vehicles) Carbon Neutral Report CSO - Fleet & Transport Data Collection Tool - ISS 2022	(Australian Government, Department of the Environment and Energy, November 2022) - Table 7 Direct (scope 1) and indirect (scope 3) emissions from consumption of transport fuels in different transport equipment
Fuel consumption (grounds & ISS stationery equipment) Data Collection Tool - ECU Grounds 2022 Data Collection Tool - ISS 2022	(Australian Government, Department of the Environment and Energy, November 2022) - Table 6 Direct (Scope 1) and indirect (scope 3) emissions from consumption of liquid fuels, including certain petroleum based products for stationary energy purposes
Refrigerant leaks ECU Refrigerant Log – 2022 (BGIS Technical Services)	(Australian Government, Department of the Environment and Energy, November 2022) - Table 9 Global warming potentials of common refrigerants (Department of Climate Change, Energy, the Environment and Water, 2021) - HFC blends

Scope 2 Emissions

Scope 2 emissions are indirect GHG emissions associated with imported electricity use.

The indirect scope 2 emissions from electricity use for ECU are estimated at **12,904.44 t CO₂-e** for CY22.

Table 3 Scope 2 emissions summary

GHG emissions – Scope 2	kWh	Emission factor (kg CO ₂ -e/kWh)	Emissions (t CO ₂ -e)
Facility			
40 Collier pass Joondalup	965,123	0.51	492.21
270 Joondalup Drive Joondalup	15,506,270	0.51	7908.20
10 Injune Way Joondalup	389,127	0.51	198.45
10 Stancliffe St Mount Lawley	752,891	0.51	383.97
2 Bradford St Mount Lawley	6,070,673	0.51	3096.04
Lot 560 Dettman Dr, College Grove	1,618,730	0.51	825.55
Total emissions Scope 2	25,302,815		12,904.44

Electricity use

Imported electricity used in facilities controlled by the organisation.

Carbon Neutral used 2022 NGA Factors to estimate imported electricity emissions for ECU.

Data sources	References
Electricity use ECU Gas and EC_Data-2022 Consumption spreadsheet	(Australian Government, Department of the Environment and Energy, November 2022) - Table 1 Indirect (Scope 2 and Scope 3) emissions from consumption of purchased electricity from a grid (South West interconnected system)

Scope 3 Emissions

The GHG protocol (GHG Protocol, Carbon Trust & WRI, 2013) identifies Scope 3 emissions as upstream and downstream emissions, based on the financial transactions of the reporting company.

- + **Upstream emissions** are indirect GHG emissions related to purchased or acquired goods and services.
- + **Downstream emissions** are indirect GHG emissions related to sold goods and services.

The GHG Protocol Scope 3 Standard further divides Scope 3 emissions into fifteen distinct categories. Scope 3 emissions inventory calculations are presented according to these

categories.

Guidance on the inclusion of Scope 3 emission sources is further provided by Corporate Value Chain Accounting and Reporting Standard. (World Resources Institute; World Business Council for Sustainable Development, 2011)

The indirect emissions of all Scope 3 activities included are estimated at **4,255.67 t CO₂-e** for CY22.

The most significant contribution to Scope 3 emissions in ECU's value chain came from air (business) travel followed by indirect fuel and energy use.

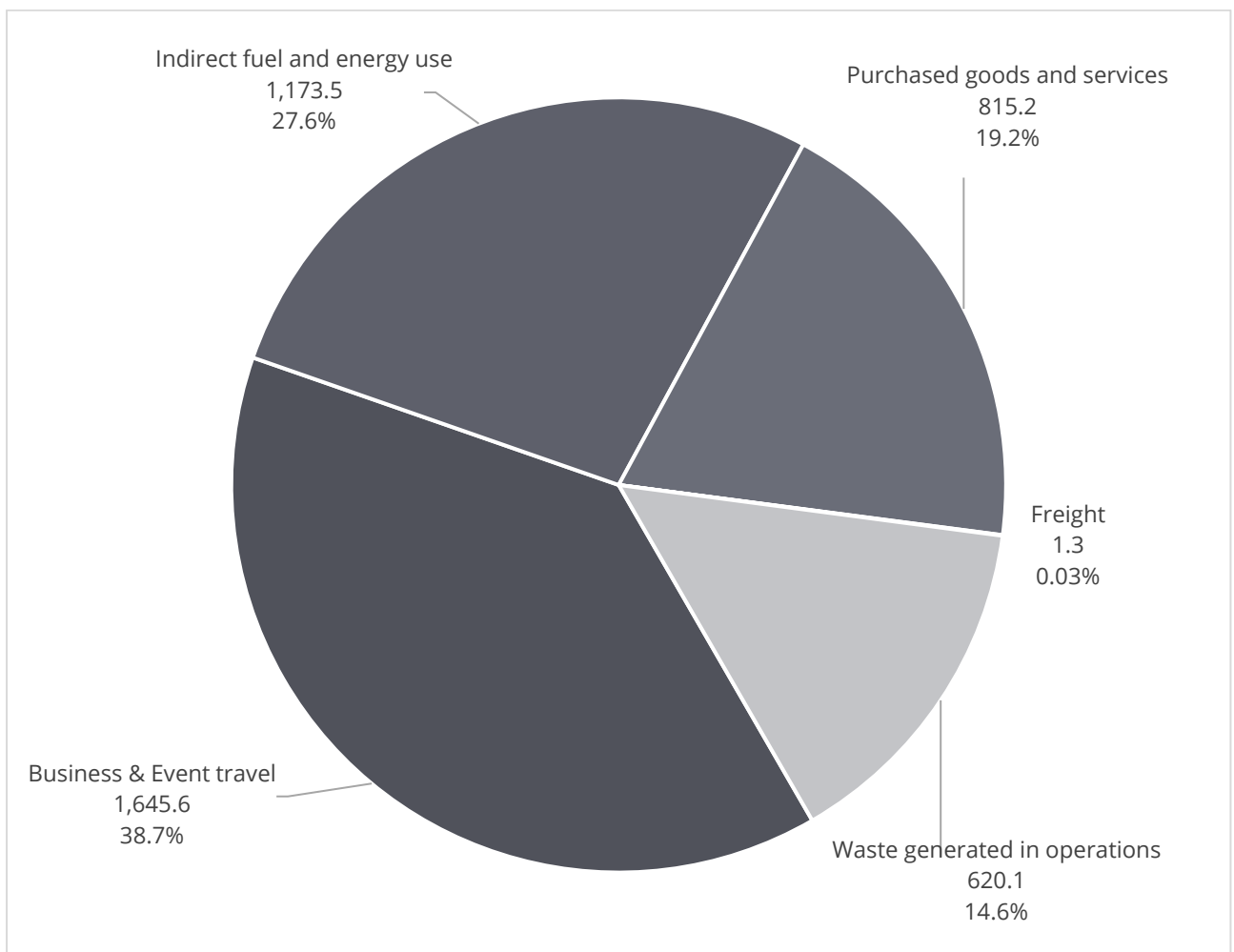


Figure 6 CY22 Scope 3 emissions by activity for Edith Cowan University (t CO₂-e; % of scope 3)

Scope 3 Emissions Summary

Table 4 Scope 3 emissions

Scope 3 GHG emissions category		Emissions (t CO ₂ -e)	Share of scope 3 total (%)
Upstream emissions			
1	Purchased goods and services		19.2%
	- Stationery (Complete Office Supplies)	76.00	
	- Water use and disposal	311.06	
	- Events (excluding travel)	335.00	
	- Office paper (Fuji Xerox)	93.15	
2	Capital goods	Excluded	-
3	Indirect fuel and energy use	1,173.53	27.6%
4 & 9	Inbound / outbound freight		0.03%
	- Removalists use	0.28	
	- ISS freight between campuses	1.00	
5	Waste generated in operations	620.09	14.6%
6	Business travel		38.7%
	- Air travel	1,389.82	
	- Event travel	255.74	
7	Employee & student commuting	Excluded	-
8	Upstream leased assets	Excluded	-
Downstream emissions			
9	Outbound freight	See inbound freight	-
10	Processing of sold products	Excluded	-
11	Use of sold products	Excluded	-
12	End-of-life treatment of sold products	Excluded	-
13	Downstream leased assets	Excluded	-
14	Franchises	Excluded	-
15	Investments	Excluded	-
Total emissions Scope 3		4,255.67	100%

Scope 3 Standard Emissions Categories

Category 1: Purchased goods and services		
Category description	Upstream (i.e., cradle-to-gate) GHG emissions from the production of products and services purchased by ECU in CY22. The boundary of this activity is as agreed with ECU.	
Activity	Emissions (t CO ₂ -e)	Percentage
Stationery (Complete Office Supplies purchases)	76.00	9.32%
Water use and disposal	311.06	38.16%
Events:		
- Meals	166.13	20.38%
- Additional infrastructure	112.95	13.86%
- Venue hire	55.21	6.77%
- Accommodation	0.70	0.09%
Office paper (Fuji Xerox)	93.15	11.43%
Total	815.20	100 %

Calculation boundary

This category covers emissions embodied within goods and services used by the business during the year.

This includes goods purchased from Corporate Office Supplies, paper supplied by Fuji Xerox in copiers, mains water use and disposal and goods and services purchases associated with events hosted by the university.

Calculation methodology

A variety of methods was used to determine emissions from Purchased Goods and Services depending on the availability of data.

The 'spend-based' method was used to calculate Corporate Office Supplies emissions, with industry-average emission factors applied, based on the economic value of the goods and services.

The relevant economic sector emission factors from the EPiC database (Crawford,

2019) were then applied to calculate the overall emissions estimate for this category. The Reserve Bank of Australia's Inflation calculator (Reserve Bank of Australia, 2022).

For the use of accommodation, emissions were determined using 2022 DBEIS Factors which are applied for the country as well as the number of room nights stay (UK Government's Department for Business, Energy & Industrial Strategy, Department for Environment, Food & Rural Affairs, 2022).

Emission factors associated with the use of water and disposal of sewage are obtained from the Australian Bureau of Meteorology Department. Data from the most recent National Performance Report 2021-22: Urban Water Utilities Dataset has been used (Bureau of Metereology, 2022). Sewage discharge rates applied are as per previous reporting periods.

Office paper emissions are based on the weight of paper used which has been estimated by multiplying the number of sheets of Fuji Xerox paper used in copiers

(allowance based on an A4 80gsm sheet at 5g/sheet).

No allowance has been made for the use of any carbon neutral paper as this level of information was not available in the COS data supplied for the assessment.

Carbon Neutral bases its emission factors for office paper supplied by Fuji Xerox on information obtained from Opal Australian Paper's Climate Active 2021 disclosure

statement (Paper Australia Pty Ltd, 2021) with an allowance for emissions associated with importing the paper (Indufor, 2016).

Emissions associated with the use of purchased goods and services are estimated at **815.20 t CO₂-e**.

For a summary of emissions by type of good/service, see [Appendix B](#).

Data sources	References
<p>Purchased goods and services</p> <p>Stationery ECU Expenditure Report - 1.1.2022-31.12.2022 (COS Consolidated Usage Report for Edith Cowan University from 01 Jan 2022 to 31 Dec 2022)</p> <p>Event purchases 2022 Event Totals for Emissions data_CE</p>	<p>Database Environmental Performance in Construction (EPIC). (Crawford, 2019)</p>
<p>Water use and disposal 2022 Master Energy and Water Figures Quarterly</p>	<p>National Performance Report; Urban Water Utilities Part B The_complete_dataset_2020-21 (Bureau of Metereology, 2022)</p> <ul style="list-style-type: none"> - Water Corporation – Perth - Water Corporation – Bunbury (sewerage) - Aqwest – Bunbury Water Corporation
<p>Accommodation 2022 Event Totals for Emissions data_CE</p>	<p>(UK Government's Department for Business, Energy & Industrial Strategy, Department for Environment, Food & Rural Affairs, 2022)</p> <ul style="list-style-type: none"> - Australia
<p>Office paper 2022 executive summary (Fuji Xerox)</p>	<p>(Paper Australia Pty Ltd, 2021) (Indufor, 2016)</p>

Category 2: Capital goods

Category description	GHG emissions generated upstream of ECU operations associated with the extraction, production and transportation of capital goods purchased or acquired.
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Not measured

Embodied emissions associated with capital equipment purchased have not been quantified as agreed with ECU.

Category 3: Indirect fuel and energy use			
Category description	Indirect GHG emissions from extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling. It also includes indirect emissions from the transmission and/or distribution of those resources.		
Scope 3 activity	Activity data	Emissions (t CO ₂ -e)	Percentage
Electricity consumption			
Joondalup campus	16,860,520 kWh	674.42	57.47%
Mount Lawley campus	6,823,564 kWh	272.94	23.26%
South West campus	1,618,730 kWh	64.75	5.52%
Natural gas consumption			
Joondalup campus	23,454.17 GJ	96.16	8.19%
Mount Lawley campus	11,374.12 GJ	46.63	3.97%
South West campus	273.06 GJ	1.09	0.09%
Fuel consumption (fleet vehicles)			
Petrol use	20,190.75 litres	11.88	1.01%
Diesel use	4,022.47 litres	2.69	0.23%
Fuel consumption (stationary equipment)			
Petrol use	1,200 litres	0.71	0.06%
Diesel use	600 litres	0.40	0.03%
Fuel consumption (ISS vehicles)			
Petrol use - Joondalup	740 litres	0.44	0.04%
Diesel use - Mt Lawley	294 litres	0.17	0.01%
Fuel consumption (ISS equipment)			
Petrol use - Joondalup	220 litres	0.13	0.01%
Diesel use - Mt Lawley	135 litres	0.08	0.01%
Petrol use - SW	40 litres	0.02	0.00%
Diesel use - All facilities	1,530 litres	1.02	0.09%
	TOTAL	1,173.53	100.0%

Calculation boundary

All fleet fuel and grounds equipment fuel consumption including some contractor use

(ISS) on campuses (petrol and diesel).

Grid purchased electricity and natural gas used on campuses.

Calculation methodology

Carbon Neutral used the average-data method to calculate emissions from this category, which involves estimating emissions using secondary (e.g., industry average) emissions factors for upstream emissions per unit of consumption.

Carbon Neutral used 2022 NGA Factors to estimate indirect fuel and energy emissions ([Appendix C](#)).

The total indirect emissions for ECU from the use of fuel and energy are estimated at **1,173.53 t CO₂-e**.

Data sources	References
Electricity use ECU Gas and EC_Data-2022 Consumption spreadsheet	(Australian Government, Department of the Environment and Energy, November 2022) - Table 1 Indirect (Scope 2 and Scope 3) emissions from consumption of purchased electricity from a grid (South West interconnected system)
Natural gas consumption ECU Gas and EC_Data-2022 Consumption spreadsheet	(Australian Government, Department of the Environment and Energy, November 2022) - Table 4 Indirect (Scope 3) emissions from consumption of natural gas
Fuel consumption (fleet & ISS vehicles) Carbon Neutral Report CSO - Fleet & Transport Data Collection Tool - ISS 2022	(Australian Government, Department of the Environment and Energy, November 2022) - Table 7 Direct (scope 1) and indirect (scope 3) emissions from consumption of transport fuels in different transport equipment
Fuel consumption (grounds & ISS stationery equipment) Data Collection Tool - ECU Grounds 2022 Data Collection Tool - ISS 2022	(Australian Government, Department of the Environment and Energy, November 2022) - Table 6 Direct (Scope 1) and indirect (scope 3) emissions from consumption of liquid fuels, including certain petroleum based products for stationary energy purposes

Category 4: Incoming freight / Category 9: Outgoing freight

Category description	GHG emissions from the transportation of goods on and between campuses in contractor vehicles in the reporting year.		
Type	Mode	Distance	Emissions (t CO₂-e)
Removalists	Rigid truck	239	0.23
Removalists	Light commercial	120	0.05
ISS	Light commercial	2,400	1.00
	Total		1.28

Calculation boundary

This category includes emissions from transportation of goods on and between campuses in vehicles not owned or controlled by ECU. This includes the use of removalists as well as ECU contractor ISS.

This excludes any deliveries in fleet vehicles which are reported as scope 1 emissions.

Other inbound and outbound freight movements are also excluded.

Calculation Methodology

Carbon Neutral used the distance-based method to calculate emissions from this category.

An average distance emission factor is applied using ABS data (ABS, 2020) and the NGER Factors (Australian Government, Department of the Environment and Energy, November 2022).

Total emissions of categories 4 and 9 are calculated at **1.28 t CO₂-e**.

Data sources	References
Inbound & Outbound Freight	(ABS, 2020); (Australian Government, Department of the Environment and Energy, November 2022)
Carbon Neutral Report CSO (Fleet)	- Rigid truck – 0.9672 kg CO ₂ -e/km
Data Collection Tool - ISS 2022	- Light commercial – 0.4162 kg CO ₂ -e/km

Category 5: Waste generated in operations

Category description	GHG emissions associated with waste treatment in facilities owned or operated by third parties.			
Commercial & industrial Compost	Weight (t)	EF (t CO ₂ /t waste)	Emissions (t CO ₂ -e)	Percentage
All facilities – C & I	205.04	1.30	266.55	42.99%
Joondalup – C & I	168.54	1.30	219.10	35.33%
Joondalup - Composted	107.4	0.046	4.94	0.80%
Mt Lawley – C & I	85.69	1.30	111.40	17.96%
Mt Lawley - Composted	40.55	0.046	1.87	0.30%
SW – C & I	11.99	1.30	15.59	2.51%
SW – Composted	14.00	0.046	0.64	0.10%
Total	633.21		620.09	100 %

Calculation boundary

This category included all emissions that resulted from waste generated in CY22 for ECU.

Calculation methodology

The weight of waste materials generated in facilities operated by ECU was obtained from contractor spreadsheets and reports as well as from estimates of grounds staff.

Emission factors are obtained from the NGER Factors (Australian Government,

Department of the Environment and Energy, November 2022).

Materials separated and sent for recycling or re-use are excluded from the emissions inventory.

Emissions avoided by sending materials for recycling instead of to burial are estimated at 857.60 t CO₂-e.

Total emissions of category 5 were calculated at **620.09 t CO₂-e**.

Data sources	References
General Waste Data Collection Tool - ISS 2022 Data Collection Tool - ECU Grounds 2022 Cleanaway Big Picture Waste & Recycling Report 2022	(Australian Government, Department of the Environment and Energy, November 2022) - Table 14 Indirect (scope 3) waste emission factors for total waste disposed to landfill by broad waste stream category

Category 6: Business travel

Category description GHG emissions from the transportation of employees for business-related activities in vehicles owned or operated by third parties, such as aircraft, trains, buses, and private vehicles. Attendee and staff travel to events hosted by the university.

Flight type	Distance (km)	EF (kg CO ₂ -e/p.km)	Emissions (t CO ₂ -e)	
Air travel				
Regional haul	27,143	0.1569	4.26	
Domestic haul	93,928	0.2728	25.62	
Short haul economy	2,286,971	0.1676	383.20	
Short premium economy	1,331	0.1703	0.23	
Short haul business	265,950	0.2513	66.84	
Short haul first	1,446	0.2513	0.36	
International haul economy	3,560,401	0.1560	555.51	
International haul prem econ.	247,962	0.2496	61.90	
International haul business	541,038	0.4525	244.80	
International haul first	75,450	0.6241	47.09	
Air travel (sub-total)	7,101,620		1,389.82	
Event travel				
Event travel	No trips	Distance per trip (km)	EF (g CO ₂ -e/p.km)	Emissions (t CO ₂ -e)
Attending by car	27,487	32.1	277	243.98
Attending by train	7,853	32.1	36.06	9.09
Attending by bus	1,961	10	136.46	2.68
Walking or cycling	1,961	10	0	0.00
Event travel (sub-total)	39,261			255.74
Business travel			Total	1,645.56

Calculation boundary

This category included all emissions that resulted from business related air travel in CY22 for ECU.

This activity also includes land travel by attendees of events hosted by the university.

Calculation methodology

Emissions from flights are determined using DBEIS Factors (UK Government's Department for Business, Energy & Industrial Strategy, Department for Environment, Food & Rural Affairs, 2022).

The large number of attendees makes it difficult to determine individual modes of

transport to events. Assumptions are used for the mode of transport and distance travelled by attendees.

Travel from overseas and interstate is not included.

ECU has limited influence over whether visitors travel to events such as graduation ceremonies.

Emissions for accommodation and public transport use are sourced from the DBEIS Factors (UK Government's Department for Business, Energy & Industrial Strategy, Department for Environment, Food & Rural Affairs, 2022).

Total emissions of category 6 were calculated at **1,645.56 t CO₂-e**.

Category 7: Staff & student commuting

Category description

GHG emissions from the transportation of employees and students between their homes and the university. Emissions from commuting may arise from private vehicle travel, bus travel, rail travel and/or air travel.

Excluded

No allowances have been made for staff and student commuting. Emissions from this activity are excluded due to a lack of data.

Category 8: Upstream leased assets

Category description

GHG emissions from the operation of assets that are leased by ECU. This category is applicable only to companies that operate leased assets (i.e., lessees).

Excluded

No allowances have been made for upstream leased assets. Emissions from electricity used in facilities leased by ECU are excluded.

Category 9: Outgoing freight

Category description

GHG emissions that occurred from transportation and distribution of sold products in vehicles not owned or controlled by ECU.

See Category 4: Outgoing freight

Emissions from outgoing freight (between campuses) have been reported under category 4 Incoming Freight.

Category 10: Processing of sold products

Category description

GHG emissions from the processing of sold intermediate products by third parties (e.g., manufacturers). Intermediate products are products that require further processing, transformation, or inclusion in another product before and therefore result in emissions from processing after sale and before use by the end consumer.

Excluded

No allowances have been made for products and services offered by the university that may be subject to further processing.

Category 11: Use of sold products

Category description

GHG emissions from the downstream use of products and services provided by ECU in CY22. ECU scope 3 emissions from the use of sold products and services include the scope 1 and scope 2 emissions of end users. End users include both consumers and business customers that use final products.

Non-quantified

No allowances have been made for emissions associated with the use of equipment sold by ECU. These emissions would be difficult to accurately quantify and are excluded from the organisational emissions inventory.

Category 12: End-of-Life treatment of sold products

Category description	GHG emissions from the waste disposal and treatment of products sold by ECU at the end of the product's life.
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Excluded

No allowances have been made for end-of-life emissions associated with the disposal of products provided by ECU.

Category 13: Downstream leased assets

Category description	GHG emissions from the operation of assets that are owned by the reporting company (acting as lessor) and leased to other entities in the reporting year that are not already included in scope 1 or scope 2.
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Excluded

No allowances have been made for the use of any downstream leased assets owned by ECU.

Category 14: Franchises

Category description	GHG emissions from the operation of franchises not included in scope 1 or scope 2. A franchise is a business operating under a license to sell or distribute another company's goods or services within a certain location.
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Excluded

ECU does not have any franchisees. Therefore, this category is not applicable for the organisation.

Category 15: Investments

Category description	GHG emissions associated with ECU investments, not already included in scope 1 or scope 2.
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Excluded

ECU has not disclosed any investments. Therefore, this category is deemed not applicable for the organisation and is outside the boundary of this assessment.

Energy Use

ECU's total facility and fleet energy use for the three campuses is shown in table 5 below.

Table 5 Total Energy Use for Joondalup, Mount Lawley and South West campuses.

DETAILS	GJ used
Natural gas - Joondalup	23,454.17
Natural gas - Mt Lawley	11,374.12
Natural gas - SW	273.06
Liquid fuels - transport (ECU grounds)	845.79
Liquid fuels - equipment (ECU grounds)	64.20
Liquid fuels - transport (ISS)	35.36
Liquid fuels - equipment (ISS)	72.57
Electricity - Joondalup	60,697.87
Electricity - Mt Lawley	24,564.83
Electricity - SW	5,827.43
TOTAL	127,209.40

Emissions Intensity

Equivalent full-time student load (EFTSL) figures are available for the years 2009 to 2022. This has been used to provide an indication of emissions intensity for ECU’s GHG emissions.

The emissions intensity shows the university’s GHG emissions relative to student numbers. This allows a comparison of emissions to be made on a year to year basis against a metric of number of enrolments.

The following table shows ECU’s gross GHG emissions per equivalent full-time student load for the periods 2008 to 2022.

Table 6 Emissions intensity (per EFTSL)

Year	EFTSL	t CO ₂ -e / EFTSL
2008	16,011	2.15
2009	15,912	1.90
2010	17,662	1.31
2011	17,870	1.69
2012	18,870	1.52
2013	17,816	1.49
2014	17,663	1.43
2015	17,268	1.43
2016	18,249	1.40
2017	19,000	1.32
2018	19,663	1.28
2019	20,129	1.25
2020	20,203	1.03
2021	20,375	0.96
2022	14,098	1.35

Historical GHG Emissions

Gross GHG emission decreased from 34,371.42 t CO₂-e in the baseline year (CY2008) to 19,074.88 t CO₂-e in CY2022. Emissions for the university have also decreased compared to the previous reporting periods.

Table 7 show the change in emissions by activity over these periods.

Table 7 Historical GHG emissions by activity – FY2020 to FY2022

Activity	GHG Emissions (t CO ₂ -e)			
	2008	2020	2021	2022
Vehicle and Equipment (Scope 1)	197.09	64.45	64.31	69.46
Fugitive Emissions (Refrigerant Leakage) (Scope 1)	223.25	108.38	179.88	36.54
Natural Gas (Scope 1)	948.48	1,544.74	1,826.54	1,808.77
Electricity (Scope 2)	22,879.07	16,854.41	15,708.84	12,904.44
Air Travel (Scope 3)	5,094.86	400.24	55.05	1,389.82
Waste (Scope 3)	534.49	234.00	217.10	620.09
Consumables (Scope 3)	335.13	32.78	90.75	169.14
Water use and disposal (Scope 3)	16.14	7.60	432.97	311.06
Natural Gas (Scope 3)	65.08	122.89	145.31	143.89
Electricity (Scope 3)	2,457.47	495.72	234.46	1,012.11
Vehicle and Equipment (Scope 3)	14.25	17.32	17.17	17.53
Events (Scope 3)	1,606.11	467.16	542.29	590.74
Freight (Scope 3)	N/A	0.00	2.85	1.28
Total	34,371.42	20,769.67	19,517.54	19,074.88

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Appendix A

Scope 1 – Vehicle and stationary fuel allowances and emission factors

Table A1 ECU transport fuel use and emission factors (Australian Government, Department of the Environment and Energy, November 2022)

Fuel Combusted	Q (L)	EC (GJ/kL)	CO ₂ EF	CH ₄ EF	N ₂ O EF	CO ₂	CH ₄	N ₂ O	Total
			(kg CO ₂ -e/GJ)			t CO ₂ -e			
Gasoline – post 2004 vehicle	20,190.75	34.2	67.4	0.02	0.2	46.54	0.01	0.14	46.69
Diesel oil – post 2004 vehicle	4,022.47	38.6	69.9	0.1	0.2	10.85	0.02	0.03	10.90
Total						57.39	0.03	0.17	57.59

Table A2 ECU stationary equipment fuel use and emission factors (Australian Government, Department of the Environment and Energy, November 2022)

Fuel Combusted	Q (L)	EC (GJ/kL)	CO ₂ EF	CH ₄ EF	N ₂ O EF	CO ₂	CH ₄	N ₂ O	Total
			(kg CO ₂ -e/GJ)			t CO ₂ -e			
Petrol	1200	34.2	67.4	0.2	0.2	2.77	0.01	0.01	2.78
Diesel oil	600	38.6	69.9	0.1	0.2	1.62	0.00	0.00	1.63
Total						4.38	0.01	0.01	4.41

Table A3 ECU natural gas use and emission factors (Australian Government, Department of the Environment and Energy, November 2022)

Facility	Q (GJ)	CO ₂ EF	CH ₄ EF	N ₂ O EF	CO ₂	CH ₄	N ₂ O	Total
		(kg CO ₂ -e/GJ)			t CO ₂ -e			
Joondalup	23,454.17	51.4	0.1	0.03	1,205.54	2.35	0.70	1,208.59
Mount Lawley	11,374.12	51.4	0.1	0.03	584.63	1.14	0.34	586.11
SW Campus	273.06	51.4	0.1	0.03	14.04	0.03	0.01	14.07
Total					1,804.21	3.51	1.05	1,808.77

Table A4 refrigerant replenishments and emission factors (Australian Government, Department of the Environment and Energy, November 2022); (Australian government, Department of Climate Change, Energy, The Environment and Water, 2021)

Gas type	Replenishment weight	Global warming potential	Reference	Total
	(kg)			t CO ₂ -e
R438A	4	3,245	(Australian government, Department of Climate Change, Energy, The Environment and Water, 2021)	12.98
R404A	5	3,943	(Australian Government, Department of the Environment and Energy, November 2022)	19.72
R410a	2	1,924	(Australian Government, Department of the Environment and Energy, November 2022)	3.85
Total				36.54

Table A5 ISS transport fuel use and emission factors (Australian Government, Department of the Environment and Energy, November 2022)

Fuel Combusted	Q (L)	EC (GJ/kL)	CO ₂ EF	CH ₄ EF	N ₂ O EF	CO ₂	CH ₄	N ₂ O	Total
			(kg CO ₂ -e/GJ)			t CO ₂ -e			
Gasoline – post 2004 vehicle	740	34.2	67.4	0.02	0.2	46.54	0.01	0.14	46.69
Diesel oil – post 2004 vehicle	294	38.6	69.9	0.1	0.2	10.85	0.02	0.03	10.90
Total						57.39	0.03	0.17	57.59

Table A6 ISS stationary equipment fuel use and emission factors (Australian Government, Department of the Environment and Energy, November 2022)

Fuel Combusted	Q (L)	EC (GJ/kL)	CO ₂ EF	CH ₄ EF	N ₂ O EF	CO ₂	CH ₄	N ₂ O	Total
			(kg CO ₂ -e/GJ)			t CO ₂ -e			
Petrol	395	34.2	67.4	0.2	0.2	1.71	0.01	0.01	1.72
Diesel oil	1,530	38.6	69.9	0.1	0.2	0.68	0.00	0.00	0.68
Total						2.38	0.01	0.01	2.40

Appendix B

Emission factors by use (water)

Scope 3 – Category 1 Purchased goods and services emission factors

Table B1 Emission factors for Category 1 Purchased goods and services – water use and disposal. (Bureau of Metereology, 2022)

Facility	Water Utility	Usage	Emission factor		Use GHG	Disposal GHG
		ML	Use (t CO ₂ -e/ML)	Disposal (t CO ₂ -e/ML)	t CO ₂ -e	(t CO ₂ -e)
Joondalup	Water Corporation - Perth	91.869	1.74	0.71	160.30	49.10
Mount Lawley	Water Corporation - Perth	45.247	1.74	0.71	78.95	19.67
SW Campus	Bunbury Water Corporation	4.658	0.37	0.71	1.74	1.29
Total					311.06	

Scope 3 – Category 1 Purchased goods and services emission factors

Table B2 Emission factors and GHG emissions by sector type for Category 1 Purchased goods and services – Accommodation (UK Government's Department for Business, Energy & Industrial Strategy, Department for Environment, Food & Rural Affairs, 2022)

Source	Location		EF	Total (t CO ₂ -e)
		No nights	(kg CO ₂ -e/night)	
Events	Accommodation – Australia	20 nights	35.0	0.70

Scope 3 – Category 1 Purchased goods and services emission factors

Table B3 Emission factors and GHG emissions by sector type for Category 1 Purchased goods and services – Corporate Office Supplies (COS) and Events (Crawford, 2019)

Source	Sector / expense type	Cost	EF	Total (t CO ₂ -e)
		(\$)	(kg CO ₂ -e/ \$)	
COS	15 Dairy Product Manufacturing	\$1,838.50	1.34	2.46
COS	16 Fruit and Vegetable Product Manufacturing	\$48.70	0.46	0.02
COS	19 Bakery Product Manufacturing	\$2,088.31	0.51	1.07
COS	20 Sugar and Confectionery Manufacturing	\$4,747.30	0.71	3.35
COS	21 Other Food Product Manufacturing	\$12,711.02	0.61	7.69
COS	22 Soft Drinks, Cordials and Syrup Manufacturing	\$14.04	0.39	0.01
COS	27 Textile Product Manufacturing	\$562.13	0.69	0.39
COS	32 Other Wood Product Manufacturing	\$1,052.39	0.41	0.43

COS	33 Pulp, Paper and Paperboard Manufacturing	\$46.16	0.85	0.04
COS	34 Paper Stationery and Other Converted Paper Product Manufacturing	\$35,174.33	0.52	18.33
COS	35 Printing (including the reproduction of recorded media)	\$2,195.54	0.36	0.79
COS	39 Basic Chemical Manufacturing	\$336.91	1.03	0.35
COS	40 Cleaning Compounds and Toiletry Preparation Manufacturing	\$18,670.39	0.39	7.37
COS	41 Polymer Product Manufacturing	\$14,899.42	0.50	7.39
COS	42 Natural Rubber Product Manufacturing	\$420.84	0.60	0.25
COS	43 Glass and Glass Product Manufacturing	\$11.25	0.54	0.01
COS	47 Other Non-Metallic Mineral Product Manufacturing	\$8.26	0.81	0.01
COS	53 Other Fabricated Metal Product manufacturing	\$668.59	0.51	0.34
COS	58 Professional, Scientific, Computer and Electronic Equipment Manufacturing	\$27,217.49	0.20	5.49
COS	59 Electrical Equipment Manufacturing	\$7,477.04	0.39	2.95
COS	60 Domestic Appliance Manufacturing	\$788.67	0.36	0.28
COS	62 Furniture Manufacturing	\$2,665.67	0.40	1.08
COS	63 Other Manufactured Products	\$37,699.71	0.42	15.84
COS	82 Transport Support services and storage	\$275.00	0.24	0.07
Events	94 Non-Residential Property Operators and Real Estate Services	\$273,765.18	0.20	55.21
Events	92 Rental and Hiring Services (except Real Estate)	\$285,987.25	0.39	112.95
Events	76 Food and Beverage Services	\$459,761.35	0.36	166.13
Total				410.30

Scope 3 – Category 1 Purchased goods and services emission factors

Table B4 Emission factors and GHG emissions by sector type for Category 1 Purchased goods and services – Office Paper (Paper Australia Pty Ltd, 2021) (Indufor, 2016)

Paper type	Weight	EF	Total (t CO ₂ -e)
	(kg)*	(kg CO ₂ -e/kg paper)	
Imported virgin	29,383	3.17	93.15

* Based on 5,876,692 pages, taken to be A4 80gsm.

Appendix C

Scope 3 – Indirect fuel emission factors

Table C1 ECU & ISS vehicle and stationary equipment indirect fuel emission factors

(Australian Government, Department of the Environment and Energy, November 2022)

Fuel type	Energy content (GJ/kL)	Scope 3 EF (kg CO ₂ -e /GJ)
Petrol	34.2	17.2
Diesel	38.6	17.3

Scope 3 – Indirect electricity emission factors

Table C2 Indirect purchased electricity emission factors (Australian Government,

Department of the Environment and Energy, November 2022)

Facility	State or Territory grid	Scope 3 EF (kg CO ₂ -e /kWh)
All	Southwest Interconnected System (SWIS) in Western Australia	0.04

Scope 3 – Indirect electricity emission factors

Table C3 Indirect purchased natural gas emission factors (Australian Government,

Department of the Environment and Energy, November 2022)

Facility	Region	Scope 3 EF (kg CO ₂ -e /GJ)
Joondalup	Metro	4.1
Mt Lawley	Metro	4.1
SW	Non-metro	4.0