



A conceptual design of UCT's Humanities Rooftop Living Lab project under development, in collaboration with UCT's Khusela Ikamva Sustainable Campus research project. Sketch design image prepared by TK & Terra Landscape Architects.

Carbon Footprint Assessment Report

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GLOSSARY OF TERMS

Capex	Capital Expenditure
CO ₂ e	Carbon Dioxide Equivalent
Covid-19	Coronavirus Disease 2019
DEFRA	Department of Environment, Food and Rural Affairs (UK)
DFFE	Department of Forestry, Fisheries and Environment (SA)
GHG	Greenhouse Gas
GSB	Graduate School of Business
HVAC	Heating, Ventilation And Cooling
IPCC	Intergovernmental Panel on Climate Change
LPG	Liquid Petroleum Gas
kgCO ₂ e	Kilograms of Carbon Dioxide Equivalent
kWh	Kilowatt Hours
NGER	National Greenhouse Gas Emissions Reporting
tCO ₂ e	Tonnes of Carbon Dioxide Equivalent

1. EXECUTIVE SUMMARY

This report provides the 2024 financial year carbon footprint report of the University of Cape Town (UCT). The scope covers all of the campuses and facilities under UCT’s operational control as well as the emission-generating activities of its students and staff. Emissions are reported as Scope 1 (direct emissions), Scope 2 (indirect emissions from purchased electricity) and Scope 3 (other indirect emissions). Emissions are reported in accordance with the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard; the most widely recognised global methodology for greenhouse gas accounting and reporting.

1.1. Results

UCT’s 2024 carbon footprint is relatively consistent with results from 2023 with an overall increase of 6%. Scope 1 emissions, which now contribute 4% to UCT’s total inventory, decreased 40% between FY23 and FY24. This was primarily associated with a reduction in diesel consumption used in generators because there were fewer hours of load shedding during this reporting period. Emissions arising from the combustion of diesel used in generator decreased 77%. Scope 2 emissions associated with the use of purchased electricity across UCT’s campuses increased 9% while Scope 3 emissions saw a few notable changes within categories such as business travel and food provisions.

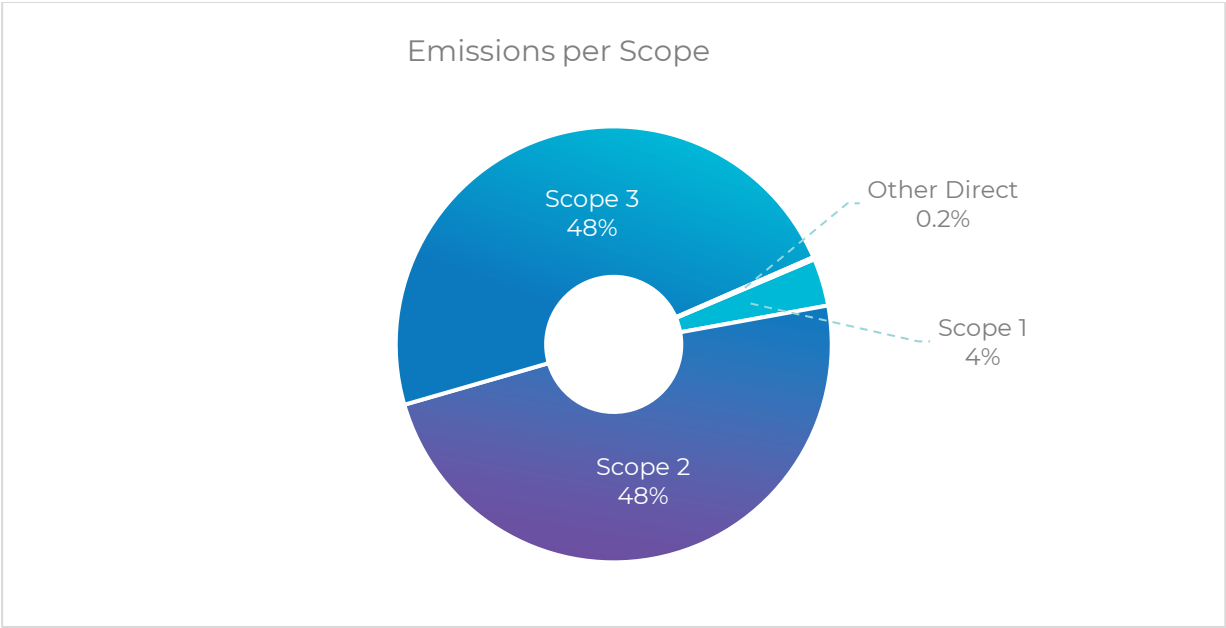


Figure 1.1: UCT 2024 Carbon Footprint Emissions by Scope

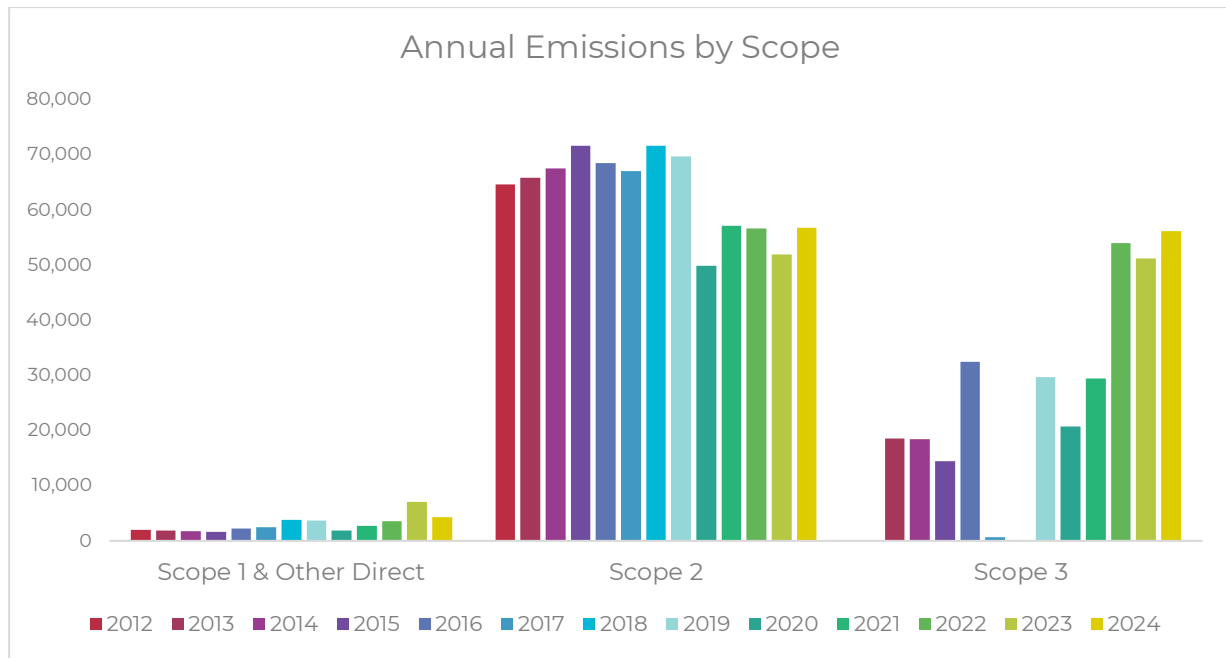


Figure 1.2: UCT Annual Emissions by Scope

Scope 1

Scope 1 emissions have decreased by 40% since UCT's previous financial year, primarily due to a decrease in generator diesel use from just under 1,4 million litres in 2023 to 316,000 litres in 2024, resulting in a 77% decrease in stationary diesel combustion emissions. A trend seen across most organisations in the country is a transfer of emissions from Scope 1 to Scope 2, as decreased load shedding raises the use of grid electricity and lowers the demand for back-up diesel generator energy. Refer to the detailed analysis per scope to see these fluctuations with respect to UCT's carbon footprint.

Scope 2

As expected, with decreased hours of load shedding in 2024, more purchased grid electricity was required resulting in an 9% increase in emissions in Scope 2. Total megawatt hours across the institution have increased from 52,726 MWh in 2023 to 62,584 MWh in 2024. However, the increase in consumption during FY24 is partially offset by a slight decrease in the calculated emissions intensity, due to the application of a slightly lower emission factor of **0.906 kgCO₂e per kWh**, sourced from SA DFFE 2023 Grid Emission Factors Report released in 2025. At the time of UCT's FY23 assessment, the most up-to-date grid average emission factor available for purchased electricity in South Africa was from the 2023 version of the same DFFE report, which was **0.985 kgCO₂e per kWh**.

Scope 3

Indirect emissions are reported in Scope 3 and are divided into 15 categories. UCT reports 6 of the categories, based on relevance and access to data. Within the category "Purchased Goods and Services", UCT reports three sub-categories: Water Consumption, Paper Purchased and Food Provisions. Within the category "Business Travel", UCT reports two sub-categories: Land and Air.

The most significant change in UCT's Scope 3 emission results in 2024 is the increase of emissions associated business travel. Air travel emissions increased 69% while land travel emissions increased 95%. Emissions embedded within food provisions have increased by 2,384 tCO₂e.

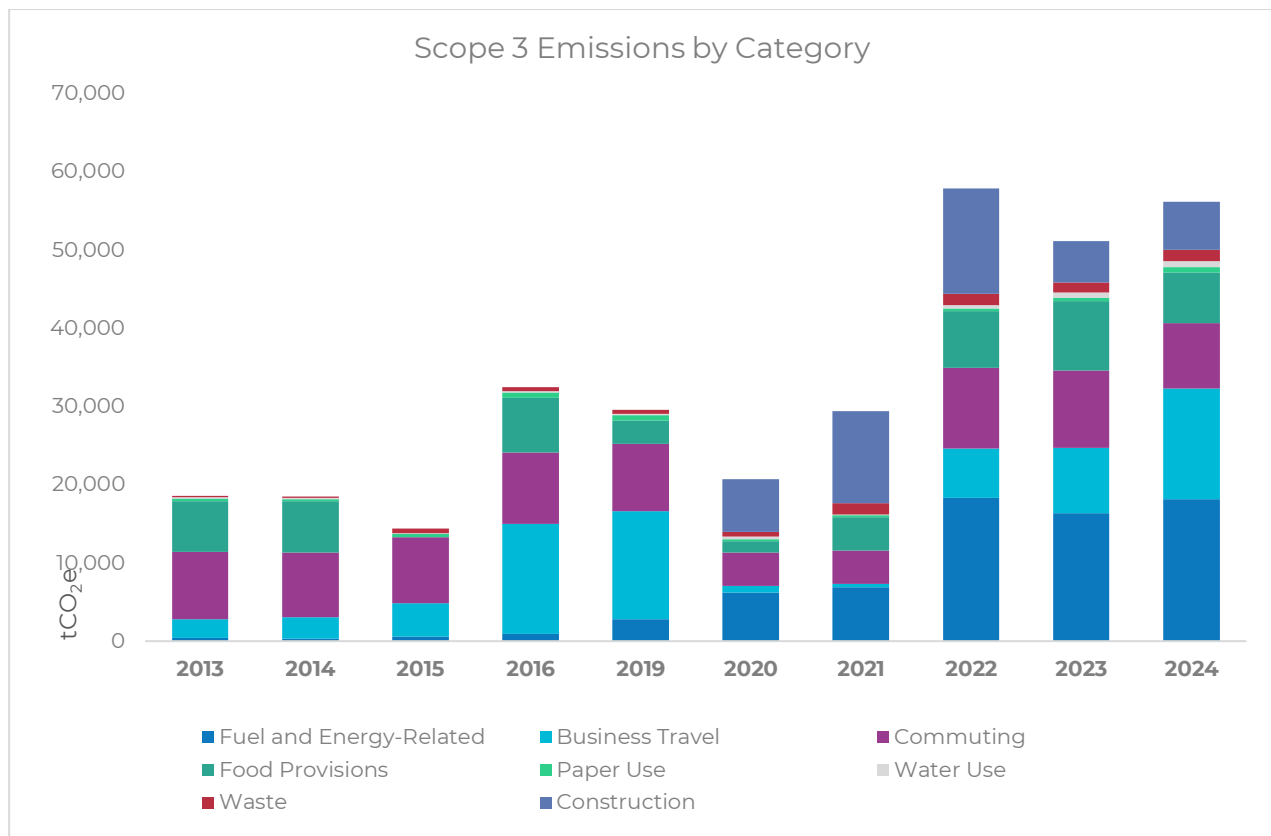


Figure 1.3: Annual Scope 3 Emissions per Financial Year, by emissions category.

Note: Scope 3 emissions were not reported in 2012 or 2018, while minimal sources were reported in 2017.

1.2. Targets

UCT has set the following target:

Net Zero emissions by 2050 (Scope 1 and 2)

- This requires a 2 – 5% reduction in emissions per annum from 2019* (pre-COVID lockdown).
- UCT has seen a 17% reduction in scope 1 and 2 emissions since its 2019 baseline year, which translates into an average decrease of 3.4% in emissions per annum since 2019

**The UCT strategy was published in early 2020, before the COVID-19 lockdowns, proposed 2020 as the baseline year, which turned out to be an inappropriate baseline year due to the forced inactivity with unrealistically low emissions levels due to the COVID lockdown. 2019 was therefore subsequently selected as the baseline year, as the most recent pre-COVID lockdown year.*

Targets are based on combined Scope 1, 2 and Other Direct Emissions. As expected, post COVID lockdowns the activity on campus began to normalise the following year and consequently these emissions increased by 16% in 2021. With most activity returning to pre-Covid levels, UCT saw a 0.5% increase in emissions between 2021 and 2022 followed by a 2% decrease between 2022 and 2023, and a 3% increase between 2023 and 2024. While levels have increased after this period of forced reductions, they have not increased as high as they were prior to the COVID-19 lockdowns, showing an **overall 17% decrease** in UCT's Scope 1, 2 and Other Direct emissions between 2019 and 2024.

Scope 1, 2 and Other Direct Emissions		
2019	2024	% Change 2019 vs 2024
73 417	61 037	17% reduction

Table 1.1: % Change in Scope 1, 2 and Other Direct Emissions since 2019

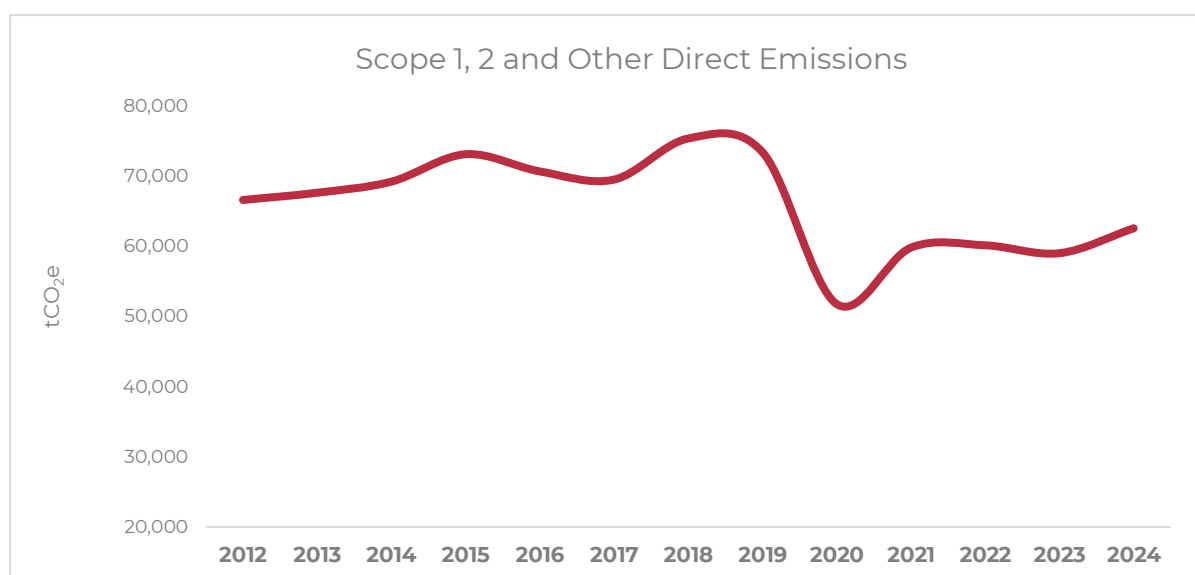


Figure 1.4: Annual Fluctuations in Scope 1, 2 and Other Direct Emissions

Due to regular annual reporting of emissions since 2012, UCT is also able to track progress since that initial baseline assessment year. The following table indicates the current reduction of 8% in Scope 1, 2 and Other Direct emissions since 2012. While this is a useful reference, there was nobody internally driving a environmental sustainability prior to 2019, which is why the 2019/2020 baseline is selected as the baseline against which the strategy published in 2020 opted to set as the baseline.

Emissions	tCO ₂ e		% Change
	2012	2024	2012 vs 2024
Scope 1, 2 and Other Direct	66 622	61 037	-8%

Table 1.2: Reduction in Scope 1, 2 and Other Direct Emissions since 2012

1.3. Recommendations

GCX has made various recommendations regarding carbon management and data management, which are detailed in the section “Recommendations” toward the end of this report, summarised as follows:

Data Management

There are still good opportunities for UCT to improve data quality and, therefore, the accuracy of emission results. Scope 2 data accuracy has improved into 2023 and 2024 due to updated information from the

GSB. Scope 3 data related to air travel has improved significantly as it includes flight routes and classes, rather than only expenditure, although extrapolations are still required. UCT has also begun the process of measuring the institution's carbon footprint earlier in the year to allow additional time for data screening, which facilitates improved data accuracy and completeness.

Carbon Management

Carbon management strategies should focus on the greatest source of emissions over which UCT has operational control, which is currently the electricity consumption at Main Campus. Solar panels are installed at three locations across UCT's campuses which have already reduced emissions by 230 tCO₂e in 2022, 2023 and 2024 combined. Further rollout of solar PV will have an increasing positive impact on emissions over time. UCT is in the process of installing new solar panels, many of which are currently awaiting final permissions from the City of Cape Town to operate. Additional recommendations regarding data and carbon management are discussed in Section 5. UCT is in the middle of a tender process to procure wheeled renewable energy, which if successful, could significantly reduce scope 2 emission from early 2027 onwards, when this wheeled renewable energy is projected to kick in.

2. INTRODUCTION

GCX was appointed by UCT to undertake the institution’s 2024 financial year greenhouse gas assessment. This assessment follows annual consecutive inventories that have been measured since 2012. Using an Excel-based log, GCX indicated what data was required for the calculation of UCT’s 2024 carbon footprint. The required data was collected by UCT from the relevant institutional departments and uploaded to an online filing system shared with GCX. Upon receipt of each data set, GCX reviewed and queried it to ensure it was applicable and comprehensive based on previous years’ collections. Some updates were made where necessary. The following report discusses and illustrates UCT’s greenhouse gas inventory results, followed by details of the methodology, assumptions and limitations, as well as recommendations for carbon management and data management at UCT going forward. Further details including all GHG Protocol reporting requirements, tables, figures and activity data have been provided in the additional report spreadsheet “GCX_UCT_CFA Report_2024.xlsx”.

2.1. Boundaries

2.1.1. Temporal Boundary

An organisational carbon footprint covers a selected 12 month period. This assessment covers UCT’s most recent financial year: 1 January – 31 December 2024.

2.1.2. Organisational Boundary

Emissions were consolidated using the operational control approach. Operational control exists when a company has the full authority to implement operating policies at the operation of the GHG emitting activities. UCT maintained the same organisational boundary as previous assessments, which encompasses 6 primary campuses / facilities as tabulated below. At the Graduate School of Business, UCT has operational control of the business school and conference centre, but the Protea Breakwater Lodge Hotel is under the operational control of a separate hotel operator. The UCT facilities on site are metered as part of the Protea Breakwater Lodge Hotel facility.

Facilities Included
Main Campus
Medical Campus
Off Campus Residences & Other Admin Buildings
Graduate School of Business
Hiddingh Campus
ICTS on Main

Table 2: UCT Organisational Boundary

The total floor area included as part of this assessment for 2024 was taken as 690 683 m².

The number of employed staff and enrolled students at UCT fluctuates annually and the final audited figures for the period measured in this assessment were as follows:

Group	Population
Students	29 396
Staff	4 777
Total	34 173

Table 3: Population of Students and Staff during the Reporting Period

2.1.3. Operational Boundary

The diagram below outlines the extensive direct and indirect emission sources that can form the operational boundaries of an organisational carbon footprint. The footprint boundary was consolidated using the operational control approach. This apportions all activities and associated emissions under UCT's operational control into Scope 1 and 2, and those not under UCT's operational control into Scope 3.

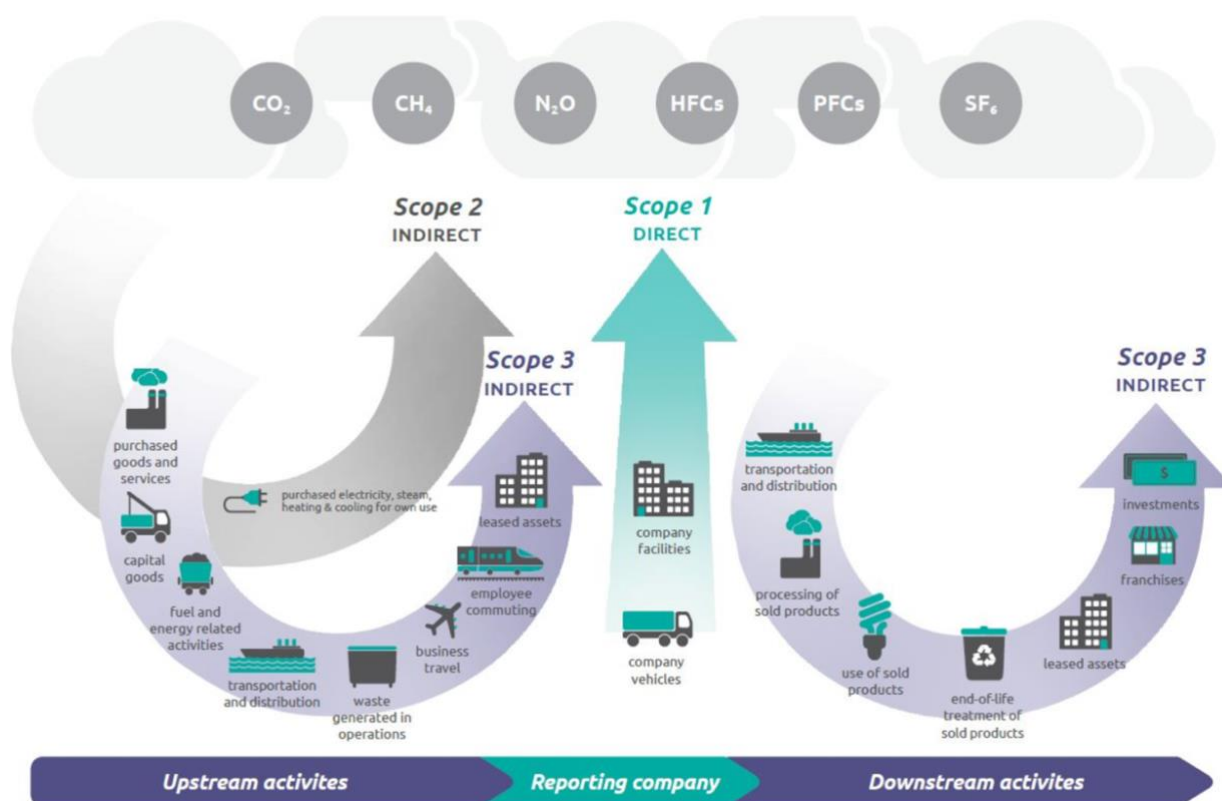


Figure 2: Operational Boundaries by Scope, Activity and Greenhouse Gas

Source: WRI, WBCSD GHG Protocol Corporate Accounting and Reporting Standard, Revised Edition, 2004

The following table lists all of the potential sources in the figure above, and indicates the complete operational boundary encompassed in this UCT carbon footprint assessment.

SCOPE 1			
Source	Source Category	Explanation	Boundary
Direct Emissions on site	Mobile Combustion	Fuel combusted in Company owned/controlled vehicles	✓
	Stationary Combustion	Fuel combusted onsite on company owned/controlled equipment	✓
	Fugitive emissions	Intentional or unintentional release of GHG	✓
	Process Emissions	GHG emissions from physical or chemical processing	NA
	Waste treatment emissions	Methane or other GHG emissions from waste processing. Company owned/controlled Waste Water treatment, landfills etc.	NA
Scope 2			
Source	Source Category	Explanation	
Indirect emissions from energy use		Purchase of Energy (heat, steam, Electricity) generated off site	✓
Out of Scopes			
Source	Source Category	Explanation	
Emissions on site	Fugitive emissions	Intentional or unintentional release of GHGs not included under the Kyoto Protocol	✓
	Biofuels	CO2 only. CH4 and N2O reported in Scope 1	NA
Scope 3			
Source	Source Category	Explanation	
Upstream Emissions	Purchased Goods and Services	Embedded emissions in purchased goods and services: Water Consumption, Paper Purchased, Food Provisions.	✓
	Capital Goods	Embedded emissions in purchased capital goods and equipment: Construction.	✓
	Fuel and energy related sources (not included in Scope 1&2)	T&D losses of purchased electricity, emissions from energy generated that is sold to end users, upstream emissions of purchased fuels & energy	✓
	Upstream transport and distribution	Transportation of goods/products to the company by a 3rd party. Transport of goods between company facilities by a 3rd party	✗
	Waste generated in operations	Emissions from waste treatment at sites not owned by the company. Can include waste transport	✓
	Business travel	Transport of employees for the purposes of business activities	✓
	Employee Commuting	Emissions from transport of employees between home and work in vehicles not owned by the company	✓
	Upstream leased assets	Operation of leased assets by the company and not reported in Scope 1&2	NA
Downstream Emissions	Downstream Transport and distribution	Transportation of products sold by the reporting company, between the company and the end consumer. Transport is carried out by a 3rd party in vehicles not owned by the company and is not paid for by the reporting company	✗
	Processing of sold products	Processing of intermediate product sold by the company	✗
	Use of sold products	Emissions as a result of end use of products (Products that directly consume Electricity, emit GHGs or form GHGs from their use)	✗
	End of life treatment of sold products	Waste disposal and treatment of EoL products	✗
	Downstream leased assets	Operation of leased assets owned by the company and leased to other entities	✗
	Franchises	Operation of franchises	NA
	Investments	Applicable to development, and private financial institutions. Operation of investments	✗

Table 4: UCT 2024 Carbon Footprint Operational Boundary

3. RESULTS SUMMARY

3.1. Absolute Emissions

UCT's 2024 financial year results are tabulated below, alongside 2023 results for an annual comparison.

SCOPE	CATEGORY	tCO ₂ e		% Change	% of Total
		2023	2024	2023 vs 2024	2024
SCOPE 1	UCT-owned vehicles: UCT Shuttle	1062	897	-16%	0.8%
	UCT-owned vehicles: Vehicle Fleet	639	603	-6%	0.5%
	Fugitive Emissions (Kyoto gases)	1463	1 777	21%	1.5%
	Stationary Combustion: LPG	19	17	-11%	0.01%
	Stationary Combustion: Diesel for Generators	3707	840	-77%	0.7%
	Energy Generation: On-site Solar	0	0	-	-
SUB-TOTAL SCOPE 1		6 889	4 135	-40%	-40%
SCOPE 2	Electricity: Main Campus	29 106	36 291	25%	31%
	Electricity: Medical Campus	9 753	10 122	4%	8.6%
	Electricity: Off Campus residences	10 718	8 225	-23%	7.0%
	Electricity: GSB	963	678	-30%	0.6%
	Electricity: Hiddingh	540	448	-17%	0.4%
	Electricity: ICTS on Main	856	937	9%	1%
SUB-TOTAL SCOPE 2		51 935	56 701	9%	48%
SCOPE 3	Category 3: Fuel and Energy-Related Activities	16 372	18 116	11%	15%
	Category 6: Business Travel - Land	274	534	95%	0.5%
	Category 6: Business Travel - Air	8 072	13 680	69%	12%
	Category 7: Employee Commuting	9 853	8 337	-15%	7%
	Category 1: Purchased Goods & Services: Food	8 864	6 480	-27%	5.5%
	Category 1: Purchased Goods & Services: Paper	429	659	54%	0.6%
	Category 1: Purchased Goods & Services: Water	667	774	16%	0.7%
	Category 5: Waste Generated in Operations	1 281	1 413	10%	1.2%
	Category 2: Capital Goods: Construction	5 323	6 139	15%	5%
SUB-TOTAL SCOPE 3		51 136	56 132	10%	48%
OTHER DIRECT	Fugitive Emissions (non-Kyoto gases)	209	201	-4%	0.2%
TOTAL EMISSIONS		110 170	117 169	6%	100%

Table 5: UCT 2024 Carbon Footprint Results Summary, relative to 2023 Results

Avoided Emissions

This is the third year that UCT has reported the use of renewable electricity. Although a small amount was generated in 2021, the data related to it was unavailable at that time and was excluded from the 2021 assessment. Due to the generation of 95,725 kWh of renewable electricity from solar panels installed at three locations at UCT-controlled facilities, Scope 2 emissions in 2024 were reduced by 87 tonnes of CO₂e. Last year, 92 tonnes of CO₂e were avoided due to the generation of 93,370 kWh of renewable energy. Although slightly more renewable energy was generated this year, the updated emission factor is lower (**0.906 kgCO₂e per kWh**) than last year (**0.985 kgCO₂e per kWh**) resulting in slightly lower avoided emissions in FY24.

Emissions by Scope

The 2024 financial year’s emissions are displayed by Scope in the pie chart below, showing the significant impact of Scope 2 and 3 on the institution’s carbon footprint with only 4% of emissions arising from Scope 1.

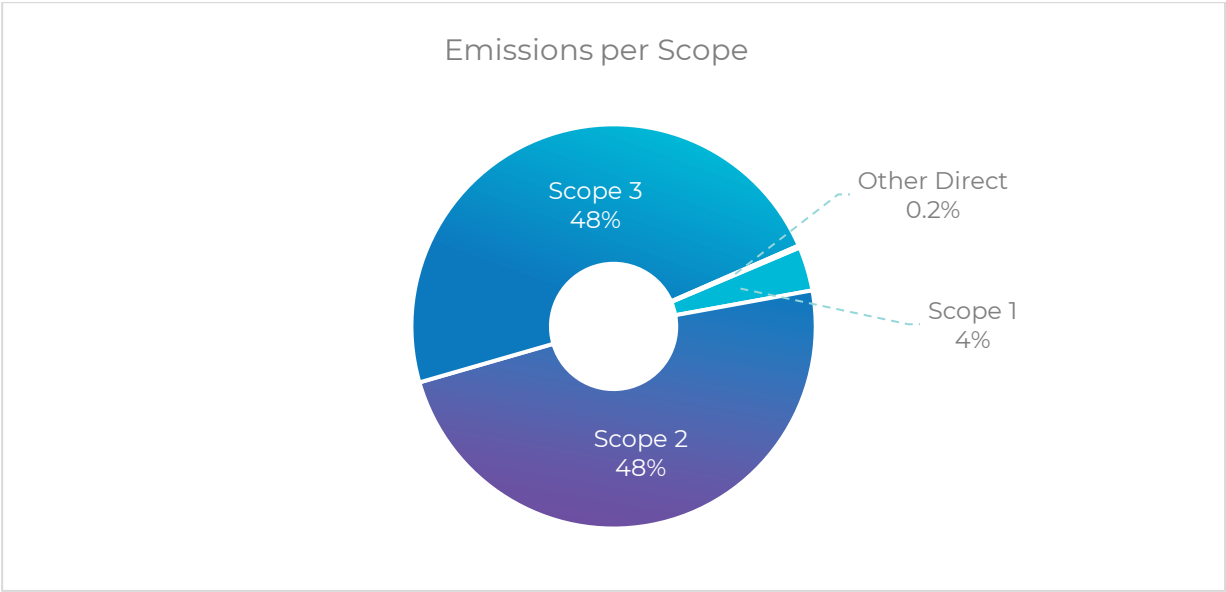


Figure 3: UCT’s 2024 Total Carbon Footprint Emissions per Scope

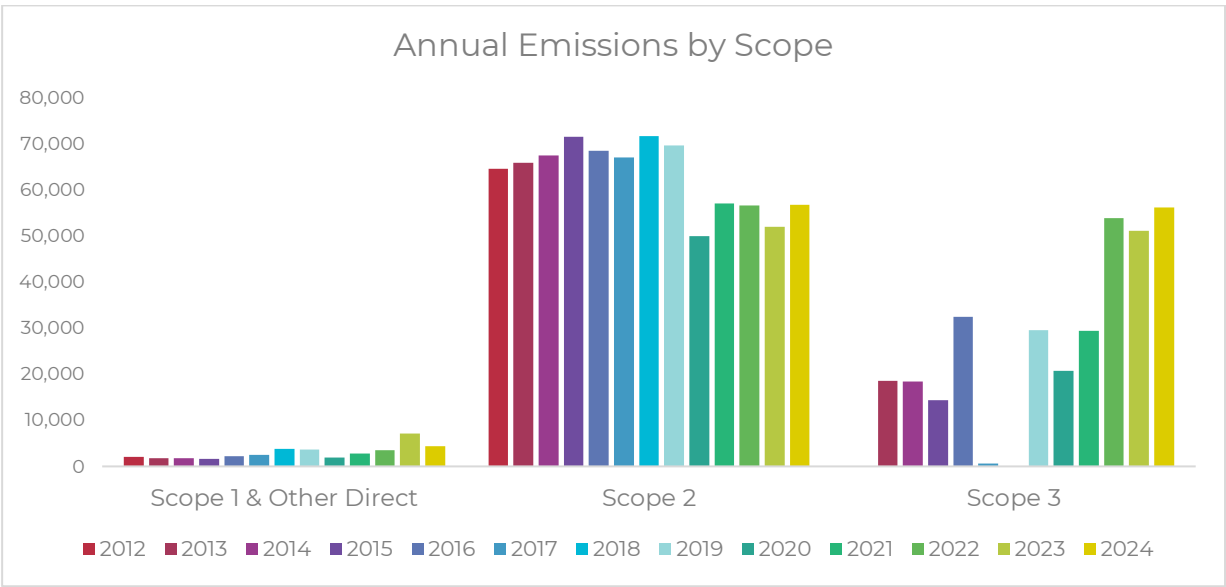


Figure 4: Annual Emissions by Scope

3.2. Intensity Metrics

There can be notable fluctuations in Scope 3 emissions, across different organisations and within the same institution year-on-year, due to changes in data availability or through broadening the boundary of Scope 3 categories included in an assessment. Therefore, tracking emission fluctuations over time is best conducted by reviewing only Scope 1, 2 and Other Direct emissions (the latter being fugitive emissions from non-Kyoto gases). Emission intensity results are compared with UCT's original baseline 2012 assessment in the table below, which shows a 14% decrease in emissions per square metre, and a 18% reduction in emissions per capita since 2012.

Intensity Metrics	Financial year		% Change
	2012	2024	2012 vs 2024
Gross Area (m ²)	649 494	690 683	6%
tCO ₂ e / m ² / annum	0.103	0.088	-14%
Population	30 579	34 173	12%
tCO ₂ e / capita / annum	2.180	1.79	-18%

Table 6: UCT 2012 and 2024 Intensity Metrics Comparison

The figure below illustrates the annual tracking of these metrics since UCT began measuring emissions in 2012. Emissions per square metre (green) are illustrated on the left axis, while emissions per capita (purple) are shown on the right. Both metrics dropped in 2020 due to Covid-19 and rose thereafter, although both remain below pre-Covid levels.

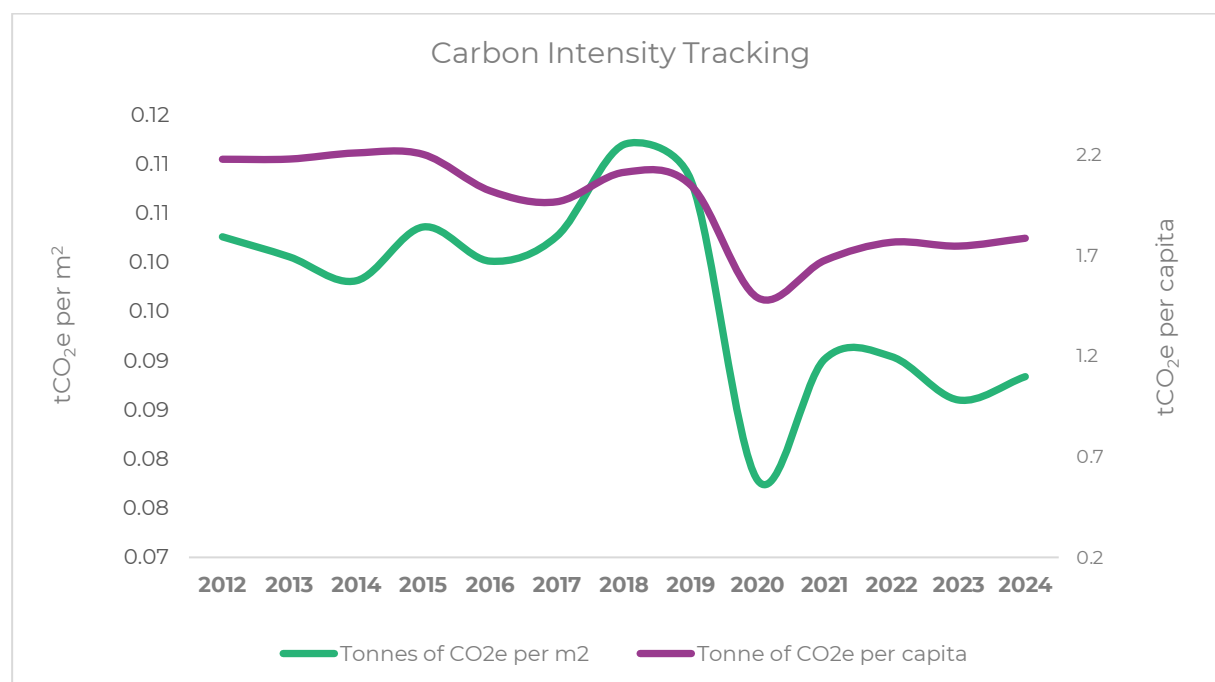


Figure 5: Annual Fluctuations in GHG Emissions Intensity Metrics

3.3. Scope 1

The figure below provides a breakdown of UCT's Scope 1 emissions per source. Direct emissions dropped significantly in 2020 due to the Covid-19 pandemic. During 2021 and 2022 emissions started normalising to pre-Covid levels. However, in 2022 the emissions profile shifted such that fewer fugitive refrigerant gases escaped, but notably more emissions resulted from diesel used in generators. That emissions profile has continued with a large increase in emissions from diesel used in generators into 2023, as well as larger quantities of fugitive refrigerant gases. In 2024, emissions from diesel used in generators decreased substantially with reduced hours of load shedding, and fugitive refrigerant gas emissions increased slightly, altogether resulting in a 39% decrease in Scope 1 emissions between 2023 and 2024. The sections below expand on the results of each Scope 1 emission source for the 2024 financial year.

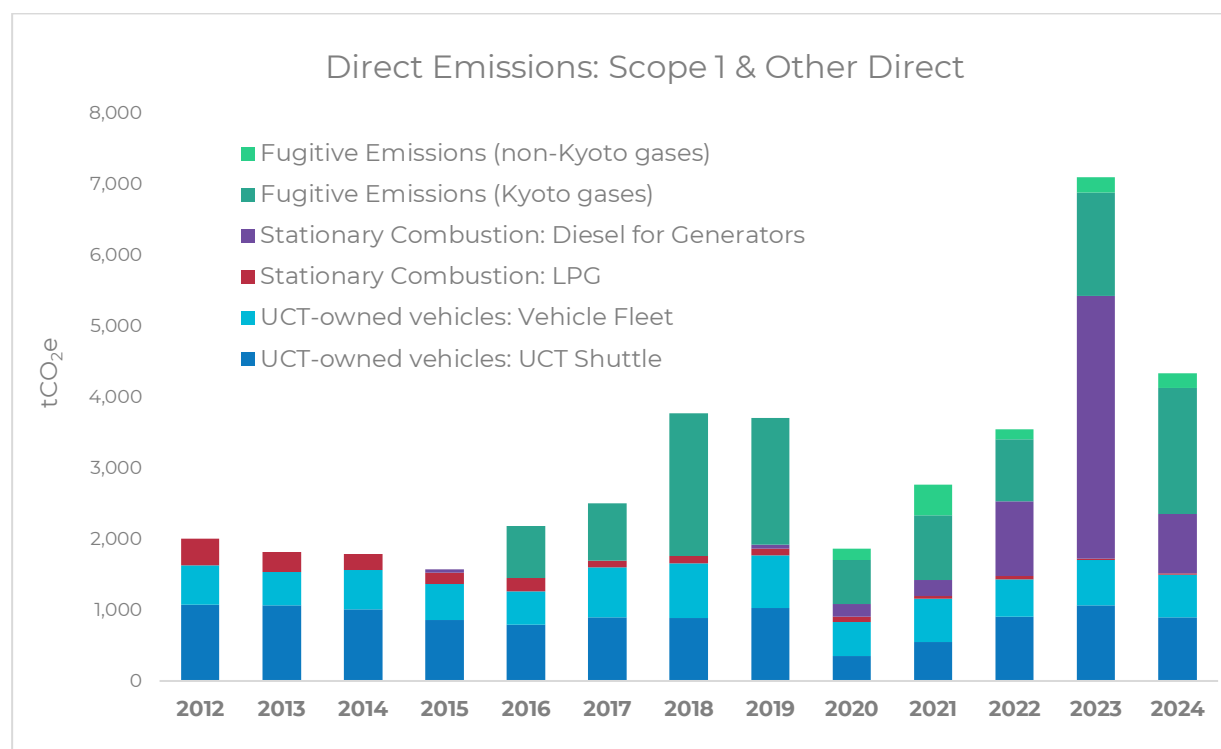


Figure 6: Annual Fluctuations in Scope 1 (Direct) GHG Emissions per Source

SCOPE 1	tCO ₂ e												
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
UCT Shuttle	1 076	1 068	1 006	861	790	902	889	1 025	348	547	907	1 062	897
Vehicle Fleet	557	465	556	503	475	697	769	748	486	612	528	639	603
Fugitive Emissions	-	-	-	-	733	807	2 012	1 793	782	1 342	1 011	1 672	1 979
LPG combustion	372	289	230	160	191	102	105	95	71	40	48	19	17
Diesel combustion	-	-	-	53	-	-	-	50	177	223	1 052	3 707	840
TOTAL	2 005	1 823	1 792	1 577	2 188	2 507	3 774	3 711	1 864	2 763	3 547	7 099	4 336

Table 7: Annual Scope 1 GHG Emissions per Source (including Other Direct emissions)

3.3.1. Shuttle Emissions

UCT Shuttle emissions arise from the mobile combustion of fuel in its shuttle fleet vehicles, which help to transport students and staff to and from campuses. The fleet includes 28 buses and 2 minibuses. Emissions are reported separately for UCT's vehicle fleet and the UCT shuttle fleet, as this will aid the institution's carbon management strategy. In 2024 the shuttle fleet required a total of 305,526 litres of diesel and 1,736 litres of petrol, which resulted in 897 tonnes of CO₂e emissions. The figure below illustrates how shuttle activity has normalised after the sharp decline during 2020 and 2021.

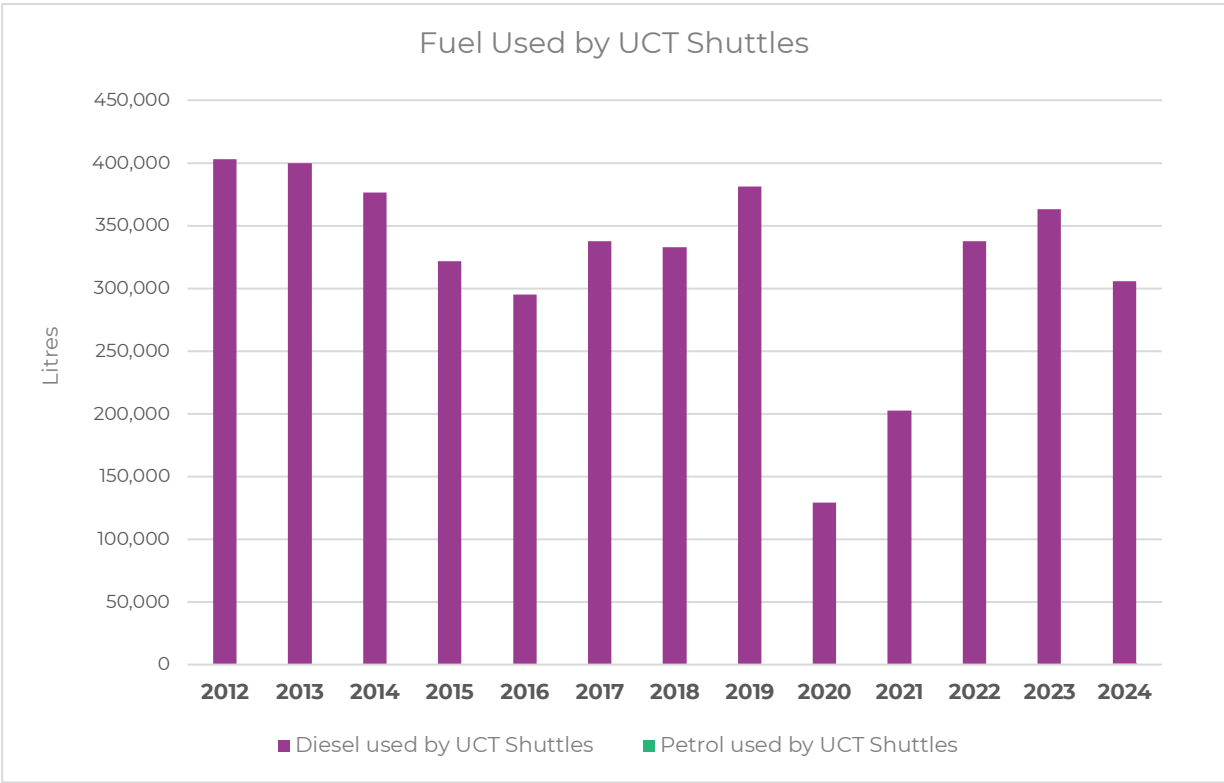


Figure 7: UCT Shuttle Fuel Use per Annum

3.3.2. Vehicle Fleet Emissions

UCT's fleet of various vehicle types, which utilise both petrol and diesel, required a total of 31,932 litres of diesel and 211,803 litres of petrol during 2024. The decrease in diesel and increase in petrol is due to some diesel vehicles being replaced by petrol vehicles, as well as the number of CPS vehicles doubling in 2024. This mobile combustion resulted in 603 tonnes of CO₂e of direct emissions. This contributes 14% of direct emissions. Fleet emissions have decreased by 6% relative to 2023.

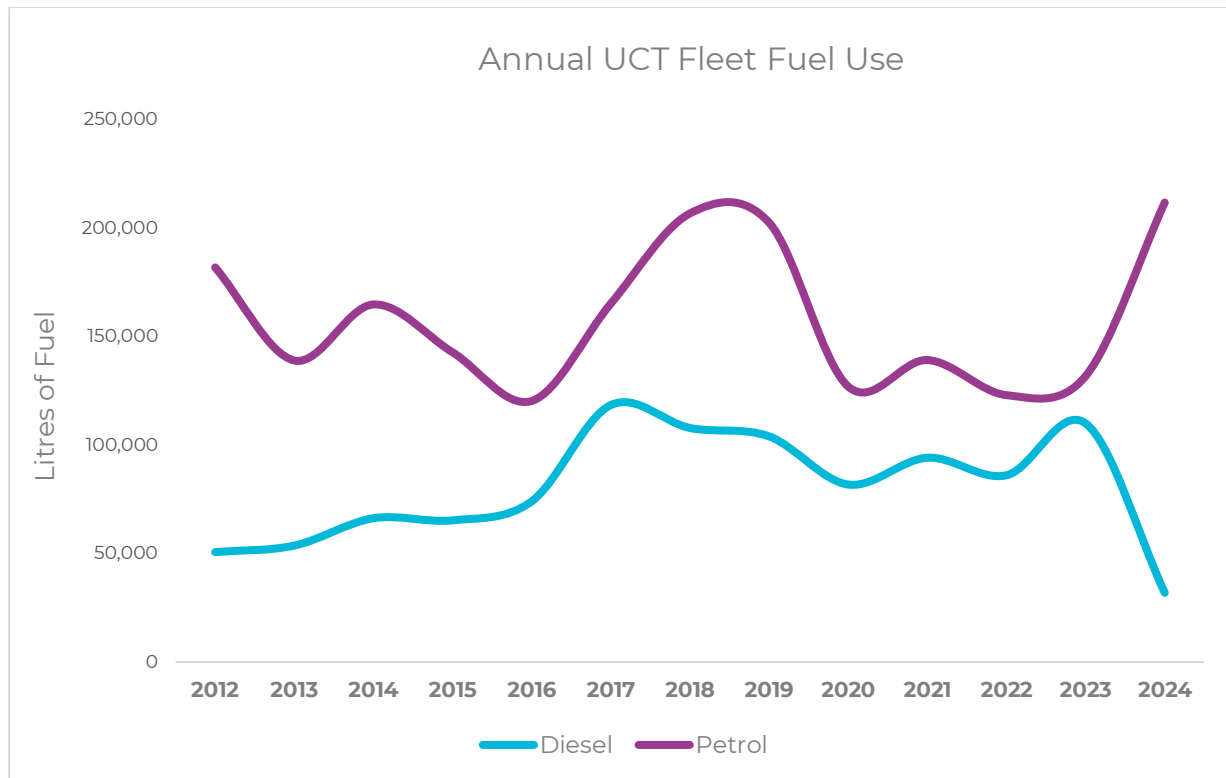


Figure 8: UCT Vehicle Fleet Fuel Use per Annum

3.3.3. Refrigerant Gas Emissions

Fugitive refrigerant gas emissions refers to various types of gases used in HVAC, air-conditioning, refrigeration systems and heat pumps that escape into the atmosphere due to system leaks. Refrigerant gases have high global warming potentials, which means they have a negative impact on the atmosphere and easily raise total greenhouse emissions in an inventory such as UCT's. HCFCs such as R22 (freon) are ozone depleting substances which should be avoided for use in air-conditioning systems. UCT's use of R22 has fluctuated over time with an overall decrease, while the use of HFC's such as R410A have remained quite high. The refrigerant gas A32 was utilised for the first time in FY23 and was reported again in FY24, which has a lower global warming potential than all the other gases used at UCT's facilities. Emissions associated with refrigerant gases have returned to those observed before the COVID-19 pandemic, most likely due to an increase in HVAC hours of use per day.

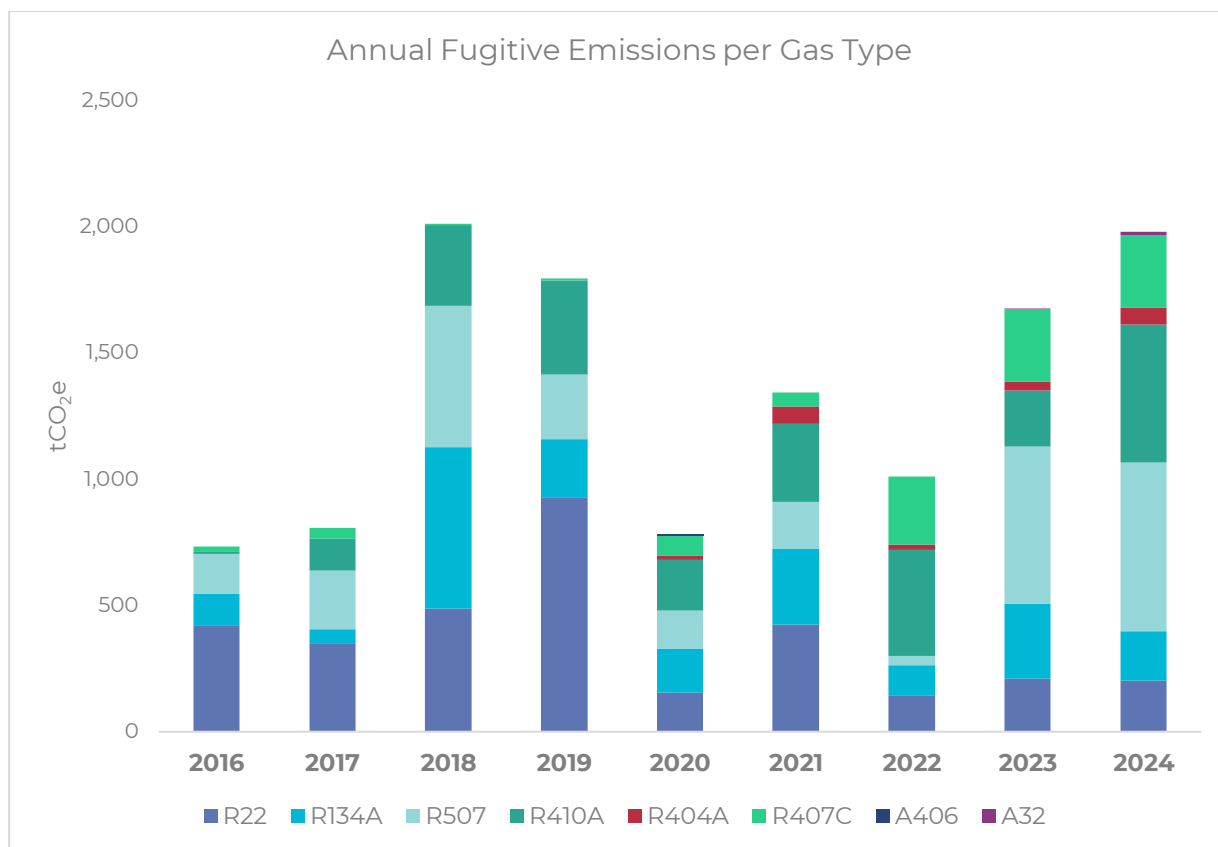


Figure 9: Annual Fugitive Emissions per Gas Type

3.3.4. Stationary Combustion Emissions

When fuel is combusted for the purpose of energy generation in stationary (non-mobile) equipment such as generators or cooking equipment, greenhouse gases are released into the atmosphere. UCT makes use of LPG (Liquid Petroleum Gas) in cooking equipment and water heaters, as well as diesel in back-up power generators.

The figure below illustrates the impact of load shedding on UCT's diesel use in generators. Over the course of 2024 South Africa experienced 1,656 hours of load shedding. UCT required 316,134 litres of diesel to provide back-up power when needed during load shedding. The decrease in generator diesel consumption is an accurate reflection of usage, primarily due to reduced hours of load shedding for this reporting period.

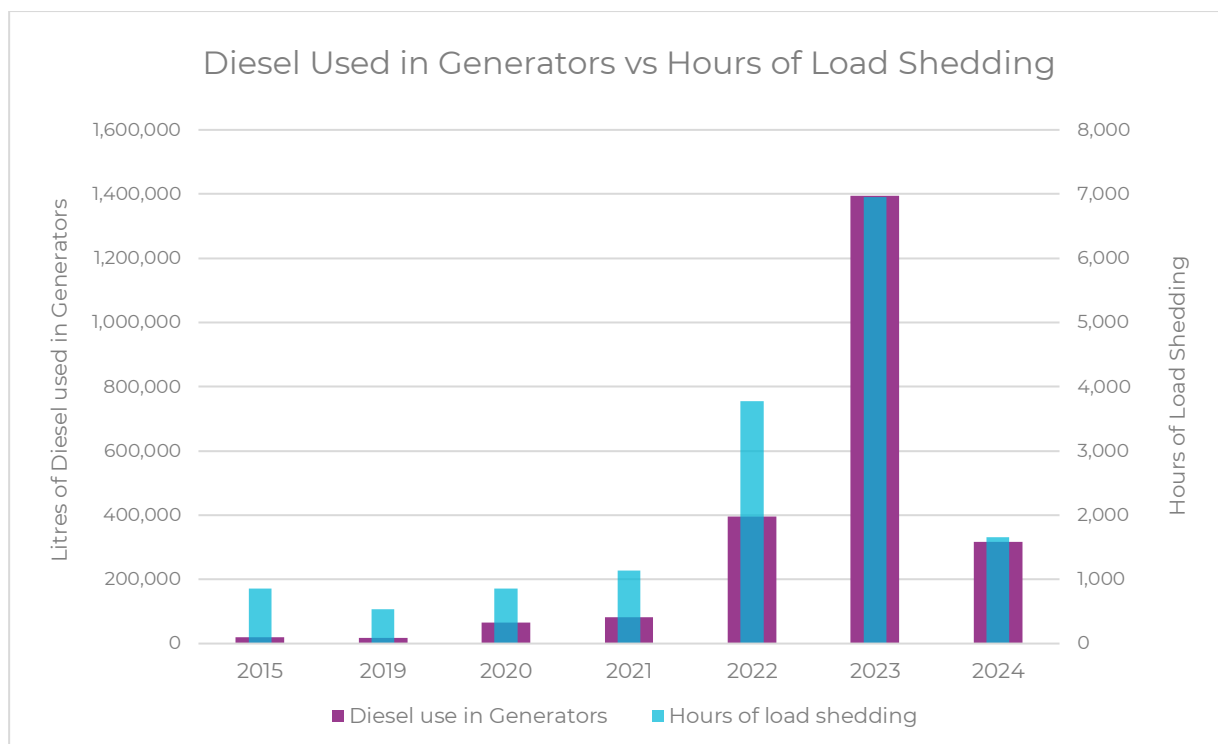


Figure 10: Annual Diesel Consumption and Hours of Load Shedding

Aside from generators, stationary fuel combustion at UCT also includes the use of LPG. Where LPG was purchased by UCT, the associated emissions are reported as stationary combustion emissions. With UCT's shift from LPG water heaters to heat pumps, and more centralised cooking practices, LPG use has steadily declined year-on-year. With a significant decrease between 2022 and 2023 into 2024, emissions arising from the stationary combustion of LPG totalled 17 tonnes of CO_{2e}, which contributed only 0.4% to direct emissions.

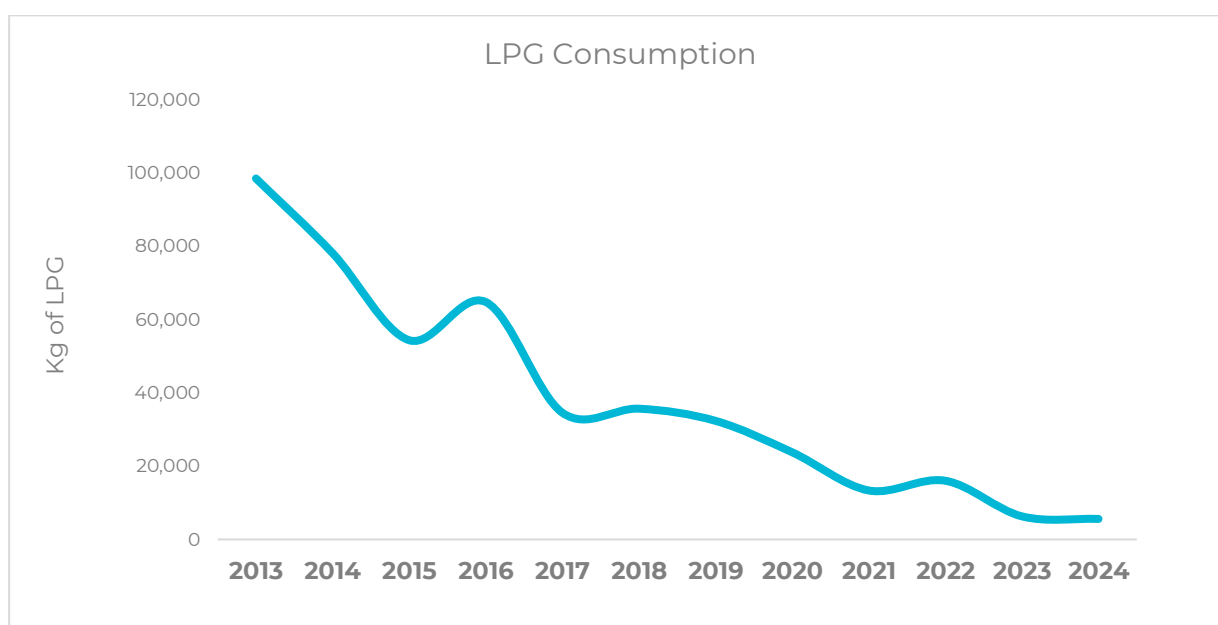


Figure 11: Annual LPG Consumption

3.4. Scope 2

Scope 2 emissions are indirect greenhouse gas emissions associated with the production of purchased electricity. Although UCT does not produce these emissions, the institution does have operational control over the quantity of electricity used. Emission results are determined based on annual emission factors released annually by South Africa's Department of Forestry, Fisheries and the Environment. The emission factor applied for this assessment was sourced from their most up-to-date Grid Emission Factors Report currently available which was released in 2025 and is based on 2023 data. That DFFE emission factor was **0.906 kgCO₂e per kWh**. The figure below illustrates Scope 2 emissions per UCT campus / facility during each financial year to date.

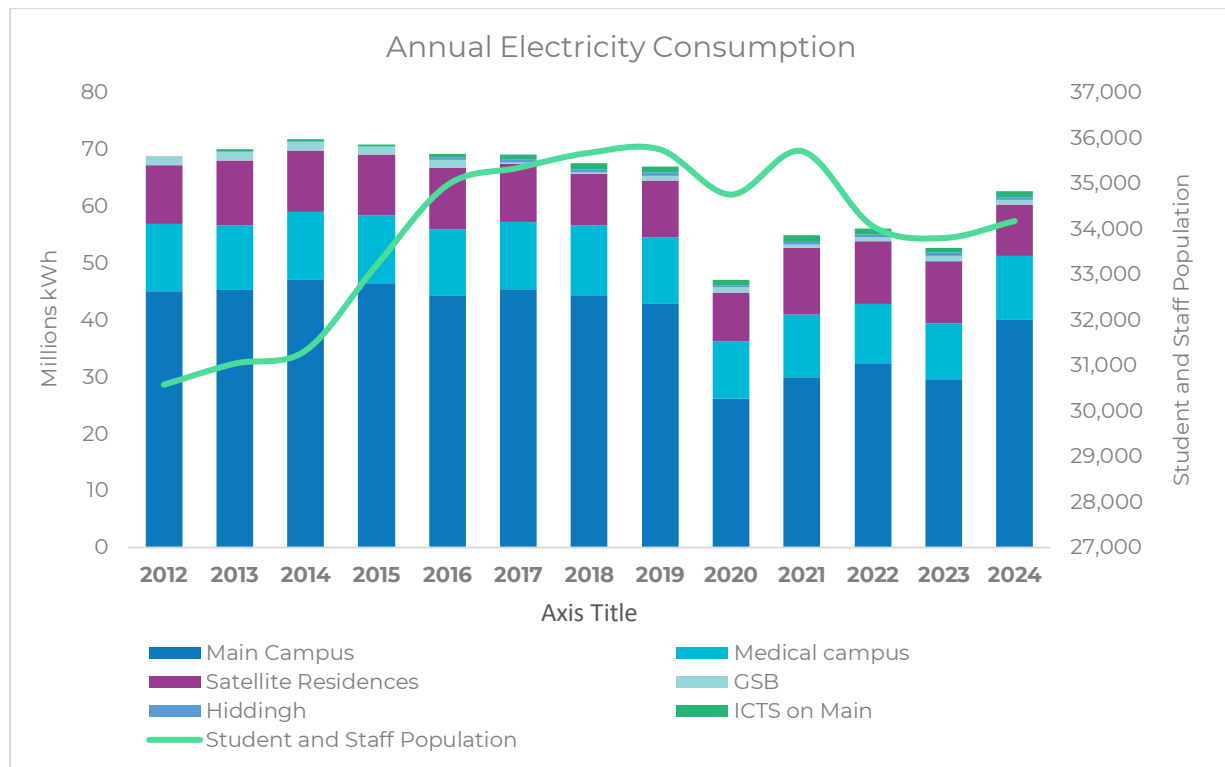


Figure 12: Annual Electricity Consumption Fluctuations per Campus vs UCT Population

This figure shows a slight increase in total kWh of electricity consumed between 2023 and 2024 although emissions show a slightly different trajectory due to annual changes to the grid average emission factor. Mistakes were picked up and corrected in the electricity data collection from the previous year at the Graduate School of Business which have increased confidence in these 2024 results. The table below lists the associated emissions per year showing the small increase in Scope 2 emissions since 2023. This is influenced by the reduced hours of load shedding during 2024, increasing the availability of electricity for consumption on campuses.

Campus	tCO ₂ e												
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Main Campus	42 394	42 583	44 226	46 933	43 774	44 001	47 024	44 512	27 750	31 077	32 698	29 106	36 291
Medical campus	11 044	10 648	11 241	12 027	11 654	11 477	12 993	12 238	10 734	11 475	10 613	9 753	10 122
Satellite Residences	9 702	10 729	10 141	10 850	10 633	9 885	9 585	10 375	8 980	12 202	11 054	10 718	8 225
GSB	1 363	1 417	1 393	1 387	1 382	327	301	839	980	611	748	963	678
Hiddingh	116	116	112	0	527	504	622	602	381	464	508	540	448
ICTS on Main	0	342	335	372	534	834	1 096	1 141	1 076	1 241	988	856	937
	64 617	65 835	67 447	71 569	68 505	67 028	71 621	69 706	49 902	57 069	56 608	51 935	56 701

Table 8: Annual Scope 2 Emissions per Facility

Main Campus continues to contribute the largest share of Scope 2 emissions at 64%. It also makes up 31% of total 2024 greenhouse gas emissions. As such, this should be a primary focus in UCT’s carbon management strategy. Although Scope 2 provides UCT with a carbon management challenge, it also provides the greatest opportunity of all emission sources for UCT to implement emission reduction initiatives that can significantly impact the overall carbon footprint.

Population numbers referred to in this report reflect the number of enrolments at UCT plus the permanent staff. This year we observe a correlating increase in both the electricity used and the staff and student population during 2024.

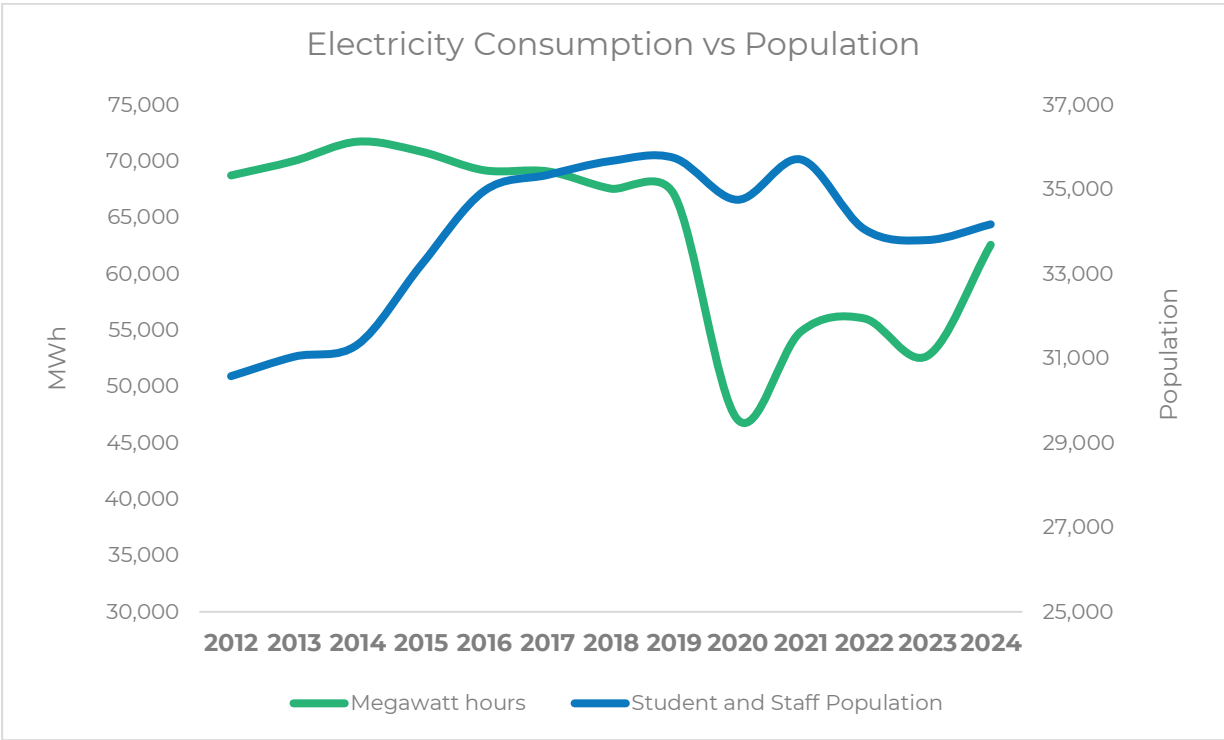


Figure 13: Annual Fluctuations in Electricity Consumption vs Population

3.5. Scope 3

Indirect emission sources arising from activities upstream and downstream from an organisation are reported within the 15 categories of Scope 3. Unlike Scope 1 and 2 sources, reporting Scope 3 emissions is optional. However, there is value in accounting for these. Certain categories would be considered relevant to an organisation’s carbon footprint, depending on the nature of the business or activities that they conduct. UCT currently reports 6 of these categories (where food, water and paper supply fall into the same category “Purchased Goods and Services”, and where land and air travel fall into the same category “Business Travel”), which is a robust boundary and encompasses some material emissions-generating activities. The results for 2024 are discussed below.

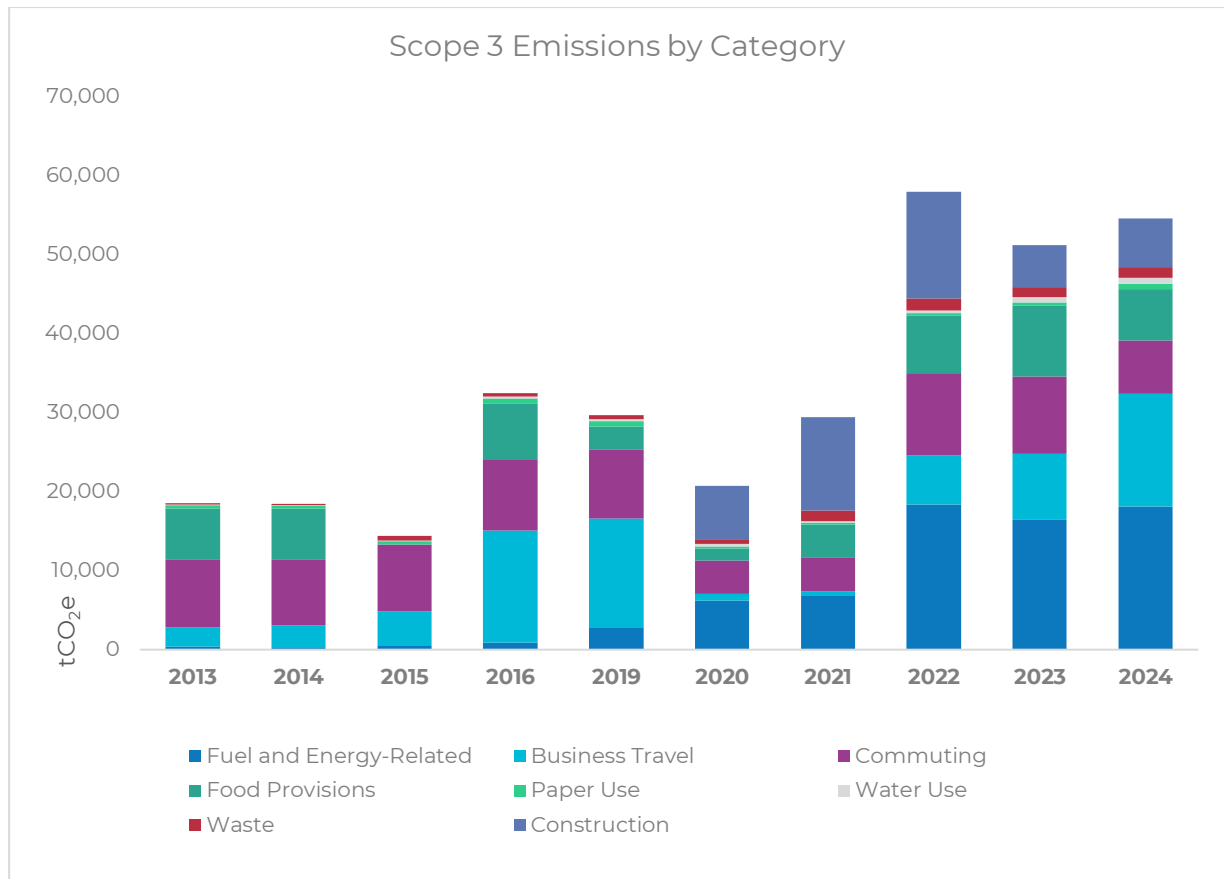


Figure 14: Annual Scope 3 Emissions per Emission Category

Note: Scope 3 emissions were not reported in 2012 or 2018, while minimal sources were reported in 2017

Combined Scope 3 emissions have increased by 10% since 2023. Fuel and Energy-Related Activity emissions have increased as a function of increased Scope 2 emissions, as this accounts for the upstream portion of emissions arising from the production, processing and transport of fuel (such as coal) before it is combusted to produce electricity.

Emissions associated with air travel have increased by 69% between 2023 and 2024. In 2023, emissions were calculated based on actual flight routes and classes for a portion of activity for which flight reports were available. To account for the balance of flight activity for which primary data was not available, the calculated results were extrapolated based on the remaining expenditure. The same methodology used in 2023 was applied in 2024, with a slightly lower accuracy rate. In 2023, 62% of flight data was provided, and the remainder was extrapolated, whereas in 2024 only 52% of the actual flight records data was provided, and the remainder was extrapolated. Thus, 2024's data has slightly lower accuracy than the previous year.

Scope 3	tCO ₂ e												
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fuel and Energy-Related Activities	-	409	341	581	890	-	-	2 842	6 232	6 920	18 341	16 372	18 116
Business Travel - Land	-	385	124	262	228	-	-	304	48	42	332	274	534
Business Travel - Air	-	2 021	2 628	3 996	13 902	-	-	13 424	763	395	5 946	8 072	13 680
Employee Commuting	-	8 566	8 217	8 465	9 071	-	-	8 671	4 245	4 219	10 327	9 853	8 337
Purchased Goods & Services: Food	-	6 485	6 549	0	7 022	-	-	2 970	1 467	4 253	7 254	8 864	6 480
Purchased Goods & Services: Paper	-	386	305	382	667	-	-	708	271	249	355	429	659
Purchased Goods & Services: Water	-	121	139	138	194	174	-	179	321	147	365	667	774
Waste Generated in Operations	-	175	143	558	452	506	-	506	584	1 384	1 484	1 281	1 413
Capital Goods: Construction	-	-	-	-	-	-	-	-	6 798	11 758	13 493	5 323	6 139
TOTAL	-	18 547	18 446	14 382	32 427	680	-	29 605	20 729	29 366	57 896	51 136	56 132

Table 9: Scope 3 emissions per category

3.5.1. Fuel- and Energy-Related Emissions

This category includes emissions related to the upstream production and transport of the fuels and energy purchased and consumed by UCT, referred to as “Well-to-Tank” (WTT) emissions for fuels consumed, as well as “Transmission and Distribution Loss” emissions related to electricity consumed. The scope was increased in 2022 to include WTT emissions associated with electricity generation and electricity lost during transmission and distribution within the municipal grid, and WTT emissions associated with commuting. The results in this category are entirely dependent on Scope 1 and 2 activity, so when electricity use, diesel combustion and mobile combustion increase, so will the emissions in this category.

3.5.2. Construction Emissions

This category covers the upstream embedded greenhouse gas emissions in the materials used to construct UCT’s capital goods. The quantified result is based on secondary expenditure data and, as such, should be considered a general estimate of emissions. Ideally primary data will be logged in the form of material quantities and supplier-specific emission factors to enable more accurate quantification of construction emissions, and to account for any green building practices. Although UCT spent R96 million on construction in 2023, this quantity increased by 48% in 2024 to R142 million. The resulting estimated greenhouse gas emissions have increased, although the applied emission factor has been adjusted for inflation as per best practice.

3.5.3. Purchased Goods and Services Emissions

Food Provisions

UCT food supply activity includes food that is supplied to first-tier residences by the number of breakfasts, lunches and dinners, as well as meals, bakery and food items supplied by vendors that operate on campus. Based on the data provided, upstream emissions embedded within food provisions decreased 27% between 2023 and 2024, primarily due to a smaller quantity of food supplied to first-tier residences during the most recent reporting year. The emission factors applied to all historic assessments were determined in a study conducted in 2012. In order to apply more up-to-date food provision emission factors, GCX calculated the required factors based on detailed life cycle data from the Ecoinvent database.

Water Consumption

Water data was supplied via SAP, in addition to consumption data from UCT’s Graduate School of Business and from UCT residences. GCX continues to apply a South Africa-specific emission factor for water supply, which is more appropriate than that which was applied in assessments prior to 2020. The emission factor is updated annually based on updates to the country’s grid emission factor. Water use emissions increased from 667 tCO₂e in 2023 to 774 tCO₂e in 2024, primarily due to an increase in water usage at UCT residences. Water use statistics have been included in the appendices.

Paper Purchased

UCT purchases office paper and custodial paper, as well as paper and books used for exams. Greenhouse gas emissions are embodied in these papers during the production and transportation of the material. Paper use emissions increased by 54% between 2023 and 2024, primarily due to the updated Sappi emission factor sourced from the company’s 2024 sustainability report, which is higher than that reported last year.

3.5.4. Commuting Emissions: Staff and Students

Commuting Emissions are based on a survey taken in 2014. However, the data is updated based on the updated populations of students and staff commuting to and from campus. As expected, due to many students remaining at home during 2020 and much of 2021, emissions dropped during those years and have increased into 2022. The increase into 2022 was exaggerated by the addition of WTT emissions to this category’s total. Total emissions decreased by 5% into 2023 as a function of slightly lower population numbers and decreased by a further 15% into 2024 partly due to emission factor updates.

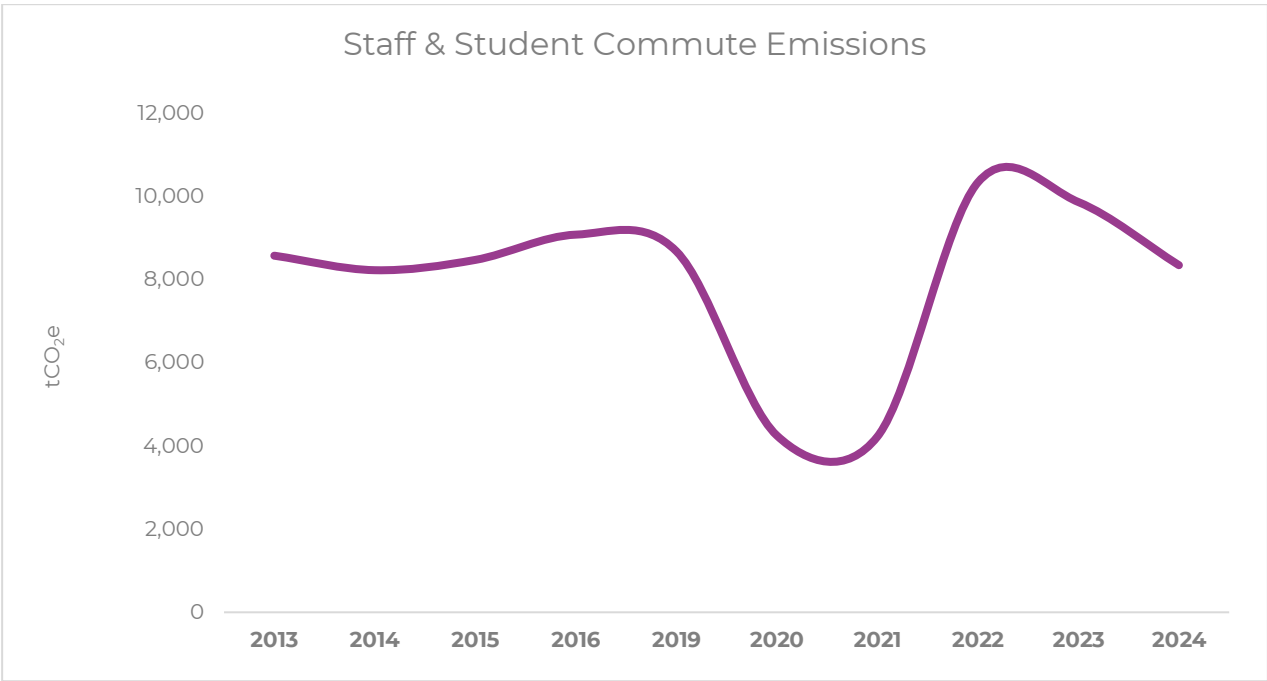


Figure 15: Annual Commuting Emissions Fluctuations

3.5.5. Business Travel Emissions

UCT’s business travel emissions include air travel, car hire (local and international), staff reimbursed travel and travel allowances. Emissions associated with air travel have increased significantly by 69% between 2023 and 2024, reaching levels close to those observed before the COVID-19 pandemic. In 2023, emissions were calculated based on actual flight routes and classes for a portion of activity for which flight reports were available. To account for the balance of flight activity for which primary data was not available, the calculated results were extrapolated based on the remaining expenditure. The same methodology used in 2023 was used in 2024, with a slightly lower accuracy rate. In 2023, 62% of flight data was provided, and the remainder was extrapolated, whereas in 2024, 52% of data was provided, and the remainder was extrapolated. Thus, 2024’s data has slightly lower accuracy than the previous year; however, the portion of data submitted is considered to be a good representative sample.

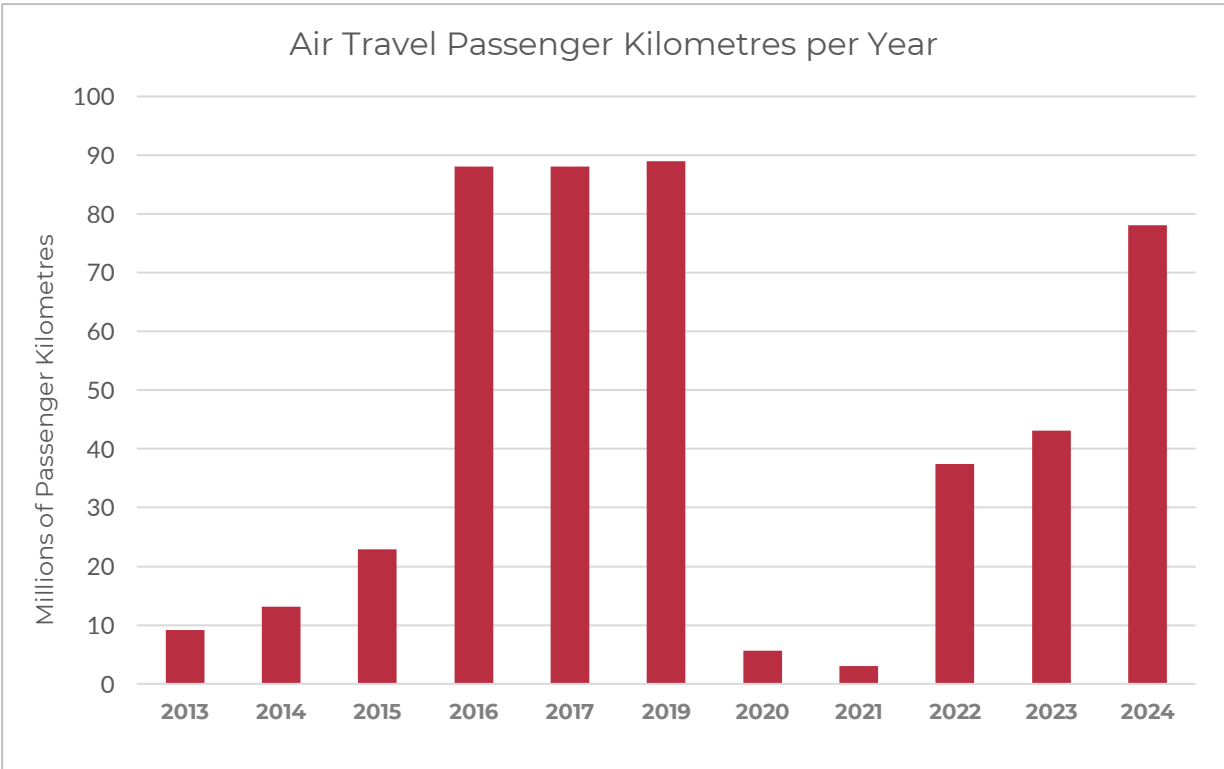


Figure 16: Annual Air Travel Emission Fluctuations

3.5.6. Waste Generated Emissions

Indirect emissions from waste generation occur due to disposal, treatment method and transport of waste types. In 2024, 74% of UCT’s waste generated was sent to landfill, which is slightly lower than the previous year. Currently the university has several recycling initiatives in place which reduce overall emissions from this source. Total waste emissions increased by 10% between 2023 and 2024. Waste statistics have been included in the appendices.

4. TARGETS

UCT has set the following target:

Net Zero emissions by 2050 (Scope 1 and 2)

- This requires a 2 – 5% reduction in emissions per annum from 2019* (pre-COVID lockdown).
- UCT has seen a 17% reduction in scope 1 and 2 emissions since its 2019 baseline year, which translates into an average decrease of 3.4% in emissions per annum since 2019.

**The UCT strategy was published in early 2020, before the COVID-19 lockdowns, proposed 2020 as the baseline year, which turned out to be an inappropriate baseline year due to the forced inactivity with unrealistically low emissions levels due to the COVID lockdown. 2019 was therefore subsequently selected as the baseline year, as the most recent pre-COVID lockdown year.*

Targets are based on combined Scope 1, 2 and Other Direct Emissions. As expected, post COVID lockdowns the activity on campus began to normalise the following year and consequently these emissions increased by 16% in 2021. With most activity returning to pre-Covid levels, UCT saw a 0.5% increase in emissions between 2021 and 2022 followed by a 2% decrease between 2022 and 2023, and a 3% increase between 2023 and 2024. While levels have increased after this period of forced reductions, they have not increased as high as they were prior to the COVID-19 lockdowns, showing an **overall 17% decrease** in UCT's Scope 1, 2 and Other Direct emissions between 2019 and 2024.

Scope 1, 2 and Other Direct Emissions		
2019	2024	% Change 2019 vs 2024
73 417	61 037	17% reduction

Table 10: % Change in Scope 1, 2 and Other Direct Emissions since 2019

Due to UCT's practice of annual carbon footprint measurement since 2012, it is also possible to track the changes in Scope 1, 2 and Other Direct emissions since that initial assessment year. The trend below clearly illustrates the impact of Covid-19 on 2020 and 2021 emissions, followed by a slight normalisation into 2022 and onwards.

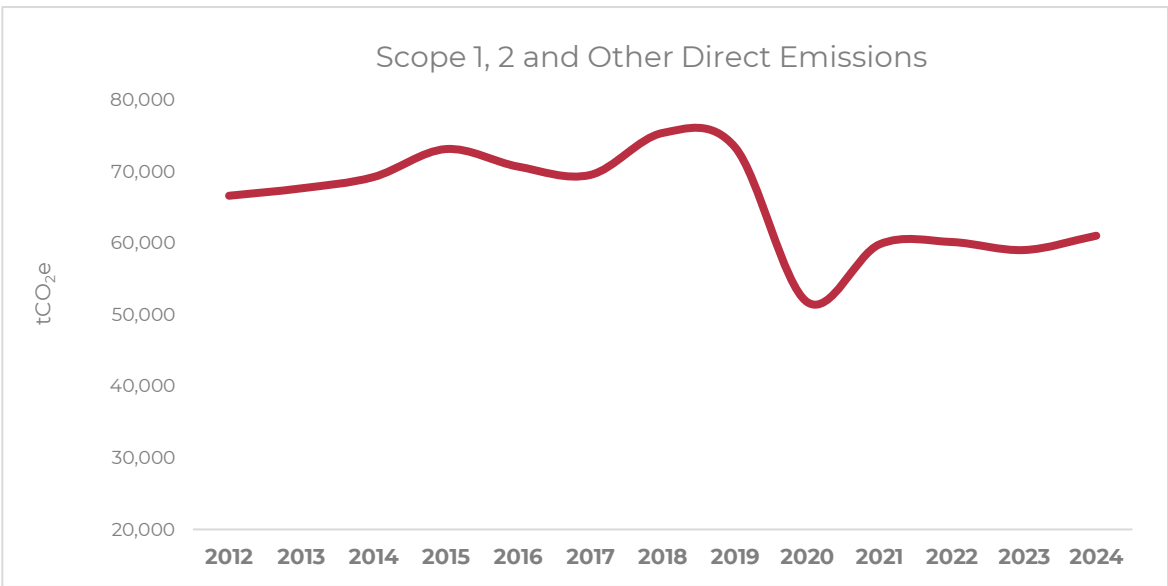


Figure 17: Annual Fluctuation in Scope 1, 2 and Other Direct Emissions

Looking at the change in emissions since UCT’s first assessment, the institution’s greenhouse gas emissions have declined by 8% since 2012. This should take into account that generator diesel emissions were not reported until 2015 and fugitive refrigerant gas emissions were not reported until 2016. However, the majority of these emissions arise from Scope 2, which has been reported relatively consistently throughout the years.

Emissions	tCO ₂ e		% Change
	2012	2024	2012 vs 2024
Scope 1, 2 and Other Direct	66 622	61 037	-8%

Table 11: % Change in Emissions since 2012

Renewable Electricity at UCT

Thanks to the generation of 95,725 kWh of renewable electricity from solar panels installed at three locations at UCT-controlled facilities, Scope 2 emissions have been reduced by 87 tonnes of CO₂e in 2024. Scope 2 provides the greatest opportunity for emission reductions at UCT and the most effective approach for the institution to maintain its reduction target. Further solar PV has been installed at UCT and is awaiting permissions from the City of Cape Town to operate, which will aid in the reduction of UCT’s Scope 2 emissions. The impact of all new installations will be tracked in all UCT greenhouse gas inventories going forward.

5. RECOMMENDATIONS

5.1. Carbon Management

Carbon footprint assessment results can inform where an organisation should focus its reduction efforts, in terms of emission sources and facilities. There are certain parameters that should be taken into account, including:

- The relative contribution of an emission source to UCT’s overall carbon footprint
- The control that UCT has over an emissions-generating activity
- Confidence in the existing data and results

Scope 2

Scope 2 emissions amounted to 56,701 tCO₂e which contributed 48% of UCT’s most recent greenhouse gas inventory. Of this, 64% are accounted for by electricity consumption on Main Campus. **Electricity consumption at Main Campus still offers the greatest opportunity for emission reductions within UCT’s carbon footprint.** Although these are indirect emissions which take place off-site, the consumption of grid electricity at the facilities within the assessment boundary is under UCT’s operational control. Although some improvements can be made in terms of clarifying the Scope 2 boundary, data quality and completeness is improving. With the rollout of various solar PV installations on UCT campuses, future inventories will continue to take into account avoided emissions related to the use of renewable energy. If UCT continues on a journey to transition from grid to renewable electricity use (on-site and wheeled energy), combined with energy efficiency initiatives throughout its campuses for lighting and air conditioning, these avoided emissions will further displace Scope 2 emissions over time.

Scope 1 and 3

Although Scope 1 contributes a smaller portion of UCT's total carbon footprint, there are still opportunities for reducing emissions, as well as reducing the institution's overall environmental impact.

Shuttle and vehicle fleets:

UCT continues to investigate the feasibility of converting its shuttle and vehicle fleets to electric vehicles. This initiative is run alongside the installation of solar energy infrastructure, such that solar energy could eventually contribute to powering electric vehicles. UCT can also focus on route and driving efficiency to reduce overall fuel consumption.

Fugitive refrigerant gases:

UCT introduced A32 refrigerant gas into campus systems in 2023, which has a lower-than-average global warming potential. The use of A32 increased almost fivefold in 2024. UCT should aim to completely phase out the use of R22 and any other HCFC gases for refrigeration or air-conditioning purposes due to their ozone-depleting qualities. Although they are not ozone-depleting substances, HFCs also have very high global warming potentials, which means that even small gas refills in air-conditioning systems can significantly increase UCT's Scope 1 emissions. Alternative, climate-friendly refrigerant gases should be considered such as hydrocarbons, ammonia or carbon dioxide.

Paper use:

The majority (71%) of paper in 2024 was for office use rather than custodial, and this is where UCT can focus on reducing paper use. Overall the contribution of total paper emissions to UCT's footprint is less than 1%, so these efforts would be in light of the broader environmental impact of paper use, more than its impact on the atmosphere.

Waste generation:

74% of UCT's waste is sent to landfill. Although waste emissions only contribute 1.2% of total greenhouse gas emissions, the amount of material sent to landfill is contributing to South Africa's overfilled landfill crisis, which UCT can help mitigate by investigating alternative waste management solutions.

5.2. Data Management

The following recommendations offer suggestions to improve data quality and access for future greenhouse gas assessments. Refer to Appendix A – "Methodology" for the current system of data management as it was applied to the 2024 inventory.

Overall, UCT has already begun collecting data earlier in the year, compared to previous assessments. This allows more time for data screening and checking, which leads to higher levels of data accuracy and completeness.

Electricity consumption: The boundary of facilities included in this assessment was drawn as accurately as possible with the information provided. However, campus-level electricity data does not show exactly which erfs are included. Although a Master Erven and Property Areas lists were provided, it is not entirely clear which of the erfs are covered in the campus-level data, and the erf lists don't completely align. Various facilities were not assigned an area metric (m²). Ideally UCT will develop a comprehensive list of erf numbers where electricity consumption is under UCT's operational control, and submit consumption data at an erf level. Currently this is being considered as part of an existing 5-year data management plan by UCT.

Diesel used in generators: Data quality remains improved through the submission of an Excel-based data log of fuel purchases. Previous assessments relied on incomplete PDF invoice collections and the conversion of fuel expenditure to fuel quantities based on diesel prices at the time.

Business Travel: Data quality remains improved due to the submission of travel consultant reports from a selection of UCT's travel agencies. This enabled the determination of summarised passenger kilometres per flight haul and class where data was available, which is a notable improvement relative to previous years' data which was 100% based on expenditure. However, reports were not available from all UCT travel agencies and where it was missing, the existing data was extrapolated based on the difference in expenditure. Going forward, UCT should aim to access reports from more, if not all, travel agencies.

Construction: The data provided for this assessment of UCT's construction footprint was well documented. However, accounting for construction emissions based on expenditure provides a very broad estimate of the actual impact. Improving the quality of this data can help UCT to better understand and manage this source of emissions in future. Ideally, UCT could consider collecting data that includes the types and quantities (by weight) of materials used for construction, for future assessments.

Food supply: Emission factors are calculated using a combination of emission factors sourced from Ecoinvent v3.10. This is a change in methodology, as the previous method has become outdated as it used food supply emission factors from a 2012 UCT-based study that focused on specific catering items at the university. This provides higher accuracy and has improved the data quality.

Commute survey: UCT conducted a new survey of staff and students to obtain a more updated breakdown of travel to and from campus. Unfortunately, the response rate was low and could not provide a representative sample. As such, the previous method was used applying the modal % split from the original survey conducted in 2014. Data quality would be greatly improved if a good representative sample were obtained in an updated survey.

Water Use: A water metering system has been installed, although GCX has suggested that due to notable annual fluctuations in reported water use that does not align with other activity changes. UCT is aware of the water data accuracy concerns and as such has re-tendered the energy and water metering services, part of which is to obtain more accurate data and greater reporting flexibility.

APPENDIX A - METHODOLOGY

The operational control approach was used to consolidate all emissions within the specified boundary.

Carbon emissions were measured in accordance with the GHG Protocol Corporate Standard (WRI & WBCSD, 2004).

As per the GHG Protocol, all Scope 1 and Scope 2 emissions were included in the report. Emissions from non-Kyoto gases (such as Freon/R22) were measured and classified as out of scope Product Use Emissions. Although optional, selected Scope 3 emissions were also included.

All emissions were expressed as CO₂ equivalents (CO₂e), and account for carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O).

All emission factors used were from UK Government GHG Conversion Factors for Company Reporting 2024, using IPCC AR5 GWPs, unless stated otherwise. Specific sources are listed on the tab "EF" in the accompanying Excel report *GCX_UCT_CFA Report_FY24.xlsx*.

All activity data was submitted to GCX by UCT. Where the data required for calculating greenhouse gas emissions was not readily available in the submitted activity data, GCX analysed the relevant data set to isolate the consumption data required. Various assumptions were made to reach a best estimate of final consumption values. Assumptions are listed in the "Assumptions" tab in the accompanying Excel report *GCX_UCT_CFA Report_FY24.xlsx* (not publicly shared).

SCOPE 1

Stationary combustion

Emissions associated with stationary combustion relate to diesel purchased for use in generators to supply energy on site, as well as LPG purchased for use at various locations. Diesel data was provided in the form of fuel quantities purchased during 2024. LPG data was supplied as the total kilograms of gas purchased during 2024. Emission factors applied to estimate the associated greenhouse gas emissions are sourced from the latest Methodological Guidelines for Quantification of GHG Emissions, October 2022 (DFFE, South Africa) Tier 2 Country-Specific with Global Warming Potentials from the IPCC AR5 for stationary combustion per fuel type. These emission factors were selected in order to align with UCT's annual NGER submission results.

Fugitive Emissions

Fugitive emissions from refrigerant gases that escaped from air-conditioning systems are reported in Scope 1, except for emissions associated with refills of R22 gas, which is not a Kyoto gas and is reported out of scopes. Several different refrigerant gas types were refilled during each reporting period. Refills are conducted by various service providers across UCT facilities. The emission factors / Global Warming Potentials applied to estimate the associated CO₂ equivalent emissions were sourced from UK Government Conversion Factors for greenhouse gas (GHG) reporting V1.1, 2024, AR5.

Vehicle Fleet

As opposed to UCT's assessment periods prior to 2022 (for which expenditure data was provided to estimate fleet emissions), actual fuel consumption figures were made available for UCT's 2024 fleet activity in the same manner as UCT's 2023 fleet activity, pertaining to diesel and petrol used in UCT-owned and long-term leased vehicles. It was confirmed historically that the SAP reports submitted did include Bidvest vehicle activity. Similarly to UCT's 2023 fleet activity, it also contained the ABSA vehicle

activity, which was reported additionally. As such, fleet emissions may have been overestimated in reporting years prior to 2022. Eqstra vehicles data was submitted separately for 2024, which also provided fuel quantities per fuel type. No data is available related to the quantities of lubricant used in these vehicles.

Emission factors applied to estimate the associated greenhouse gas emissions are sourced from the latest Methodological Guidelines for Quantification of GHG Emissions, October 2022 (DFFE, South Africa) Tier 2 Country-Specific with Global Warming Potentials from the IPCC AR5, for mobile combustion per fuel type.

UCT Shuttle

Emissions are reported separately for UCT's vehicle fleet and the UCT shuttle fleet, as this will aid the institution's carbon management strategy. UCT's shuttle fleet is unchanged since 2023 and includes 32 vehicles. The fuel consumption data provided covers all operating vehicles. Data was provided as the quantity of diesel and petrol used during the reporting period. All diesel and petrol use reported is known to be used by UCT shuttle vehicles. FY24 was the first year reporting emissions from petrol used by UCT shuttles, as a new vehicle that uses petrol was added to the fleet. Emission factors applied to estimate the associated greenhouse gas emissions are sourced from the latest Methodological Guidelines for Quantification of GHG Emissions, October 2022 (DFFE, South Africa) Tier 2 Country-Specific with Global Warming Potentials from the IPCC AR5, for mobile combustion per fuel type.

Renewable Electricity

This is the third year that UCT is reporting the use of renewable electricity within the institution's greenhouse gas inventory. The on-site generation of electricity must be reported in Scope 1. At UCT this relates to on-site solar installations at three locations. There are no associated direct emissions. However, the "avoided Scope 2 emissions" are reported outside of Scopes for reference, as the energy is utilised by UCT facilities which would otherwise have required grid electricity.

SCOPE 2

Purchased Electricity

This scope covers all electricity consumption under UCT's operational control.

Data was provided by Terra Firma for most campuses, while separate data was provided for ICTS and GSB. A SAP and a P&S report were provided for all other Erfs such as residences and all other UCT admin buildings. SAP data includes many reversals, which are listed in the comments section of UCT's SAP data report. Taking these into account would require an extensive manual process of updating several figures per erf. Due to the time required, the existing figures are applied. Therefore, results are slightly over estimated.

GSB

UCT has 100% operational control of its Graduate School of Business and Conference Centre, located at the V&A Waterfront. The facility is metered as part of the Protea Breakwater Lodge Hotel. In order to apportion electricity consumption between the hotel and the university, the following methodology was applied: Consolidated electricity consumption is provided for the three facilities, along with total expenditure. Although the actual consumption is not metered separately per facility, the billing is separated and this was used to determine a best estimate of the % split in consumption between the facilities. Some of the guests at the Breakwater Lodge are UCT students and academics. As such, UCT is considered to have operational control of any associated electricity consumption at that facility. The hotel has provided an updated estimated % breakdown of hotel visitors for 2024. UCT has accounted for their control of electricity use at the hotel based on the combined % of UCT student and academic visitors. The breakdown is as follows:

- UCT Students & Academics: 11.95%

- Other Hotel Guests: 88% "

Selected facilities are excluded from the total floor area metric as UCT is considered to have little operational control over activity (and therefore, associated emissions) at these locations: Red Cross Hospital, Groote Schuur, Field Stations, Sports Science Institute, Valkenberg Manor House & Wild Fig, Montebello. As such, electricity consumption for these facilities is not included in the assessment.

To date, UCT's assessments have applied Eskom's financial year factor to the prior calendar year's data, which is the most appropriate option because Eskom's financial year runs from 1 April to 31 March annually. For example: Eskom's AR 2021 factor (based on their financial year 1 April 2020 - 31 March 2021) is applied to UCT's 2020 data. The majority of the months in that Eskom financial year fall in 2020 and are, therefore, most applicable to UCT's 2020 data. See tab "Figures" for a list of Eskom emission factors and the UCT reporting year's they have been applied to.

Eskom Factor 1 and Factor 2: All UCT assessments prior to 2020 have been based on the Eskom emission Factor 1 "total energy sold". GCX recommended switching to Eskom's Factor 2: "total energy generated". This is because Factor 2 is calculated using national energy results that exclude Eskom's own consumption, thus avoiding double counting in the calculation of the emission factor. Factor 2 has been applied to all subsequent assessments (FY2020 onwards).

Scope 2 emissions associated with electricity consumption during UCT's 2023 and 2024 financial years were measured by applying the emission factor from the South African Department of Forestry, Fisheries and Environment (DFFE) Grid Emission Factors Reports. Once the DFFE began publishing emission factors, those were adopted, as they provide a more accurate reflection of the national grid-average emission factor rather than Eskom-specific values.

Scope 2 emissions were calculated and reported using both the location-based and market-based methods. This is in accordance with GHG Protocol Corporate Standard's "Scope 2 Guidance" (January 2015). No contractual instruments were purchased during the reporting periods, and since South Africa currently has no official residual mix factor, both the location-based and market-based totals are the same.

SCOPE 3

Category 1: Purchased Goods and Services: Paper

This category includes the embedded emissions within purchased paper during the financial year. UCT's paper use includes custodial paper as well as office paper use. For all paper types, the full 12 months-worth of data was provided and no extrapolations were required.

Although data was provided in the form of a SAP report where the general ledger listed various purchases related to paper and stationary, it only provided expenditure data and no information related to paper quantities or weights. Therefore, additional data was requested as follows:

Numbers of paper reams or towels or bales related to each paper category: Reams of paper used at ICTS, custodial paper bales and towels from Campus Cleaning Services, and reams of paper procured from suppliers. All reported units were converted to kilograms of paper. See "Assumptions" tab in the accompanying Excel report *GCX_UCT_CFA Report_FY24.xlsx* for conversions. The most recent available Sappi Typek emission factor for 80gsm paper was applied to estimate emissions embedded within office paper used.

To estimate embedded emissions within custodial paper used, an emission factor has been applied from UK Government Conversion Factors for greenhouse gas (GHG) reporting V1.1, 2024, AR5 for paper material use.

Category 1: Purchased Goods and Services: Water

A SAP report was provided covering all UCT water consumption, excluding the GSB, in kilolitres consumed. The SAP Residences water data was provided in rands spent and converted to kilolitres using the average cost of water (ZAR/kL) during FY24. Although this is a Scope 3 source, to account for partial

control of water consumption at BWL, consumption was apportioned based on the floor area of each facility (BWL, CC and GSB) in line with the method applied in previous assessments. C7-2 is a code reserved from digital water meter readings, the installation of which is yet to be completed.

kL WATER CONSUMED from 2013 to 2024 per annum for all UCT facilities									
2013	2014	2015	2016	2019	2020	2021	2022	2023	2024
380,530	436,178	365,622	562,787	519,527	327,611	149,994	394,020	713,902	923,313

Category 1: Purchased Goods and Services: Food Provisions

The data submitted for the number of meals provided at Residences in 2024 included the number of breakfasts, lunches and dinners as in 2023 and prior.

GCX calculated food emission factors using a combination of emission factors sourced from Ecoinvent v3.10, unless stated otherwise. The calculations can be found in the "EFs" tab in the accompanying Excel report *GCX_UCT_CFA Report_FY24.xlsx*. All assumptions are listed in the "Assumptions" tab in the accompanying Excel report *GCX_UCT_CFA Report_FY24.xlsx*. This is a change in methodology, as the previous method has become outdated as it used food supply emission factors from a UCT student alumni dissertation published in 2012 (Gravenor, M. (2012), Food Sustainability at UCT: An exploratory investigation into the University of Cape Town's food system and its relation to the institutional carbon footprint, Minor dissertation towards a Master of Science specialising in Climate Change and Sustainable Development, University of Cape Town).

First Tier Residences are contracted by UCT Properties and Services, who provided meal provision data. The residences also supply students with meal vouchers which they redeem on campus from the campus food vendors. Therefore, although voucher figures are provided by Food & Connect (Residences food), emissions are reported alongside those from food supply via campus vendors. They are removed from the residence food supply emissions, to avoid double counting.

Category 2: Capital Goods: Construction

In the absence of primary material quantities data, UCT was able to submit secondary expenditure figures for construction-related activities during 2024. Rands spent were converted to Euros based on the exchange rate at the time of the assessment (see the "EFs" tab in the accompanying Excel report *GCX_UCT_CFA Report_FY24.xlsx*). An emission factor from EXIOBASE (Climatiq) Construction Work: South Africa, 2019, AR5 was applied to estimate the associated embedded emissions within the capital goods constructed during the reporting year. This emission factor has been updated based on the accumulated inflation rate between 2019 and 2024 by GCX (see the "EFs" tab in the accompanying Excel report *GCX_UCT_CFA Report_FY24.xlsx* for more details on the calculation). The conversion of Rands to Euros has taken into account the current exchange rate.

Category 3: Fuel- and Energy-Generating Activities

This category covers Fuel- and Energy-Related Activities that are not included in Scope 1 or 2. It includes Well-to-Tank emissions associated with the fuel used in generators, LPG used in equipment and fuels used in UCT's vehicle and shuttle fleets. It also includes emissions associated with transmission and distribution losses within the electricity grid, Well-to-Tank emissions associated with the generation of electricity and the generation of electricity lost during transmission and distribution. Emissions associated with Transmission and Distribution losses are calculated using a factor of 0.083 kgCO₂e per kWh, sourced from the South African Department of Forestry, Fisheries and Environment (DFFE) Grid Emission Factors Report, 2025. Although it is based on data from 2023 it is considered to be a most up-to-date measurement of the country's grid emission factor and transmission and distribution losses emission factor, and the most appropriate option for UCT's 2024 carbon footprint.

Category 5: Waste generated in operations

A detailed waste report was provided. To estimate emissions associated with general waste to landfill, an emission factor is applied from Friedrich & Troy 2012 "GHG emission factors developed for the collection, transport and landfilling of municipal waste in South African municipalities". Waste Management, Vol. 33: Issue 4, which is updated annually to account for updates to South Africa's grid emission factor. Emission factors for recycled waste are from UK Government GHG Conversion Factors for Company Reporting 2024, AR5. Waste recycling statistics for 2024 are given below:

Category	Total Kg	Recycled Kg	Scope 3
	2024	2024	tCO2e
Non-recycled (general waste to landfill)	968,880	0	1,411
General Recycled	3,533	3,533	0.02
Hazardous Chemical (recycled)	1,313	1,313	0.01
Hazardous Medical (recycled)	60,522	60,522	0.39
Food waste (recycled)	276,680	276,680	1.77
e-Waste ICTS and P&S (recycled)	2,530	2,530	0.02
	1,313,458	344,578	1,413

UCT transitioned to a new temporary waste service provider under an emergency contract, which affected the level of detail available in the waste data. Additionally, during this transition, recycling services were temporarily unavailable, which may have influenced the associated emissions. A new contractor has since been appointed in 2025 with recycling re-instated and good reporting in place.

Category 6: Business travel

Air travel information was submitted for three travel agencies: Travel Manor, Travel with Flair Cape Town, and Travel Connections. Flights booked via these agencies represent 52% of the total invoiced quantity for UCT's air travel during 2024. Therefore, the data that was made available, which was converted to passenger kilometres per flight haul and class, has been extrapolated to represent 100% of the total invoiced quantity.

In the absence of a UK Government emission factor for short haul premium economy flights, the emission factor for short haul business class flights has been applied to all premium economy flights as a conservative estimate.

Air travel emission factors include the effects of radiative forcing.

Car hire data was also provided in SAP reports: separate general ledgers were provided for UCT car hire and for UCT staff reimbursements and allowances. These reports included additional expenditure which needed to be filtered out to arrive at actual Rands spent on car hire.

Car rental Rands / Km were previously derived from actual distance travelled data from Bidvest in 2022 and prior. Similarly to 2023, Bidvest data was not provided for this assessment. Therefore, the cost per kilometre travelled is based on South Africa's 2024 Automobile Association rate of R4.84 per km.

Staff reimbursements: one general ledger was provided covering staff travel reimbursements, as well as travel allowances. Data was only available as travel expenditure, no distances or vehicle types were available. Data was filtered for food allowances, and by cost per km to isolate reimbursements expenditure. Allowances are filtered as all entries that contain "travel" and exclude travel at the reimbursements cost per km to prevent double counting.

Category 7: Employee Commute

In the interest of comparability, the methodology applied in 2019, 2020, 2021, 2022 and 2023 is maintained in this assessment. Data is based on the UCT Information Systems survey undertaken in 2014. The survey reflects commuting activity of students and staff at upper campus. Figures are extrapolated to reflect the full UCT commuting population for each year. The modal % split is maintained from the original

survey conducted in 2014, however UCT request an adjustment in 2022 to reflect the general shift from staff and student commuting via train to commuting via taxi. These %'s were adjusted in UCT's previous assessment to represent the increase in travel by taxi and the decrease in travel by train, without affecting the proportions of the other travel modes per year. Total persons commuting is based on staff and student population figures for 2024. Commuting in UCT shuttles is excluded as the associated emissions are reported in Scope 1 as UCT-owned and controlled vehicle. It is assumed that the average minibus taxi has a capacity of 8 people. As such, the emission factor for minibus taxi travel is derived from that for a large petrol vehicle, divided by 8. Emissions do not include home working emissions.

Student and staff populations commuting to campus were reduced for UCT's 2020 and 2021 assessments, based on detailed attendance schedules, to account for the impact of Covid on commuting. These adjustments were removed for UCT's 2022, 2023 and 2024 assessments because commuting has mostly normalised for this reporting period.

The category also includes the Well-to-Tank emissions associated with the fuel used for employee commuting for each mode of travel. No data is available related to home working and this is noted as an exclusion.

ORGANISATIONAL BOUNDARY

UCT confirm that all properties with 0m² reported on the D1 properties list are not under UCT's operational control. Where electricity data has been provided for a campus or an erf number, it has been confirmed that the consumption is under UCT's operational control. Where m2 are provided for an erf that is not under UCT's operational control, it has been removed from the total m2.

APPENDIX B – ASSUMPTIONS & LIMITATIONS

It is often necessary to make assumptions and extrapolations based on the available data. Please take note of some of the key assumptions, extrapolations and limitations listed below:

It was assumed that all data submitted to GCX by UCT was accurate, precise and complete unless stated otherwise.

Scope 2

Where electricity consumption data is provided by SAP or P and S, for an Erf at Upper Campus, Middle Campus, Lower Campus, Medical Campus or Hiddingh, it is assumed that the electricity consumption at the erf is accounted for by UCT's metering through TFS and the data provided for those precincts.

Where partial data was available for a property and the remaining months were unavailable, they were estimated based on the average of existing months of data.

Where data was unavailable for a property that is owned by UCT, where electricity use is not listed as a service type on UCT's Master Erven, or properties that are listed as "leased", it is assumed that electricity consumption is not under UCT's operational control (for example, the property is leased out) and, as such, the associated emissions are excluded from Scope 2.

The sheets "Master Erven" and "D1 Property Areas" list UCT owned facilities and associated erf numbers. Campus-level data is provided by Terra Firma Solutions, along with a list of "Campus Buildings" covered by the data. However, the list of TFS campus buildings primarily lists generators, and does not provide erf numbers. Therefore, it is assumed that the TFS data covers Upper, Middle, Lower, Hiddingh and Medical Campuses, including all erfs listed under those campus names on the Master Erven sheet. Is it also assumed that the TFS data for Medical Campus includes the erf numbers listed on the Master Erven sheet for "Health Science", "Groote Schuur" and "Red Cross". On the sheet "D1 Property Areas" some erf numbers are not shown. Ideally electricity data could be provided in kWh consumed per erf number, alongside a comprehensive list of UCT-controlled erfs. In the absence of full visibility into this information, the data provided is assumed to cover all UCT-controlled erfs for the reporting period.

Where 2024 data was unavailable for a Residence or Other Admin Building that is still listed on the UCT Master Erven or property areas list, consumption is estimated based on the most recent available data as a best estimate.

Scope 3

It is assumed that the flight activity provided in travel consultant reports is a good representative sample of all UCT flight activity.

It was assumed that the emissions associated with a short haul first class flight are similar to those associated with a short haul business class flight. The latter is applied to short haul first class flights in the absence of a haul-specific emission factor.

Flight data was excluded when routes were not given, and rather a hotel name was given.

Staff reimbursements: it is assumed that all general ledger records where "net price" (cost per km) is logged at R4.18, R4.64 and R4.84 reflect staff reimbursements, and no other records on the ledger reflect staff reimbursements.

Travel allowances: it is assumed that all entries on the general ledger, aside from staff reimbursements, that are not labelled "travel" do not reflect travel allowances.

Hired cars: vehicle types are not known. In order to apply an emission factor it is assumed that they are mostly medium-sized petrol vehicles.

Staff reimbursements and travel allowances: vehicle types are not known. In order to apply an emission factor they are assumed to be mostly medium sized with unknown fuel type.

Commute: travel by car is assumed to be conducted on average by medium petrol cars. It is assumed that the average minibus taxi has an 8 person capacity.

Emissions related to paper used for exam books and papers have been based on estimated data to date, using assumptions regarding average usage per student.

It is assumed that an average toilet roll weighs 150 grams. The average weight of hand towels utilised at UCT is based on that used in 2019: 0.2 kg each.

Property areas: where total square metres were provided, "external gross area" is applied to calculations in line with previous methods. Where gaps in area data were manually completed in previous assessments, the same was done for this assessment, assuming no changes to the relevant property areas. UCT confirm that there were no significant changes to the organisational boundary. An updated properties list was submitted, which includes changes in size to existing facilities.

Water consumption at GSB in 2024 was assumed to be the same as in 2023.

GCX calculated food emission factors using a combination of emission factors sourced from Ecoinvent v3.10, unless stated otherwise. The following assumptions were made:

- The average sandwich sold is assumed to contain ham, cheese, lettuce, tomato and butter in the quantities assumed on the 'EF' tab and required on average 0.025 kWh of electricity for toasting.
- The average "cold breakfast" is assumed to be breakfast cereal. The emissions are calculated based on a bowl of wheat cereal, which is assumed to average 45 grams, eaten with cow milk.
- Pasta is assumed to be made without eggs. The main ingredients were flour and water.
- In the mayonnaise calculations, egg yolk is assumed to comprise 33% of a whole egg on average. Whole lemon emissions are applied to estimate emissions per kg of lemon juice - it is assumed the whole lemon was used to extract its juice.
- In order to estimate the average emissions embedded in a lunch with meat, GCX has calculated the emissions associated with a large tortilla wrap and applied it to all lunches with meat, assuming that it provides a close estimate of actual average meal emissions. Emissions are calculated based on a single wrap containing 80 g tortilla, 100 g cooked beef mince, 30 g cheese, 12 g tomato, 7 g onion, 6 g lettuce and 5g mayonnaise, while requiring on average 0.05 kWh of electricity to cook the beef.
- In order to estimate the average emissions embedded in a vegetarian lunch meal, GCX has calculated the emissions associated with a large vegetarian tortilla wrap and applied it to all vegetarian lunches, assuming that it provides a close estimate of actual average meal emissions. Emissions are calculated based on a single wrap containing 80 g tortilla, 80 g cooked beans, 20 g cheese, 20 g bell peppers, 12 g onion, and 10 g carrot, while requiring on average 0.05 kWh of electricity to cook the beans.
- In order to estimate the average emissions embedded in a dinner with meat, GCX has calculated the emissions associated with spaghetti bolognese and applied it to all dinners with meat, assuming that it provides a close estimate of actual average meal emissions. Emissions are calculated based on a single meal containing 100g pasta, 120g beef mince, 50g onion, 40g carrot, and 150g tomato, while requiring on average 0.05 kWh of electricity to cook the beef.
- In order to estimate the average emissions embedded in a vegetarian dinner meal, GCX has calculated the emissions associated with a lentil and vegetable bolognese and applied it to all vegetarian dinners, assuming that it provides a close estimate of actual average meal emissions. Emissions are calculated based on a single meal containing 100g pasta, 120g lentils, 50g onion,

40g carrot, and 150g tomato, while requiring on average 0.05 kWh of electricity to cook the lentils and vegetables.

- The average “uncooked snack” is assumed to be a fruit and nut snack pack. Emissions are calculated based on a 100 g pack containing 30 g peanuts, 10 g cashews, 10 g almonds, 28 g raisins, 10 g dried mango, 10 g banana chips and 2g salt. On average, it is assumed that 0.1 kWh of electricity is used to dehydrate the mango and banana used in this snack.
- The average “cooked snack” is assumed to be a standard blueberry muffin, which requires approximately 0.05 kWh of electricity to bake in an oven. Emissions are calculated based on a 100 g muffin made with 40 g white wheat flour, 20 g sugar, 10 g vegetable oil, 10 g egg, 10 g milk, 7 g blueberries, 2 g baking powder, 0.5 g salt, and 0.5 g vanilla extract. The muffin liner was assumed to weigh approximately 5g. The emission factor for blueberries was assumed to be similar to grapes, as both are irrigated, high-value fruit crops with comparable cold-chain transport requirements in South Africa.
- The emission factor for lunch at residences is assumed to be the average of the cold lunch, meat lunch and vegetarian lunch.
- The emission factor for dinner at residences is assumed to be the average of the meat and vegetarian dinner.
- Meal vouchers supplied by residences are redeemed on campus from the campus food vendors. Therefore, they are removed from the residence food supply emissions, to avoid double counting.
- The cost of a beverage is assumed to be between R10 and R15 in order to make a best estimate of emissions of a beverage.

This report was compiled by GCX

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