2015

# University of Cape Town Carbon Footprint Report 2014

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Balance Design

7/24/2015

**ACKNOWLEDGEMENTS**
This report would not have been possible without the following people and they are gratefully acknowledged:

- André Theys, Director of Properties and Services for supporting and funding this project;
- Anthony Dane of Environmental Resources Management (ERM) for input to the methodology and review of this report;
- The students of INF3011 for calculating components of the footprint and making recommendations;
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- Alex Hetherington, Corporate Sustainability Strategist at Carbon Calculated for providing input to the students in a technical workshop; and
- All the data holders from the Properties and Services Department, Student Housing and Residence Life, as well as Procurement and Payment Services. Refer to list of data holders in Appendix 1.

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## OVERVIEW OF UCT'S CARBON FOOTPRINT IN 2014

**Reporting period:**
Calendar year 2014: 01 January 2014 – 31 December 2014

**Reporting boundary:**
Operational control approach

**Carbon footprint calculation conducted on:**
All campuses of the University of Cape Town: Main Campus, Health Sciences, Graduate School of Business and Hiddingh (Arts)

**Methodology:**
Greenhouse Gas Protocol – Corporate Accounting and Reporting Standard

| | |
|---|---|
| Total students | 26 254 |
| Total staff (FTE) | 5 075 |
| Total floor area | 665 858m² |

**UCT Carbon Footprint 2014**

| CATEGORY | | $tCO_2e$ | % of Total |
|---|---|---|---|
| **Scope 1** | **Direct Emissions** | **1 792** | **2.05** |
| | Jammie Shuttle | 1 006 | 1.15 |
| | UCT vehicle Fleet | 556 | 0.64 |
| | LPG | 230 | 0.26 |
| **Scope 2** | **Indirect Emissions** | **67 112** | **76.91** |
| | Electricity: Main Campus | 44 219 | 50.68 |
| | Electricity: Medical campus | 11 239 | 12.88 |
| | Electricity: Off Campus Residences | 10 149 | 11.63 |
| | Electricity: GSB | 1 393 | 1.60 |
| | Electricity: Hiddingh | 111 | 0.13 |
| **Scope 3** | **Other Direct Emissions** | **18 351** | **21.03** |
| | Fuel and energy-related | 341 | 0.39 |
| | Business Travel | 124 | 0.14 |
| | Business travel - airlines | 2 628 | 3.01 |
| | Employee commuting | 8 065 | 9.24 |
| | Purchased goods - Food | 6 549 | 7.51 |
| | Purchased goods - Paper | 362 | 0.41 |
| | Purchased goods - Water | 139 | 0.16 |
| | Waste | 143 | 0.16 |
| | **TOTAL emissions** | **87 255** | |

| | | |
|---|---|---|
| **INTENSITY METRICS (Scope 1&2 only)** | | |
| | Gross Area (updated 2014) | 665 858 |
| | **Tons CO2e/m²/annum** | **0.10** |
| | Population - Staff & Student EFT | 31 329 |
| | **CO2e/person/annum** | **2.20** |

**Notes** Scope 1 Fugitive emissions from HVAC not included

**Comparison of 2013 and 2014 Carbon Footprints**

| CATEGORY | 2014 | 2013 | Diff | % Change |
|---|---|---|---|---|
| **Scope 1 Direct Emissions** | **1 791.53** | **1 820.56** | -29 | -1.6 |
| Jammie Shuttle | 1 005.68 | *1 068.20 | -63 | -5.9 |
| UCT vehicle Fleet | 556.10 | *462.98 | 93 | 20.1 |
| LPG | 229.74 | 289.38 | -60 | -20.6 |
| **Scope 2 Indirect Emissions** | **67 111.62** | **64 888.05** | 2 224 | 3.4 |
| Electricity: Main Campus | 44 218.64 | 42 582.81 | 1 636 | 3.8 |
| Electricity: Medical campus | 11 239.30 | 10 647.97 | 591 | 5.6 |
| Electricity: Off Campus Residences | 10 149.26 | 10 124.12 | 25 | 0.2 |
| Electricity: GSB | 1 392.94 | 1 416.65 | -24 | -1.7 |
| Electricity: Hiddingh | 111.49 | 116.50 | -5 | -4.3 |
| **Scope 3 Other Direct Emissions** | **18 351.37** | **18 170.71** | 181 | 1.0 |
| Fuel and energy-related | 341.21 | 409.45 | -68 | -16.7 |
| Business Travel | 123.87 | *153.58 | -30 | -19.3 |
| Business travel - airlines | 2 627.83 | *1 820.36 | 807 | 44.4 |
| Employee commuting | 8 065.00 | 8 566.00 | -501 | -5.8 |
| Purchased goods - Food | 6 549.47 | 6 484.63 | 65 | 1.0 |
| Purchased goods - Paper | 361.97 | 487.41 | -125 | -25.7 |
| Purchased goods - Water | 139.04 | 120.56 | 18 | 15.3 |
| Waste | 142.98 | *128.71 | 14 | 11.1 |
| **TOTAL emissions** | **87 254.53** | **84 879.32** | **2 375** | **2.8** |

** Figures above for 2013 have been restated using new data or emission factors*

## Table of Contents

# 1 INTRODUCTION

This report is the fourth carbon footprint report for the University of Cape Town (UCT), commissioned by the Properties and Services Department. A first, baseline report was compiled for the year 2007 in 2009, the second report for 2012 in 2013, and the third report for 2013 in 2014[1]. Annual reporting of greenhouse gas emissions has now become well-established. The results of this report will be incorporated into the annual Sustainability Report in terms of the ISCN-GULF Charter[2], contributing to the international university network on best practices for achieving sustainable campus operations.

The methodology for this report is, as previously, the GHG Protocol Corporate Accounting and Reporting Standard (Revised). The further guidance for Scope 3 emissions, contained in the GHG Protocol ***Corporate Value Chain (Scope 3) Accounting and Reporting Standard*** has been adopted for the first time in this report, relating mainly to the grouping of indirect activities and category titles.

The calculation of UCT's carbon footprint remains incorporated into the curriculum of the Department of Information Systems (Faculty of Commerce) third year course. This began in 2013 and provides an opportunity for students to increase awareness of climate change issues, while simultaneously enhancing the experiential learning that occurs in project-based learning. This course was showcased by the International Sustainable Campus Network at the World Economic Forum Annual Meeting in Davos, January 2015 (ISCN, 2015).

This report was compiled by an independent sustainability consultant, using some primary research by the Information Systems students. An independent specialist was consulted on methodology and reviewed the report. No third-party verification of emissions has been undertaken.

**The GHG Protocol**

The GHG Protocol is a multiple-stakeholder partnership of business, NGOs and governments led by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).

A carbon footprint can be defined as a measure of the greenhouse gas emissions that are directly and indirectly caused by an activity or are accumulated over the life stages of a product or service, expressed in **carbon dioxide equivalents $CO_2e$**.

There are a total of 18 greenhouse gases with different global warming potentials, but under the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto protocol, only the following gasses are considered for the purposes of carbon accounting:

- Carbon dioxide, $CO_2$; Methane, $CH_4$; Nitrous Oxide, $N_2O$; Hydrofluorocarbons, HFCs; Perfluorocarbons, PFCs; and Sulphur dioxide, SF6.

Refer to **Appendix B** for an overview of the GHG Protocol.

[1] Available at http://www.greening.uct.ac.za/about/reports/

[2] http://www.international-sustainable-campus-network.org/charter-and-guidelines/charter-overview

## 2 OVERALL METHODOLOGY

The GHG Protocol used for this report is a widely used methodology, suitable for companies, organisations and universities. GHG accounting and reporting practices are still evolving, requiring annual adjustments as new methods are introduced and emission factors updated.

The Protocol defines emissions as either 'direct' or 'Indirect', where direct emissions are from sources that are owned or controlled by the entity. Three 'scopes' are defined:

- Scope 1 Direct emissions
- Scope 2 Indirect emissions from purchased electricity
- Scope 3 Other indirect emissions

In the UCT context, Scope 1 includes direct emissions from the combustion of liquid fuels in the UCT-owned vehicle fleet, and the combustion of LPG in research facilities and Jammie shuttle. Scope 2 includes indirect emissions associated with purchased electricity from Eskom. Scope 3 comprises a range of indirect emissions including business travel, air travel, employee commuting, purchased goods and services such as food, paper products, water supply, and solid waste.

Under the GHG Protocol reporting of Scope 1 and 2 are compulsory, while Scope 3 is voluntary. This report does not include certain compulsory information since this was not made available - accounting for air-conditioning and refrigeration gas refills. Future reports may expand the activities reported under Scope 3

This study includes most of the same components as the previous study, with a few adjustments in order to align with current GHG Protocol methodology and updated emission factors. New approaches to categorisation of certain emission sources in Scope 3 were adopted to align with best practice. Changes in methodology introduced in this report are:

*Scope 1*

- Jammie Shuttle has been moved to Scope 1 since UCT has direct control over the external service provider.

*Scope 3*

- Well-to-tank (WTT) Fuel, Flights and LPG are placed together in a new category "Fuel and energy-related emissions", as per the GHG Protocol guidance.
- Recycled and Non-recycled wastes are grouped together under 'Waste'.

For the purpose of year-on-year comparison, where emission factors change, the previous year is restated using the updated factors.

For this report, an independent study was conducted by the author, supported by research undertaken by the Information Systems students, as part of a curriculum project. In order to streamline data gathering, all data was gathered by a staff member of Properties and Services from the data holders. Thereafter it was circulated to the students. Gaps and anomalies in information were dealt with by direct engagement with the data holders listed in Appendix A.

The components of the footprint were divided among groups of Information Systems students and each group produced a separate report for their component (refer to list of Project Reports in the References section). The student projects calculate UCT's carbon footprint, and provide recommendations for the reduction of emissions and the improvement of the measurement process. These reports can be accessed at Vula Student Reports).

All campuses have been included, and all students and staff (FTE) are covered in this report.

**Emission Factors**
This study calculated emissions using the most up-to-date 2014 emissions factors from the UK Department for Environment, Food and Rural Affairs (Defra). The exception is the factor for electricity emissions, where the local Eskom factor of 0.94 t $CO_2e$ /MWh was used. Although a few South African-specific emissions factors are coming into use (paper, water and municipal waste) a decision was made to default to the Defra factors in the interests of simplicity and comparability with the previous report. This approach should be reviewed in future reports.

## 2.1 Quality control and uncertainty

The quality of the data supplied has a significant impact on the analysis performed on the results. Three confidence levels were assigned to the results and this is reported at the end of each activity category:

- Low – High uncertainty in data quality
- Medium – Some uncertainty in the quality of the data
- High – Very low uncertainty in the quality of the data

## 3 CARBON FOOTPRINT RESULTS

The total emissions recorded for 2014 are 87,254 tons of $CO_2e$. This is an increase of 2.8% compared to 84,879 $tCO_2e$ reported for 2013. Table 1 below tabulates the results according to the GHG Protocol; Table 2 compares the result with the previous study; and Table 3 is a pie chart showing the relative contribution of each emission source.

Factors to be considered when comparing the 2013 and 2014 results are:

1. The population, including students and staff (Full time equivalent) of the university increased from 31,041 in 2013 to 31,329 in 2014, an increase of 0.93%.
2. The total building area for 2014 was 665,858m² a small decrease from 668,165m² in 2013, due to the omission of certain properties from the schedule of building areas.

**Table 1: UCT Carbon Footprint 2014**

| CATEGORY | | $tCO_2e$ | % of Total |
|---|---|---|---|
| **Scope 1** | **Direct Emissions** | **1 792** | **2.05** |
| | Jammie Shuttle | 1 006 | 1.15 |
| | UCT vehicle Fleet | 556 | 0.64 |
| | LPG | 230 | 0.26 |
| **Scope 2** | **Indirect Emissions** | **67 112** | **76.91** |
| | Electricity: Main Campus | 44 219 | 50.68 |
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| | Business Travel | 124 | 0.14 |
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| | Purchased goods - Water | 139 | 0.16 |
| | Waste | 143 | 0.16 |
| | **TOTAL emissions** | **87 255** | |

| | | |
|---|---|---|
| **INTENSITY METRICS (Scope 1&2 only)** | | |
| | Gross Area (updated 2014) | 665 858 |
| | **Tons $CO_2e/m^2$/annum** | **0.10** |
| | Population - Staff & Student EFT | 31 329 |
| | **$CO_2e$/person/annum** | **2.20** |

**Notes** Scope 1 Fugitive emissions from HVAC not included

In terms of intensity of carbon emissions, a change of methodology has been adopted, using only Scope 1 & 2 emissions in the calculation of emissions intensity. The emissions per square metre have reduced from 0.13 t $CO_2e$ in 2013, to 0.10 t $CO_2e$ in 2014. The per capita emissions have reduced from 2.75 t $CO_2e$ to 2.20 t $CO_2e$ in 2014 (Table 1).

**Table 2: Comparison of 2013 and 2014 Carbon Footprints**

| CATEGORY | 2014 | 2013 | Diff | % Change |
|---|---|---|---|---|
| **Scope 1 Direct Emissions** | **1 791.53** | **1 820.56** | -29 | -1.6 |
| Jammie Shuttle | 1 005.68 | *1 068.20 | -63 | -5.9 |
| UCT vehicle Fleet | 556.10 | *462.98 | 93 | 20.1 |
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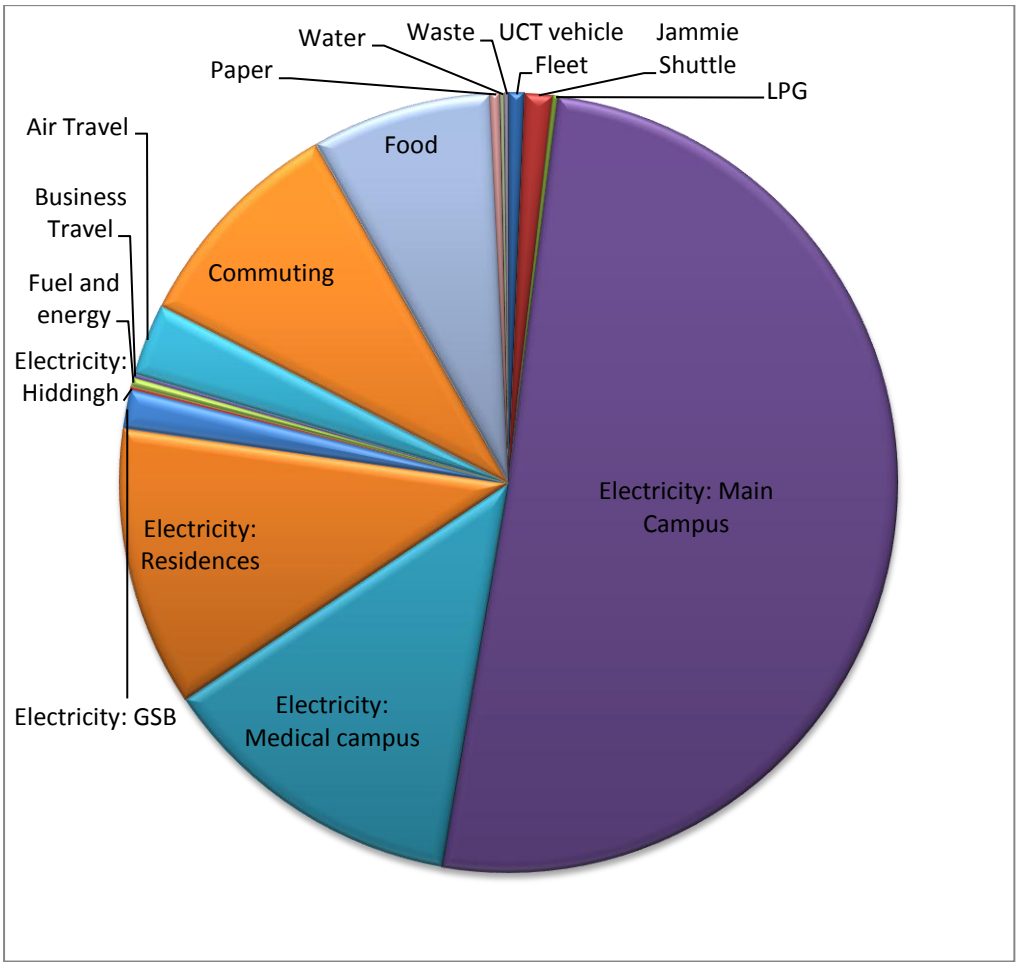


**Figure 1: Contribution of each emission source**

## 3.1 Scope 1: Direct Emissions from Owned/Controlled Operations

Direct emissions comprise the UCT-owned vehicle fleet, the Jammie Shuttle and the use of LPG gas. All Scope 1 emissions account for 2.06% of the total carbon footprint, up from 0.88 in 2013. The bar chart in Figure 1 provides a year on year comparison of Scope 1 emissions.

The Jammie Shuttle emissions were previously reported under Employee Commuting (Scope 3); however it is considered more appropriate to report this under Scope 1 since UCT has direct control over the external service provider through long-term contracts.

Fugitive emissions from gas refills to air-conditioning equipment are not accounted for as not data has been provided.

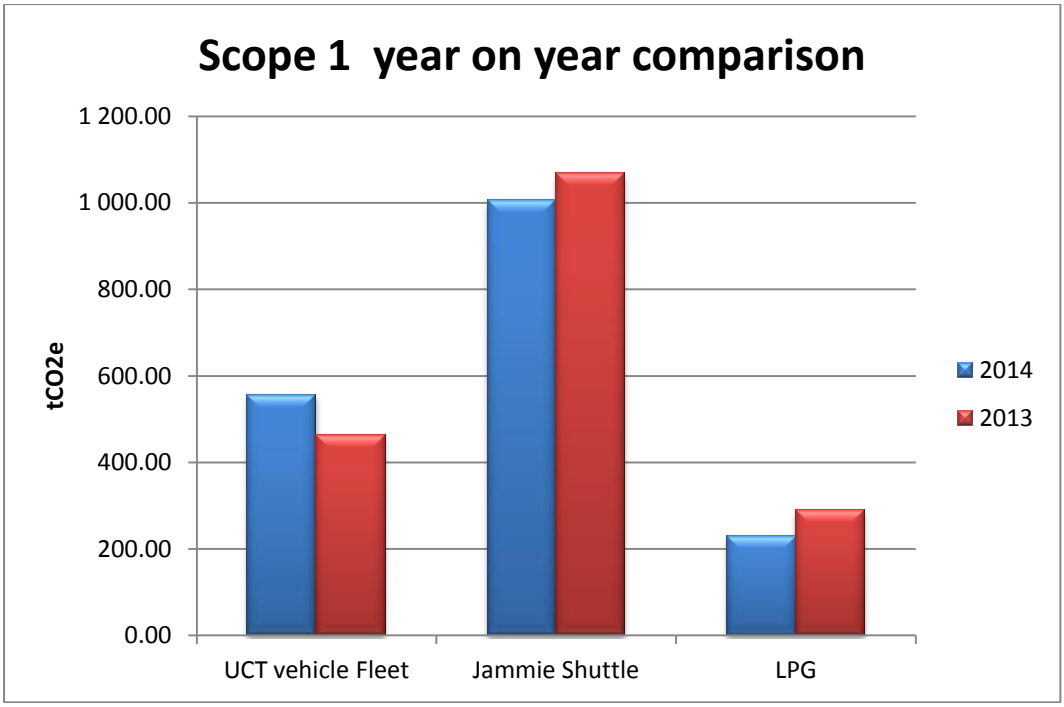


**Figure 2: Scope 1 year on year comparison**

**Vehicle fleet data**
UCT's vehicle fleet consists of around 130 vehicles. Fuel for these vehicles is processed through the Bankfin fuel system or a UCT staff member buys fuel and is then reimbursed by the university. The results of vehicle fleet emissions show an increase of 20.1%, due to an increase in fuel consumed. Reasons for this significant increase are unknown.

The 2013 values have been restated using the higher 2014 Defra emission factor for liquid fuels.

***Vehicle Fleet -Data quality***
*Data provided comprises the litres of fuel of both diesel and petrol purchased. This result is considered to have a* ***high*** *confidence level.*

**Jammie Shuttle**
For the Jammie shuttle, the fuel report was provided by the service provider with a monthly breakdown. The Defra emission factor for Diesel 100% mineral was used.

In comparison to 2013, the fuel consumption decreased by 5.8%. This may be due to routing changes introduced for the purpose of efficiency.

***Data quality***
*The fuel report figure received appears accurate and a monthly breakdown was provided, therefore confidence level is* ***high****.*

**Liquid Petroleum Gas (LPG)**
LPG is used for research purposes, fuelling laboratory burners, water heating, and for cooking in residence kitchens. This category is a minor source of emissions, contributing only 0.26% of the total.

The amount of LPG ordered in 2014 decreased by 20.6%, attributed to the shift to electric heat pumps for water heating.

***Data quality***
*It is likely that some LPG use occurs in Off-campus Residences and this is not captured; therefore there is a* ***medium*** *level of confidence in this result.*

## 3.2 Scope 2: Indirect emissions from the use of purchased electricity

Electricity data for Main Campus (Upper, Middle and Lower) and for the Medical campus were provided from the internet-based electricity metering system managed by Properties and Services. However, anomalies were observed that could not be resolved, and therefore the billing data has been used for all campuses in this report. This is unfortunate given the investment made by UCT in the digital metering technology, which is ongoing. Information was received from the metering service provider showing that a number of the digital meters were out of service for periods during 2014. These digital meters are reported to have a life-span of approximately 4 years; therefore this can be expected to be an ongoing issue requiring management.

Overall electricity emissions have increased by **3.4%**, while the population increased by 0.93% and the floor area decreased by 0.3%, reflecting a negative result. Carbon emissions for Main campus increased by 3.8%, although the floor area remained the same. This is attributed to the installation of new air-conditioning equipment in spaces previously without air-conditioning. An increase in electricity emissions of 5.6% occurred for Medical campus (floor area unchanged) and the reasons are unknown. Emissions for Off-campus residences increased by 0.2%, while the area included in this study decreased by 1.9%, a negative result. The decrease recorded for the Hiddingh campus is attributed to data inaccuracy rather than efficiency measures.

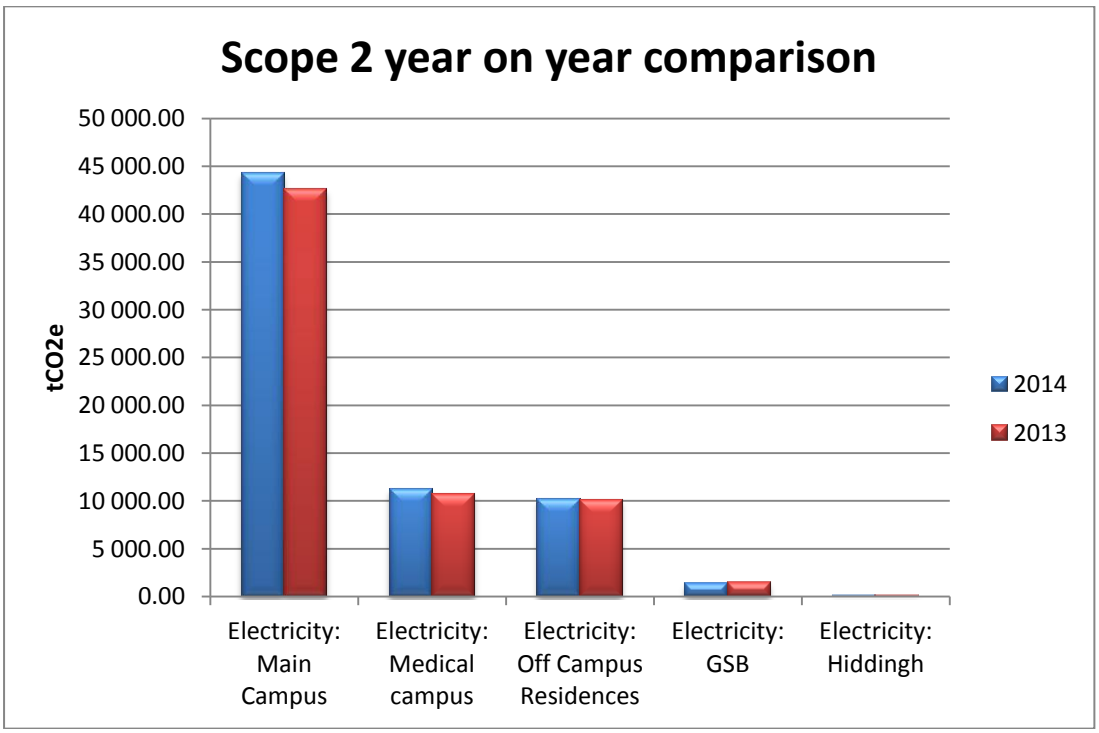


**Figure 3: Scope 2 year on year comparison**

Electricity emissions accounted for 76.9% of the total UCT Carbon Footprint, with Main campus contributing 50.68% of the total; Medical campus 12.88%; Off-campus Residences 11.63%; the Graduate School of Business 1.6%; and Hiddingh Arts campus 0.13%.

***Scope 2: Electricity – Data quality***
*Data for all campuses was drawn from the municipal billing data, captured from the accounts in spreadsheets by staff at Properties and Services and Student Housing. Data capturing anomalies were observed, (e.g. consumption (kWh) reported as service charges and demand charges (kVA) at times; therefore the confidence level is* ***medium,*** *particularly in the case of Hiddingh campus. The data quality Off-campus Residences, provided by Student Housing was of a higher standard and a* ***high*** *confidence level is assigned to these results.*

## 3.3 Scope 3: Other indirect GHG emissions

Scope 3 is a voluntary reporting category under the GHG Protocol; therefore emission estimates are acceptable as long as there is transparency with regard to the estimation approach.

Components of Scope 3 Indirect Emissions identified for UCT include Fuel and energy-related activities, Business Travel (Hired Cars, Staff Reimbursements and Air Travel); Employee Commuting; Purchased Goods and Services (Food, Paper Products, Water); and Waste (Figure 3).

Scope 3 emissions account for 21.03% of the total carbon footprint, down from 23% in 2013. Employee Commuting (students and staff) remains the largest portion at 9.24%, and Food Supply the second highest component in Scope 3 at 7.51% (Table 1; Figure 3).

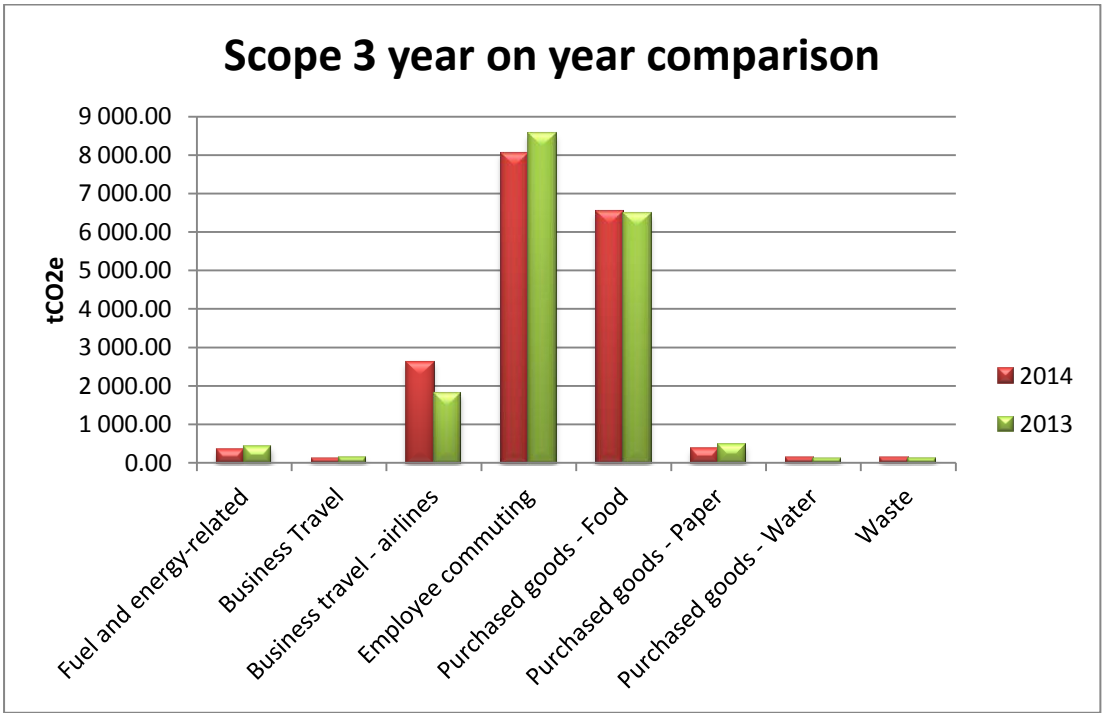


**Figure 4: Scope 3 year on year comparison**

**Fuel and energy related activities**
The former 'Well-to-Tank (WTT)' [3] categories reported for 2013 for Fuels (Vehicle Fleet), Flights and LPG have now been grouped under the new category 'Fuel and energy-related emissions', in accordance with best practice.

These emissions contribute only 0.39% of total emissions.

***Fuel and energy related activities – Data quality***
*The data for fuels, flights and LPG are all of reasonable quality; therefore this result is assigned a* ***high*** *confidence level*

**Business Travel**
Business Travel comprises three subcategories, Hired Cars, Staff Reimbursements (for fuel purchased in the course of work in their own vehicles) and Air Travel. Data for hired cars was supplied by the service provider in kilometres travelled, and it was assumed that hired cars are medium-sized, petrol cars.

Revised data for Hired Cars in 2013 was provided by the service provider after an initial review highlighted anomalies. This figure has been restated for a second consecutive year and is significantly lower than reported in the previous report. Results for Hired Cars, using revised data, show a decrease of 6.8% from 2013 to 2014.

Staff Reimbursements was provided as kilometres travelled, recorded by the SAP system. The kilometres travelled decreased by a significant 26.8%, from 493,044km in 2013 to 360,452km. Reasons for this trend are not understood and require further research.

The emission factor for 2014 for passenger vehicles was revised by Defra to a lower number, contributing to lower overall emissions for Business Travel.

***Business Travel - Data quality***
*The data set initially received for Hired Cars was queried with the service provider. Investigation revealed that the data set was incorrect, having included other universities that the service provider includes in a purchasing group. The confidence level of the revised data set is considered to be* ***medium.***

*For Staff Reimbursements the total distance travelled for each claim is recorded but not the amount or type of fuel, therefore a* ***medium*** *confidence level has been assigned.*

**Employee Commuting (Students and Staff)**
Employee Commuting comprises various forms of commuting by students and staff, such as private car use, public transport (bus, rail, and taxi), cycling and walking.

The emissions from this category contribute 9.24% to the total carbon footprint, which is a large portion (21%) of the total Scope 3 emissions.

[3] Well-to-tank emissions are those associated with the extraction and transport of primary fuels as well as the refining, distribution, storage and retail of fuels purchased.

To estimate the split between modes of transport, the Information Systems students conducted another survey, both online and in person. There were a total of 643 respondents (up from 400 for 2013). Guidance was obtained from a departmental statistician, proposing that a minimum sample size of 600 respondents should be targeted, to make the results statistically relevant. Averaging methods were used to account for the entire staff and student body across all campuses[4]. Results show a decrease of 5.8% for 2014, attributed to improvements in the accuracy of data. In terms of the popularity of each mode of transport (overall students and staff), 40.4% use private cars (down from 44%); 38% use the Jammie (up from 34%); 12% walking (up from 6%); 3.4% by train (down from 5%); and cycling remains at 1% (Figure 4).

Considering the results for students and staff separately, it is interesting to note that cycling is more popular with staff (3%) than with students (1%); private cars use is 36% for students and 56% for staff; while use of the Jammie is 43% for students and 23% for staff.

The contribution of private cars to the total for Employee Commuting emissions is 69%, down from 74% in the previous report. This shift is understood to be due to improved accuracy rather than a trend in behaviour.

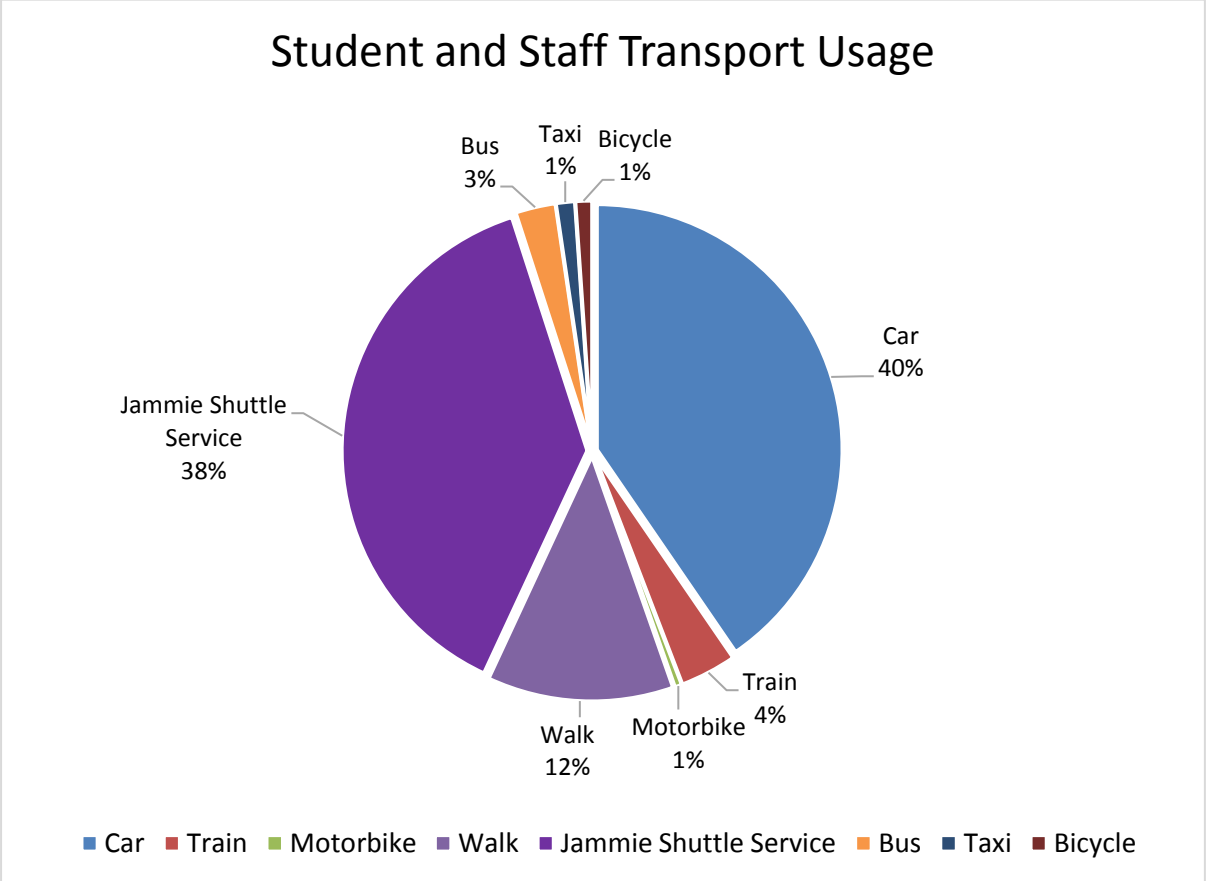


**Figure 5: Student and staff transport usage**

***Employee Commuting – (Staff and student) - Data quality***

[4] Assumption made that Main campus population represents 70% of all students and staff.

*Students conducted a commuting survey both online and in person, achieving a sample of 643 respondents on Main campus only, from a population of 31,041. Given the averaging methods used to account for the entire staff and student body, these results are assigned a **medium** confidence level.*

**Air Travel**

The same methodology was applied as the previous report for 2013. The Defra factors for 2014 decreased compared to 2013.

Results show an increase in emissions of 44% over 2013 and an increase in the number of flights of 42.9%. Air travel comprises 3.01% of the total footprint, up from 2.37% in 2013. Domestic travel increased by 49%; Regional travel by 37% and International travel by 39%. Reasons for these increases are unknown and require research.

***Air Travel – Data quality***

*Detailed data was made available therefore a **high** confidence level has been assigned here. It should be noted that the accuracy of the distance estimation tool (Travelmath) has an inherent inaccuracy of between 5-10%, as it uses a straight-line distance.*

**Purchased goods and services - Food Supply**

The food system at UCT consists of two parts:-the Residence food system for over 4,000 students in 17 first-tier residences; and the Campus food system, catering for over 26,000 students (including residence students) and over 5,000 staff on all campuses. The catering at residences is out-sourced to a single service provider that provides data on meals served, making this relatively easy to measure. By contrast, the Campus food system consists of a number (27) of small- to medium-scale food vendors contracted by UCT.

The emission factors for meals were once again drawn from a UCT post-graduate student dissertation on food sustainability (Gravenor, 2013), since no more recent factors could be found. Updated and localized factors should be sought for future reports.

Results for food related emissions are:

- Total footprint from food for UCT: 6,549 $tCO_2e$
- Residences: 2,936 $tCO_2e$
- Campus Vendors: 3,612 $tCO_2e$

These results are very similar to the previous report, reflecting a minor 1% increase. Food emissions comprise 7.5% of the total carbon footprint, compared to 7.6% in 2013. Research to obtain more accurate data from a wider range of campus vendors did not occur and should be undertaken next year. Support from Properties and Services in obtaining annual sales figures from the vendors as a contractual obligation would streamline this measurement.

***Food Supply - Data quality***

*Data was provided on all meals supplied in first-tier residences for 7 months when students are present on campus. Confidence level is **medium**.*

*Emissions from campus vendors were estimated using meal sales data from a major campus food service provider. No surveys were undertaken. Given the assumptions made to arrive at the result, the confidence level is **low.***

**Purchased goods and services - Paper products**
The category includes printing and photocopy paper, toilet paper, paper hand towels and exam books and papers. Paper towels were not included in the previous report due to lack of an emission factor and a weight for that type of paper. Additions made in this category include an estimate of paper consumed by academic departments; and of Exam books and papers, using information provided from Procurement and student numbers.

Data for printing and photocopy paper was received from the ICTS Department for printers under their control, and from the campus copy centres managed by Nashua. Since recycled content of paper purchased is not known, a conservative assumption was made of no recycled content.

Results show a significant reduction in the use of office paper, with a 22% reduction reported by Campus Copy centres and 43% reduction for the ICTS printers. The total number of sheets reported decreased from 64.7 million to 41.7 million. This appears to reflect trends away from paper use towards digital platforms and media across the university.

***Paper products - Data quality***
*While accuracy and completeness has improved, it is expected that this result is remains an underestimation since paper is not purchased centrally at UCT, and is therefore difficult to measure. More paper products were included in this report; however there is likely to be a many other products being consumed. A* ***low*** *confidence level is therefore assigned.*

**Purchased goods and services -Water**
Water supply data was provided from municipal billing data captured by Properties and Services. The emissions for 2014 show a large increase of 15.3% over 2013. This change is likely to be due to data accuracy as data capturing anomalies were identified in the data. Results show a massive increase for Off-campus Residences of over 25%, which is unlikely. The result may also be due to the municipal billing anomalies reported last year, which have not yet been resolved. This result highlights the need for better data collection and water metering, measurement and monitoring by the university, rather than reliance on the municipality.

***Water- Data quality***
*All water data is derived from municipal bills from either Properties and Services or Student Housing. Due to quality of data capture, the confidence in these results is* ***low****.*

**Solid waste**
Waste is measured as 'Wet' (non-recyclable) or 'Dry' – (recyclable) and provided to UCT by a waste service provider. Recycled waste includes the sub-categories of Hazardous Waste (Chemical and Medical), e-Waste, and printer cartridges. At this stage no independent verification of solid waste measurement data is being undertaken.

The quantity of Wet waste removed from UCT increased by 13%, from 389 tons in 2013 to 440 tons in 2014. Recycled waste quantity and emissions decreased by 2.2%.

The percentage of waste recycled remained around the 60% level, with 62.7% reported for 2013 and 59.2% reported for 2014. Levels of recycling are not improving towards a goal of 70%, in spite of

ongoing development of recycling infrastructure, training and awareness campaigns undertaken by the Green Campus Initiative (GCI) and Properties and Services over the last 5 years.

A Defra emission factor of 21 kg$CO_2$e per ton of waste was used for all Recycled waste categories. In future, local factors specific to waste type should be sought.

***Solid waste - Data quality***
*Reporting of accurate waste statistics remained problematic, with initial results being queried and then revised by the service provider for both 2013 and 2014. 2013 results have therefore been restated in using the revised data set.*

*Waste statistics by the service provider are highly generalised and based on an estimate of volume and weight per 'wheelie' bin collected; therefore the confidence level of these results is* ***low****.*

*Since data on* ***Hazardous waste*** *is required for legal compliance purposes, this result is likely to be fairly accurate, and is assigned a* ***high*** *confidence level.*

## 3.4 Benchmarking against other universities

The emissions produced by UCT have been compared with that of the same set of eight universities as the previous report, with updated emissions results from their latest reports[5]. Table 3 below compares the performance of UCT with this range of institutions, using a per capita intensity benchmark[6]. No examples of South African universities using the GHG Protocol could be found.

For this report, both Gross (before mitigation and/or offsetting) and Net (after mitigation) results have been provided (Table 3 and 4 below). Review of the international reports found an increase in reporting of offsetting / reducing of carbon emissions, through a range of means, including purchase of Renewable Energy Certificates.

A further adjustment to the methodology to align with best practice was made, by the inclusion of only Scope 1 and 2 emissions in the benchmarking calculations.

Results of the Gross emissions comparison (Table 3) show that UCT has relatively low emissions at **2.20** t$CO_2$e per capita, (3rd out of 9), with the Mean for this sample range being 3.54 t$CO_2$e per capita. Arizona State University has the lowest per capita emissions at 2.12 t$CO_2$e per capita. The University of California, Berkeley, also with a Mediterranean climate, has per capita emissions of 2.14 t$CO_2$e.

**Table 3: Comparison with other universities - Emissions per capita (Gross)**

| University | Year | Population (students & staff) | Gross Total tCO2eq | tCO2e per capita |
|---|---|---|---|---|
| **Arizona State University** | 2014 | 85 355 | 181 153 | 2.12 |

[5] Selection of these universities is made from those that use the GHG Protocol, publish reports online and where possible, from varying geographic and climatic regions.
[6] Students and full-time staff were included in the calculation.

| | | | | |
|---|---|---|---|---|
| **California, Berkeley** | 2014 | 50 511 | 107 984 | 2.14 |
| **University of Cape Town** | 2014 | 31 329 | 68 906 | 2.20 |
| **Monash University** | 2013 | 55 669 | 139 018 | 2.50 |
| **University of Queensland** | 2012 | 43 773 | 133 964 | 3.06 |
| **University of Hongkong** | 2013 | 33 525 | 108 726 | 3.24 |
| **Cornell University** | 2014 | 31 155 | 182 663 | 5.86 |
| **Carnegie Mellon Penn.** | 2013 | 16 079 | 97 359 | 6.06 |
| **University of Maryland (UMD)** | 2014 | 33 890 | 214 700 | 6.34 |
| **Mean** | | 42 365 | 137 164 | **3.72** |

Results of Net emissions comparison (Table 4) are quite different, with Carnegie Mellon jumping from 9$^{th}$ to 1$^{st}$ place, due to the offsetting of 100% of emissions from purchased electricity by purchasing Renewable Energy Certificates. UCT shifts to 4$^{th}$ place, and the Mean drops to 3.17 $tCO_2e$ per capita.

**Table 4: Comparison with other universities - Emissions per capita (Net)**

| University | Year | Population (students & staff) | Net Total tCO2eq | tCO2e per capita |
|---|---|---|---|---|
| **Carnegie Mellon Penn.** | 2013 | 16 079 | 30 899 | 1.92 |
| **Arizona State University** | 2014 | 85 355 | 181 153 | 2.12 |
| **Monash University** | 2013 | 55 669 | 118 325 | 2.13 |
| **California, Berkeley** | 2014 | 50 511 | 107 984 | 2.14 |
| **University of Cape Town** | 2014 | 31 329 | 68 906 | 2.20 |
| **University of Queensland** | 2012 | 43 773 | 133 964 | 3.06 |
| **University of Hongkong** | 2013 | 33 525 | 107 799 | 3.22 |
| **Cornell University** | 2014 | 31 155 | 182 663 | 5.86 |
| **University of Maryland (UMD)** | 2014 | 33 890 | 200 121 | 5.91 |
| **Mean** | | 42 365 | 125 757 | **3.17** |

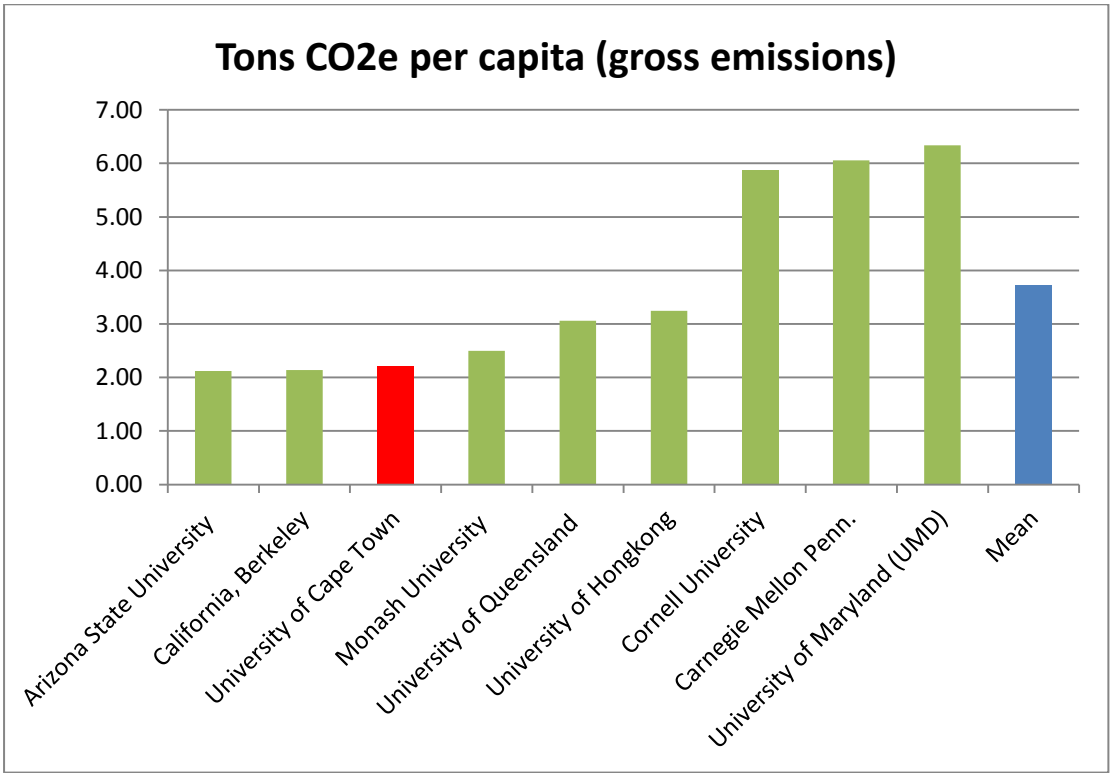


**Figure 6: Chart comparison of per capita emissions (Gross emissions)**

# 4 CONCLUSIONS AND RECOMMENDATIONS

The results of this study show that the total carbon footprint has increased by 2.8% (Table 2). Since 2013, the population increased by only 0.93% and the floor area actually decreased by 0.3%. Therefore the result reflects a negative trend. The main contributor to this increase is emissions from purchased electricity, which rose by 3.4% over 2013. Main campus emissions increased by 3.8% and Medical campus by 5.6%. Another contributor was Air Travel, rising by 44.4% or 807 t $CO_2$e of the total increase of 2375 t $CO_2$e for the entire footprint.

The contribution of the three scopes to the total remains similar, with the minor changes due to re-categorisation rather than actual trends. Scope 1 contributes 2.06% of the total; Scope 2 electricity 76.9%; and Scope 3 at 21.03% (down from 23.1%). The contribution of Scope 1 to the total has increased from 0.88% to 2.06%, due to the Jammie Shuttle emissions being included in Scope 1.

Positive trends emerging from this study are a reduction in commuting caused by improved data from a survey (501 t $CO_2$e); and reduction in office paper usage (125 t $CO_2$e). Minor reductions were also made in electricity consumption at the GSB; and a reduction in Jammie Shuttle emissions.

A negative trend is the 44% increase of Scope 3 emissions for Air Travel, on top of an increase of 13.5% in the previous year. As previously recommended, consideration should be given to an appropriate offset approach for these emissions. The UCT Energy Research Centre would be in a position to provide recommendations.

Another negative trend is the increase in solid waste of 11%, given the relatively small growth in population of 0.93%. Further, the percentage of waste recycled did not improve and remained very similar to 2013 at 60%. Solid waste management clearly requires attention, in particular behaviour change for recycling at source. Waste management training for staff and students at UCT should be increased by the administration.

Results show that Employee Commuting emissions comprise 9.24% of the total emissions. This is an important activity to target for emissions reduction efforts. Efforts should focus on behaviour change of students and staff and the provision or support of alternative modes of transport. The information contained in the commuting survey should be reviewed towards informing infrastructure planning purposes by the administration.

The major gap in this study is the ‘fugitive’ emissions of greenhouse gases from air-conditioning and refrigeration equipment) in Scope 1. These are compulsory reporting in terms of the GHG Protocol and are being reported by other universities. Data collection and analysis should commence ahead of the next reporting process.

The findings of the UCT Carbon Footprint 2014 should be communicated to the UCT community through a range of media, including infographics. Public access to this information should be provided in a prominent location on the UCT website to enhance transparency and accountability.

All the recommendations for reduction of the carbon footprint made in the 2013 report are still relevant (Rippon, 2014).

**Discussion of the 2015 footprinting process**

By contrast with the footprinting process during 2014, the process was not as streamlined or efficient as in 2015. Data collection from with Properties and Services was delayed by a lack of response from data holders, although these staff had been notified well in advance of the data submission date in February 2015.

It was found that some data holders had not been formally briefed by their managers to participate in this annual footprinting process. They did not have an understanding of the process, it objectives, nor of their responsibilities, so were therefore not ready to cooperate when asked for information.

Specialist input to the methodology from an external party was once again provided on a pro-bono basis. The downside of this is that competition for time with other responsibilities results in delays in the process. In future it would be preferable for this role to be taken up once again by the UCT Energy Research Centre.

The student projects worked fairly well in 2015. The Information Systems student work on a commuting survey made an important contribution to this report, with an increased sample size that is more statistically relevant. The research by the group working on the measurement of electricity emissions was again given access to the digital electricity metering platform; however they found the platform to be unstable, giving differing results at different times. They discovered that a number of the meters had been non-functional during 2014. This informed the decision to revert to using the municipal billing data to calculate emissions.

Additional work was done by all groups of the Information Systems students on the development of activity **data templates**. These are now of an adequate standard to issue to the data holders for the 2016 reporting process to ensure more complete and accurate data.

The need for a secure and accessible platform for data storage was identified in the 2013 study; however the UCT intranet site is still being used until resources can be found to develop this. An Honours group in the Information Systems department is currently working on the development of such a platform.

**Recommendations for more effective reporting**

1) Adopt a **formalised data submission process**, to structure the manner in which the data holders maintain their data and how and when it is submitted for annual reporting.

2) Provide data holders with a **template** for each component of the footprint.

3) Develop and implement standard **measurement and monitoring systems** and procedures for electricity and water. These should include allocation of roles and responsibilities of dedicated staff.

4) Install more digital meters, for both electricity and water, preferably down to a building level, to enable trends to be observed more immediately and clearly.

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| | |
|---|---|
| Greenpact | Scope 1 (Vehicle fleet, Jammie and LPG) |
| Power House | Scope 2 Electricity |
| SinC | Business Travel |
| Famous Five | Staff and Student Commuting |
| TBA | Food Supply |
| NoName2 | Paper Products |
| G.O.A.T | Water |
| KJFC | Waste |

## APPENDIX A: LIST OF INFORMATION SOURCES

| CATEGORY/SECTOR | CONTACT | DESIGNATION | METRIC |
|---|---|---|---|
| Building List & Areas | Nigel Haupt | P&S: Physical Planning Unit | Square metres ($m^2$) |
| Population data | Linda Jones | HR Office | Students & staff (FTE) |
| Electricity: Main campus; Medical campus | Christo Odendaal | P&S: Engineering Services Manager | Kilowatt hours (kWh) |
| Electricity: Hiddingh Campus | Fahmza Jaffar | P&S: Finance | Kilowatt hours (kWh) |
| Electricity: Off campus Residences | Linda Tsipa | Student Housing | Kilowatt hours (kWh) |
| Electricity: GSB | Rayner Canning | GSB Finance Dept | Kilowatt hours (kWh) |
| LPG | Di de Villiers | Vendor Management | Kilograms (kg) |
| Water: Main campus; Medical | Fahmza Jaffar | P&S Finance | Kilolitres (Kl) |
| Water: Hiddingh Campus | Fahmza Jaffar | P&S Finance | Kilolitres (Kl) |
| Water: Off campus Residences | Linda Tsipa | Student Housing | Kilolitres (Kl) |
| Water: GSB | Rayner Canning | GSB Finance Dept | Kilolitres (Kl) |
| Solid Waste | Duke Metcalf | P&S: Custodial and Estates Manager | Tons Wet/Dry |
| Hazardous Waste: Medical/Chemical | Brett Roden | P&S: Environmental Risk Officer | Litres/kilograms |
| E-Waste | Brett Roden | P&S: Environmental Risk Officer | Kilograms |
| E-Waste (ICTS) | Charl Souma | ICTS | Kilograms |
| Printer cartridges (Green Office) | Brett Roden | P&S: Environmental Risk Officer | Kg of metal and plastic recycled |
| Commuting | n/a | n/a | n/a |
| Transport: Jammie Shuttle | Clive Lippert | P&S | Litres fuel/passengers |
| Transport: Hired cars | Angelo Griffiths | Procurement | Kilometres |
| Transport: UCT Vehicle Fleet | Carol Paulse | Procurement | Litres fuel |
| Transport: Staff Reimbursements | John Pretorius | Procurement | Km; diesel/petrol |
| Air travel | Angelo Griffiths | Procurement | Kilometres |
| Video Conferencing | Charl Souma | ICTS | Hours |
| Paper Products - custodial | Duke Metcalf | | Rolls |
| Paper Products - print paper ICTS | Charl Souma | ICTS | Sheets/reams |
| Paper Products (Campus copy Centres) | Therese Wiborg | Nashua | Sheets/reams |
| Food supply: Residences | Glenn von Zeil | Fedics | Number of meals served |
| Food supply: Vendors | Wayne/Duke Metcalf | Zemonfoods | Number of meals served |

## APPENDIX B: OVERVIEW OF GHG PROTOCOL SCOPE AND EMISSIONS

Figure [1.1] Overview of GHG Protocol scopes and emissions across the value chain