UNIVERSITY OF CAPE TOWN
CARBON FOOTPRINT REPORT 2013

Report compiled by Sandra Rippon, independent Sustainability Consultant to UCT Properties and Services, and reviewed by Anthony Dane of the environmental consulting firm ERM Southern Africa.

Data gathering and calculations carried out by students of
INFORMATION SYSTEMS (INF3011F) FACULTY OF COMMERCE

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EXECUTIVE SUMMARY

- UCT has committed to transitioning to a sustainable campus as part of international and internal commitments
- Total emissions decreased by 2.7% (population increased by 1.5%, floor space increased by 2.9%)
- Emissions intensity improved (emissions per capita decreased by 0.01%; emissions per square meter decreased by 0.12%
- UCT compares favourably to other universities - 2.75 tCO_2e/ capita against average of selected sample of 4.6 tCO_2e/ capita
- Electricity represents 76% of total emissions
- The largest emission reductions were achieved at Medical Campus, due to electricity reduction initiatives
- Establishing a robust baseline continues to be the greatest challenge
- Data collection and reporting is improving: methodologies have improved for this report
- Third year Information Systems students continue to contribute to this process as part of a curriculum project

The University of Cape Town (UCT) has made International commitments to transition to a sustainable campus and adopted internal policies, which give rise to the need to measure, monitor and mitigate the carbon footprint of the institution. Carbon footprinting is considered to be a critical step in achieving sustainability goals at UCT and aligns with the UCT strategic research initiative of meeting the challenges of climate change. This is the third UCT carbon Footprint Report, for the 2013 calendar year and is compared to the results of a similar study for 2012. It has been compiled by an independent sustainability consultant for Properties and Services. The process was supported by research conducted by third year Information Systems students, as part of a curriculum project. This research is planned to be an ongoing part of the curriculum, giving the students direct exposure to challenging problems of sustainable campus operations and measuring and mitigating UCT's carbon footprint.

The methodology used for this carbon footprint study is the *GHG Protocol Revised Corporate Accounting Standard (2013),* which is suitable for companies, organisations and universities. Two distinct approaches can be used to consolidate GHG emissions: the 'equity share' and the 'control' approaches, the latter being used for this report. The Protocol defines emissions as either 'Direct' or 'Indirect', where direct Greenhouse Gas (GHG) emissions are emissions 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*, while *Scope 3: Other Indirect emissions*, is an optional reporting category that allows for the measurement of all other indirect emissions (GHG Protocol, 2013). This study included most of the same components as the 2013 study, with a few adjustments to align with current methodology.

The total emissions recorded for 2013 are 85,360 tons of CO_2e (tCO_2e), representing a 2.7% reduction compared to a restated 2012 figure. A total reduction of 2360 tCO2e is recorded, with main factors contributing to this change being electricity on Medical campus and Business and

Employee Travel. Of the total emissions, electricity accounts for 76.07%, highlighting the critical importance of electricity demand reduction initiatives.

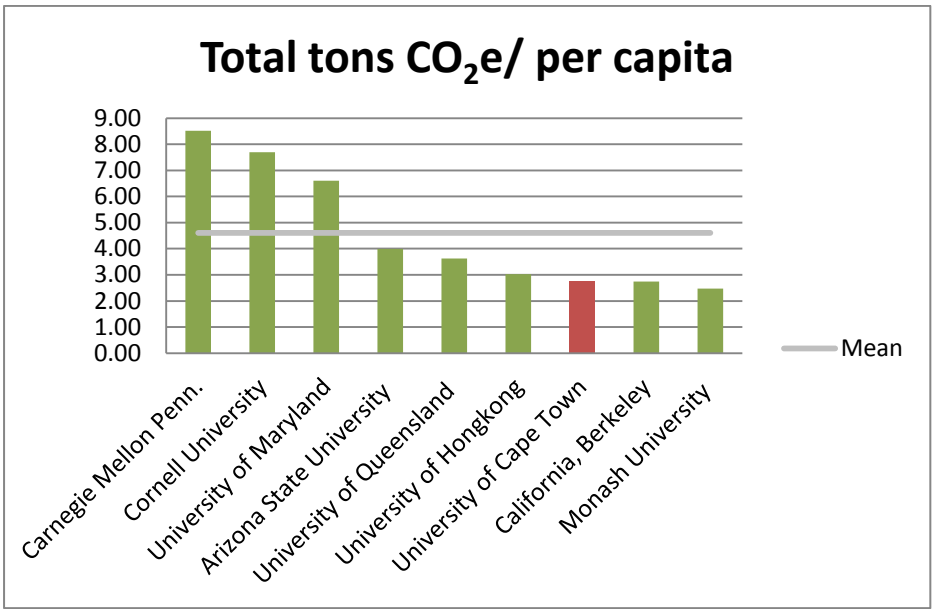
The emissions intensity decreased from 2.87 tCO_2e per capita in 2012, to 2.75 tCO_2e per capita in 2013. In comparison, the University of California, Berkeley, has per capita emissions of 2.74 tCO_2e. Monash University (2013), Australia has the lowest per capita emissions of the samples selected at 2.47 tCO_2e per capita.The emissions per square metre for 2013 are 0.13 tCO_2e/m^2, compared with 0.14 tCO_2e per $/m^2$ for 2012 (Table 1).

TABLE 1: CARBON FOOTPRINT FOR 2013 ACCORDING TO GHG PROTOCOL

CATEGORY	SOURCE	EMISSIONS 2013 tons CO2e		% of Total
Scope 1	**Direct Emissions**	**755**		0.88
	UCT vehicle Fleet		**465.41**	0.55
	LPG		**289.38**	0.34
Scope 2	**Indirect Emissions from Electricity**	**64 888**		76.02
	Electricity: Main Campus		**42 582.81**	49.89
	Electricity: Medical campus		**10 647.97**	12.47
	Electricity: Off Campus Residences		**10 124.12**	11.86
	Electricity: GSB		**1 416.65**	1.66
	Electricity: Hiddingh		**116.50**	0.14
Scope 3	**Other Indirect Emissions**	**19 717**		23.10
	WTT Fuels		**94.81**	0.11
	WTT flights		**278.39**	0.33
	WTT LPG		**36.25**	0.04
	Business Travel		**384.57**	0.45
	Employee travel (commuting)		**9 634.20**	11.29
	Food Supply		**6 484.63**	7.60
	Official flights		**2 021.23**	2.37
	Paper products		**487.41**	0.57
	Water supply		**120.56**	0.14
	Non-recycled waste		**155.52**	0.18
	Recycled Waste		**19.63**	0.02
	TOTAL		**85 360.02**	
INTENSITY METRICS		**2013**	**2012**	
	Gross Area	668 165	649 404	
	Tons CO2e/m²	**0.13**	**0.14**	
	Population	31 041	30 579	
	Tons CO2e/capita	**2.75**	**2.87**	

Key factors to be considered when comparing the 2012 and 2013 results are:

1. The population, including student and staff, increased from 30,579 in 2012 to 31,041 in 2013, an increase of 1.5%.
2. The total Building area reported in 2012 was 649,404m², which increased by 2.9% to 668,165m² for 2013.



Scope 1 comprises Vehicle Fleet and LPG gas emissions. The results of Vehicle Fleet emissions after restatement of the 2012 data show a significant decrease of 16.4% compared to 2012. Emissions from LPG gas, used for research purposes, water heating and cooking, reduced by 12.7% compared with 2012, due to a shift to electric heat pumps for water heating.

Overall, Scope 2 electricity emissions have increased very slightly by 0.1%, while the population increased by 1.5% and floor area increased by 2.9%. Emissions for Main campus increased marginally by 0.4%, while the area increased by 3.9%, reflecting an actual reduction. A reduction in electricity of 3.6% or 369 tCO2e has occurred for Medical campus, due to energy efficiency measures. However, greater reductions in consumption might have been expected due to ongoing the retrofitting of end-of life equipment with new, efficient technologies.

Under Scope 3, Business Travel, results for hired cars show a decrease of 16.3% from 2012 to 2013. This activity is reported to fluctuate depending on conferencing events and visiting academics for a particular year. Staff reimbursements increased by a significant 53.6%, from 320,871km in 2012 to 493,044km in 2013. The reasons for this trend require further research.

For Employee Travel (staff and student commuting) a survey was conducted by the Information Systems students to estimate the split between all modes of transport. Results show a decrease of 26.2% in 2013, attributed to improvements in the accuracy of data.

Food supply emissions amount to 7.6% of the total carbon footprint, making this component the third highest across all scopes, after electricity and transport. Compared to 2012, these emissions have increased by 485 tCO2e, or 8.1%, due to more accurate data provided for residences.

Data gathered for this report included more accurate air travel information for both 2012 and 2013, allowing for a more accurate restatement of 2012 emissions. Results show an increase in emissions of 13.5% over 2012. Air travel comprises a low percentage of the total footprint at 2.4%; however this increase is of significant quantity. The data only includes air travel booked through UCT's preferred travel agencies.

The emissions for water supply in 2013 reflect a decrease in consumption of 33.8% over 2012; however municipal billing anomalies found for both 2012 and 2013 render this result anomalous.

The solid waste results reflect an increase in Non-recycled waste of 41% and an increase in Recycled Waste of 58%. Over 11% of this increase in recycled waste is attributed to the inclusion of new recycled waste categories (hazardous waste, e-Waste, and printer cartridges). Overall the quantity of waste removed from UCT increase by 16% from 967 tons in 2012 to 1123 tons in 2013.

Positive trends emerging from this study are the reduction in electricity consumption of 3.6% on Medical campus (while floor area increased by 1.5%), Main campus electricity increased by only 0.4% in spite of a 3.9% increase in floor area and a reduction in Business Travel and Employee Travel (the latter due to better data). The decrease in emissions intensity from 2.87 tCO_2e per capita in 2012, to 2.75 tCO_2e per capita in 2013 is another positive trend. The fact that greater electricity emissions reductions were not found in this study indicates the need to invest in further retrofitting of electrical equipment with more efficient technologies across the campuses. Investment in renewable energy sources should also be explored. This investment is likely to make business sense due to the reductions in annual operating costs that would be achieved. In addition to infrastructure investment, there are significant opportunities to reduce energy consumption through behaviour change campaigns. Although a reduction in Employee Travel is found, this activity represents 11.29% of the total emissions, 74% of which comprises private car use, making this an important activity to target for mitigation of the carbon footprint.

A negative trend is the increase in solid waste by 16%, given the relatively small growth in population as well as the increase in Non-recycled waste emissions by 41%. Further, the percentage of waste recycled did not improve and remained the same as 2012 at 60%. This is a disappointing result given the efforts during the last five years to provided recycling infrastructure, training and awareness campaigns.

Another negative trend is the increase of 13.5% in Air Travel. To reduce these emissions, video conferencing should be promoted (through incentives or disincentives) and consideration given to an appropriate offset approach. Comparing Business Travel and Air Travel results year-on-year remains a challenge as the activity data fluctuates considerably due to non-annual conferences, visits by academics, and ad hoc projects requiring travel. More information is required to link the activity data to changes in key drivers.

Key Recommendations:

- Invest in further retrofitting of electrical equipment with more efficient technologies across all campuses.
- Investigate the increase in Air Travel, promote the use of video conferencing, and consider appropriate approaches to offsetting these emissions.
- Target transport emissions (11.3% of total) for emissions reduction.
- Conduct an official traffic survey to determine accurate commuting modes; provide a questionnaire on commuting modes upon student registration.
- Adopt a sustainable food programme, where carbon emissions and broader sustainability concerns are addressed, such as the social, ecological and economic impact of the food supply chain.
- Communicate the findings of the UCT Carbon Footprint 2013 and provide public access to this information to enhance transparency and accountability.
- Plan and adopt measures to improve the next Carbon Footprint study.

Overall, the carbon footprinting process was more effective in terms of data gathering and storage, and certain activity data sets were greatly improved. Refinements have been made to the methodology. Together these improvements to the process should mean that the results are more robust. However, delays were caused by incomplete and incorrect data provision. Planning towards a more effective process for the next report, this should aim to ensure all relevant activities, impacts and products have been included in the study. To achieve a robust baseline for the carbon footprint and allow meaningful year-on-year comparison, any activity data that is considered outstanding from this study should be identified immediately, and the gathering of those data sets planned ahead of the next annual report.

Actions required to further improve data collection should include the development of a secure and accessible platform for the collection and storage of the data long-term; providing data holders with a template for each component of the footprint and adopting a formalised data submission process; and installing more digital meters for both electricity and water, preferably down to a building level. The Carbon Footprint reports should be made available for public viewing to enhance transparency and accountability of the institution.

1 INTRODUCTION

The University of Cape Town (UCT) has made International commitments to transition to a sustainable campus and adopted internal policies, which give rise to the need to measure, monitor and mitigate the carbon footprint of the institution (Refer Box 1). Carbon footprinting is considered to be a critical step in achieving sustainability goals at UCT, and the practice has been widely adopted by universities internationally. A first, baseline report was compiled in 2009 by the Energy Research Centre (ERC), UCT, and second report in 2013. This third carbon footprint report is for January to December 2013.

Box 1: UCT's COMMITMENTS TO SUSTAINABILITY

1990	International ***Talloires Declaration*** signed by VC Saunders
2001	Recommitment to the implementation of Talloires by VC Ndebele
2008	***Green Campus Policy Framework*** adopted by UCT Council and Senate
2009	***Green Campus Action Plan*** developed by Properties and Services
2012	ISCN-GULF ***Sustainable Campus Charter*** signed by VC Price
2012	First Report submitted in terms of the ISCN-GULF Sustainable Campus Charter

Reduction of carbon emissions is identified as a key strategy by UCT's *Green Campus Policy Framework*, formally adopted by the UCT Council and Senate in 2008. The Framework highlights the need for a Green Campus Plan to have '*as its main strategy the reduction of the university's carbon footprint through targeted objectives for energy savings, reducing carbon emissions, recycling and water conservation*' (Hall, 2008).

In terms of international commitments, the most recent is that made in terms of the *ISCN-GULF Sustainable Campus Charter*. Participation in this network provides the opportunity for the exchange of information and best practices for achieving sustainable campus operations, and integrating sustainability in research and teaching. Signing the Charter commits an institution to set their own concrete targets against shared Charter principles, and reporting transparently on progress against those targets. UCT submitted its first report in terms of the Charter in 2012 and will complete a second report in 2014.

The Charter comprises three principles, and incorporates the practice of carbon footprinting in Principle 2:

- **Principle 1**: Sustainability Performance of Buildings on Campus
- **Principle 2**: Campus-wide Master Planning and Target Setting e.g. Carbon Footprint
- **Principle 3**: Integration of Facilities, Research, and Education e.g. sustainability in curriculum and research and outreach.

Further, the incorporation of the carbon footprinting process into the curriculum of the Department of Information Systems in the Faculty of Commerce, addresses Principle 3 by providing student projects that connect facilities, research and education.

1.1 What is a Carbon Footprint?

A carbon footprint can broadly 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 (ERC, 2010).

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, with others being regulated elsewhere (ERC,2010):

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

1.2 Background to Carbon Footprinting at UCT

In 2009, the Energy Research Centre (ERC) at UCT completed the first carbon footprint report for UCT using data for the year 2007, the task having taken two years by ERC Interns. A second carbon footprint report was produced in 2013 for 2012, led by the ERC, with contributions from the students of the 3rd year Information Systems course and the final report compiled by the sustainability coordinator. The reporting was undertaken without specialised software, essentially a manual process. This third carbon emissions reporting exercise has been done in a similar manner except that this report was compiled by the independent sustainability consultant, without the assistance of the ERC. A former ERC member who had been involved in the previous report was consulted on methodology, checked the calculations and reviewed the report.

Both the previous Carbon Footprint reports highlighted the lack of accessibility of data required to calculate the footprint, the lack of standardized data capturing practices and a central database for data storage. Efforts were made to rectify these issues in the planning stage of this report.

This report presents the results of the university's third carbon footprint analysis, and compares the university's carbon footprint with the 2012 report, and the footprint of other academic institutions.

2 OVERALL METHODOLOGY

The methodology used for this carbon footprint study is the *GHG Protocol Revised Corporate Accounting Standard (2013),* which is suitable for companies, organisations and universities. GHG accounting and reporting practices are still evolving requiring adjustments as new methods are introduced; however there are well established principles that guide reporting:

- Relevance - serves the decision-making needs of users
- Completeness - accounts for all GHG emission sources and activities within the chosen inventory boundary. Discloses and justifies any specific exclusions
- Consistency – allows for comparison over time, documents any changes to the data, inventory boundary, methods, or any other relevant factors
- Transparency - discloses any relevant assumptions
- Accuracy – reduces uncertainties as far as practicable

Two distinct approaches can be used to consolidate GHG emissions: the 'equity share' and the 'control' approaches. This report uses the control approach. Under the control approach, a company accounts for 100 percent of the GHG emissions from operations over which it has control. It does not account for GHG emissions from operations in which it owns an interest but has no control. Control can be defined in either financial or operational terms. When using the control approach to consolidate GHG emissions, companies choose between either the operational control or financial control criteria (GHG Protocol, 2013).

The Protocol defines emissions as either 'Direct' or 'Indirect'. Direct GHG emissions are emissions from sources that are owned or controlled by the entity. Indirect GHG emissions are emissions that are a consequence of the activities of the entity, but occur at sources owned or controlled by

another entity or company. What is classified as direct and indirect emissions is dependent on the chosen approach (equity share or control). To delineate direct and indirect emission sources, three "scopes" (Scope 1, Scope 2, and Scope 3) are defined: Scopes 1 and 2 are carefully defined in the GHG Corporate Standard (GHG Protocol, 2013), while Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. 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. Scope 2 includes indirect emissions associated with purchased electricity (from Eskom). Scope 3 comprises a range of indirect emissions including business travel, employee travel (commuting), food supply, air travel, paper products, water supply, and solid waste.

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

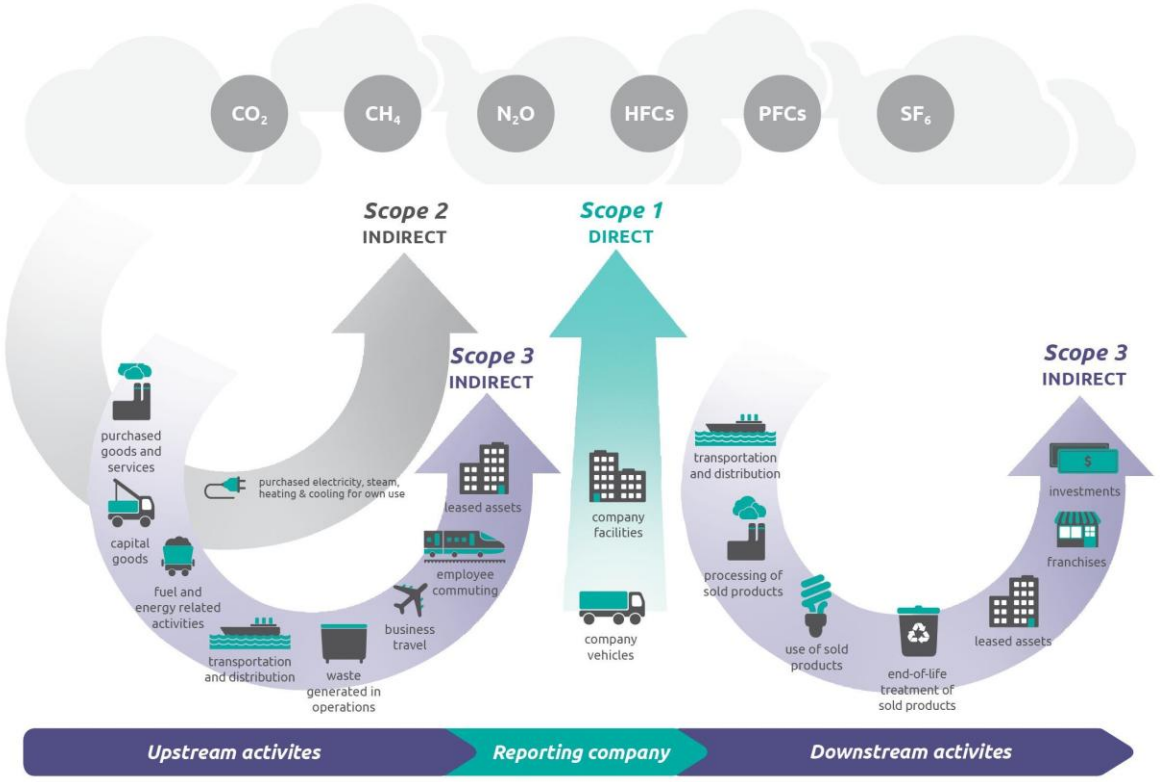


Figure 1: Overview of GHG Protocol scopes and emissions

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. Changes in methodology introduced to refine the results and align with the GHG Protocol are as follows:

Scope 1

- Vehicle Fleet – staff reimbursements emissions have been moved to the Scope 3 'Business Travel' category, which is a new category

Scope 3

- New categories – Well-to-tank (WTT) Fuel, Flights and LPG
- Staff and student commuting have been split into 'Business Travel' (hired cars and staff reimbursements) and 'Employee Travel' (all modes of commuting including Jammie shuttle).

Certain values have been restated due to methodological changes. New approaches, particularly around categorisation of certain emission sources, were adopted to improve the accuracy of the footprint and align with best practice. Restatements to the 2012 footprint were made to allow for greater comparability.

For this report, an independent study was conducted by the author, supported by research conducted by third year Information Systems students, as part of a curriculum project. In 2013, the students of this third year course also prepared research reports for the UCT Carbon Footprint and this is planned to be an ongoing part of the curriculum, giving the students direct exposure to challenging problems of the real-world, in this case, sustainability and in particular measuring and mitigating UCT's carbon footprint. In order to streamline data gathering, all data was gathered by the Executive Director of Properties and Services from data holders. Annual totals for each category were given as opposed to monthly breakdowns, making identification of gaps and anomalies difficult. Breakdowns for certain categories were thus gathered by the author directly from data holders listed in Appendix 1.

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 focus of the student projects was the calculation of UCT's carbon footprint, and they were also required to provide recommendations for the improvement of the measurement process, and the reduction of emissions.

An improvement over the previous report was achieved in terms of obtaining data timeously and in a useable format. Certain data sets were greatly improved, namely Air Travel and Food Supply in residences.

Emission Factors

In general, unless stated otherwise, this study calculated emissions using the most up-to-date 2013 emissions factors from the UK Department for Environment, Food and Rural Affairs (DEFRA). The factors used in the 2009 report were typically from the International Panel for Climate Change (IPCC) for 2006. The 2012 footprint study saw a significant methodological shift away from using the IPCC guidelines towards using the GHG Protocol Revised Corporate Accounting Standard. With this shift came a decision to use DEFRA emission factors; seen to be simpler to use and understand, compared to IPCC factors. The exception is the factor for electricity emissions, where the local Eskom factor of 0.94 tons CO2e/MWh was used. Although certain sources currently support different Eskom emission factors, a decision was taken to use the same factor as the 2012 report for comparability. A few other South African emissions factors were found in the course of this study; however they have not been used here to prioritise consistency and comparability with the previous report. Future footprints could consider the use of context specific factors, while balancing the principles of simplicity, comparability and appropriateness.

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 used in this analysis and are 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 2013 are 85,360 tons of CO_2 equivalents (expressed as tCO_2e). This is an increase compared to the 82,704 tCO_2e reported for 2012; however once the total for 2012 is revised to 87,777 tCO_2e (to account for improved data and changes in methodology) the result reflects a decrease of 2.7%. A total reduction of 2360 tCO_2e is recorded, with main factors contributing to this change being electricity on Medical campus and the revised commuting data obtained from a survey. Of the total emissions, electricity accounts for 76%.

Table 1 below tabulates the results according to the GHG Protocol; Table 2 compares the result with the previous study; and Table 3 provides benchmarking per capita against other universities.

Key factors to be considered when comparing the 2012 and 2013 results are:

1. The population, including student and staff (Full time equivalent) of the university increased from 30,579 in 2012 to 31,041 in 2013, an increase of 1.5%.
2. The floor area of Main Campus increased by 3.9%. The New Engineering Building (12,759m²) accounts for most of this increase.
3. The total Building area used in the baseline study for 2007 was only 380,998m²; in 2012 the figure increased to 649,404m² since the entire of the university was included. In 2013 the area increased by 2.9% to 668,165m².

Table 1: Carbon Footprint for 2013 according to GHG Protocol

CATEGORY	SOURCE	EMISSIONS 2013 tons CO_2-e	% of Total
Scope 1	**Direct Emissions**	**755**	0.88
	UCT vehicle Fleet	**465.41**	0.55
	LPG	**289.38**	0.34
Scope 2	**Indirect Emissions from Electricity**	**64 888**	76.02
	Electricity: Main Campus	**42 582.81**	49.89
	Electricity: Medical campus	**10 647.97**	12.47
	Electricity: Off Campus Residences	**10 124.12**	11.86
	Electricity: GSB	**1 416.65**	1.66
	Electricity: Hiddingh	**116.50**	0.14
Scope 3	**Other Indirect Emissions**	**19 717**	23.10
	WTT Fuels	**94.81**	0.11
	WTT flights	**278.39**	0.33
	WTT LPG	**36.25**	0.04
	Business Travel	**384.57**	0.45
	Employee travel (commuting)	**9 634.20**	11.29
	Food Supply	**6 484.63**	7.60
	Official flights	**2 021.23**	2.37
	Paper products	**487.41**	0.57
	Water supply	**120.56**	0.14
	Non-recycled waste	**155.52**	0.18
	Recycled Waste	**19.63**	0.02
	TOTAL	**85 360.02**	

INTENSITY METRICS	2013	2012
Floor Area	668 165	649 404
Tons CO_2e /m²	0.13	0.14
Population	31 041	30 579
Tons CO_2e/capita	2.75	2.87

In terms of intensity of carbon emissions, the emissions per capita for 2013 are 2.75 tCO_2e, compared to 2.87 tCO_2e in 2012. The emissions per square metre for 2013 are 0.13 tCO_2e /m², compared with 0.14 tCO_2e /m² for 2012.

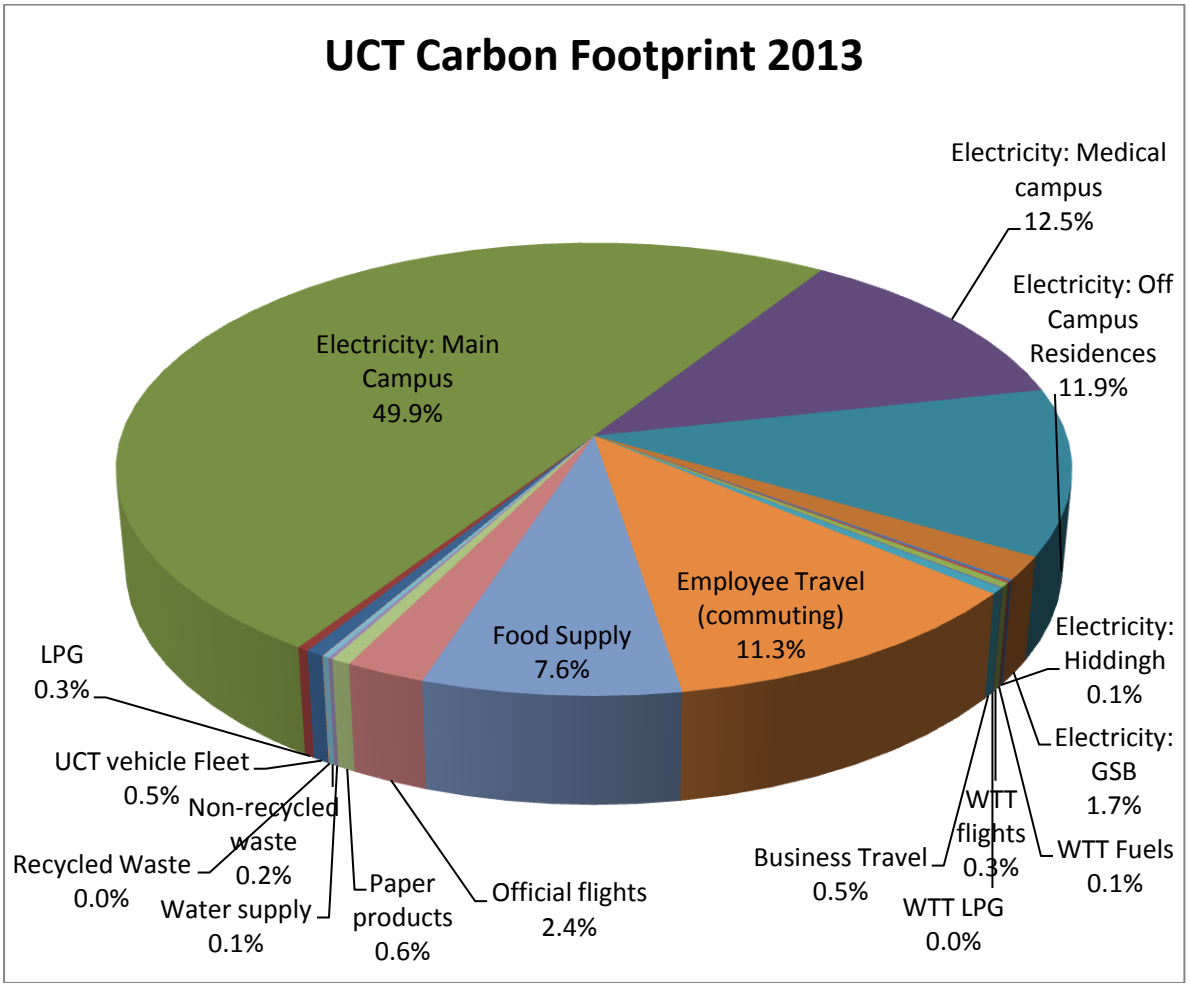


Figure 2: UCT GHG Emissions 2013

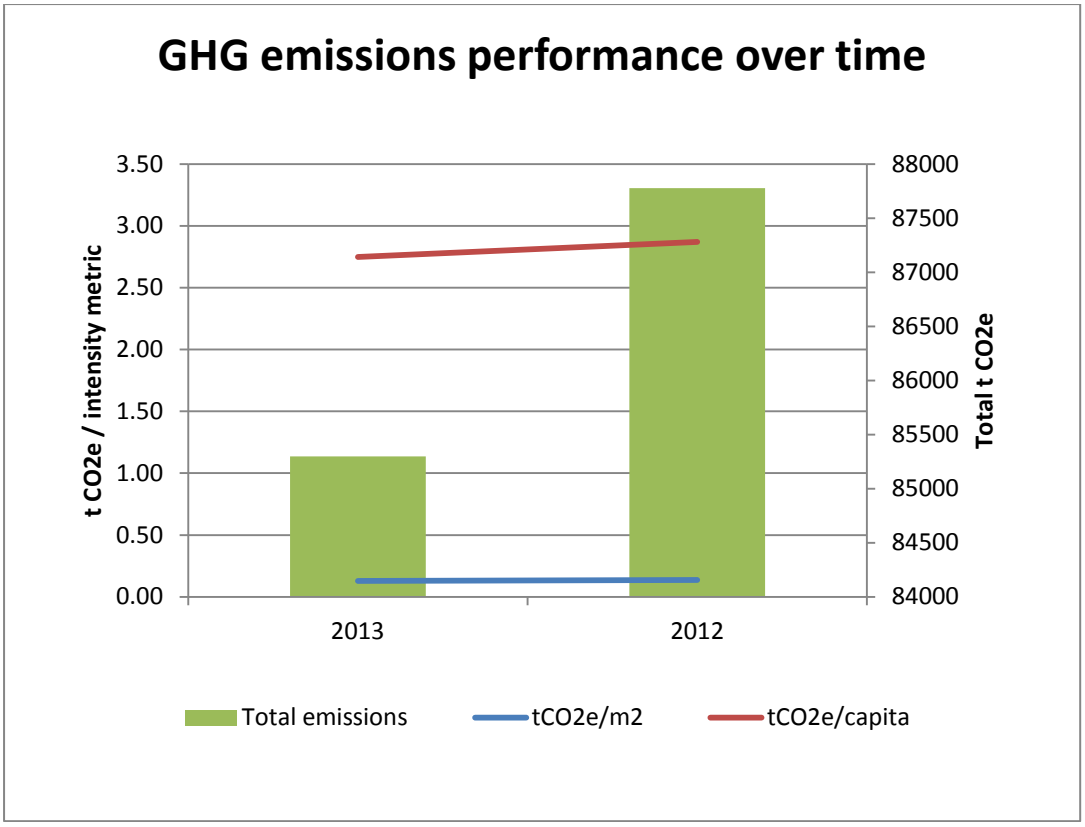


Figure 3: GHG emissions performance over time

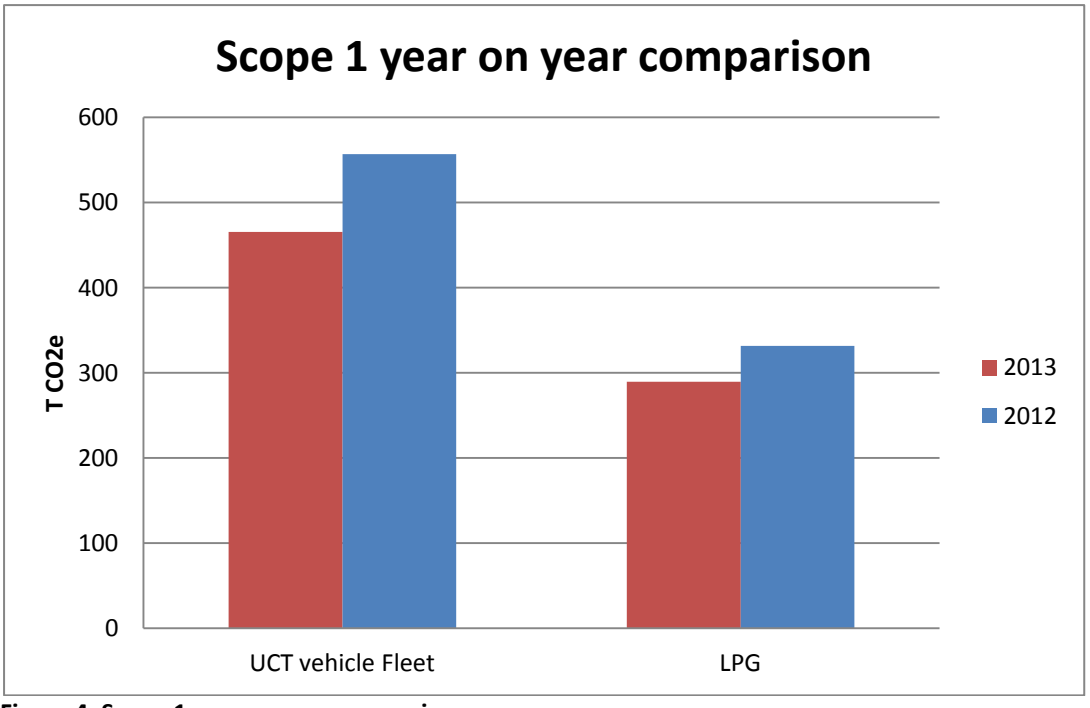


Figure 4: Scope 1 year on year comparison

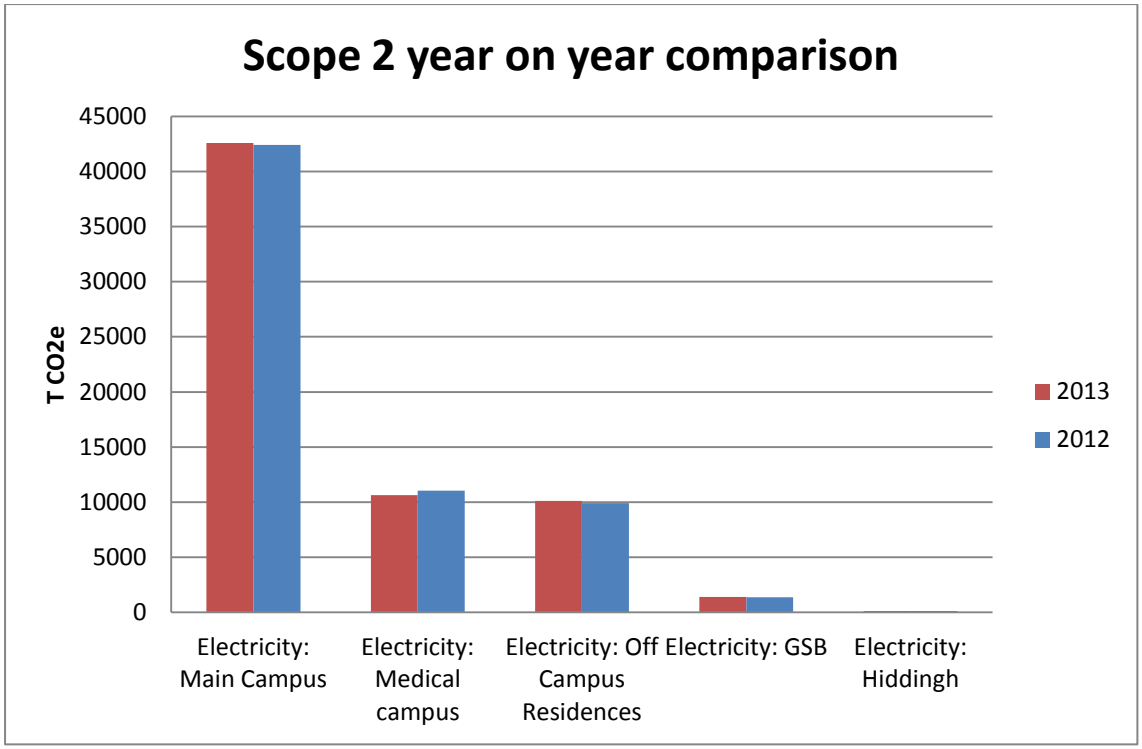


Figure 5: Scope 2 year on year comparison

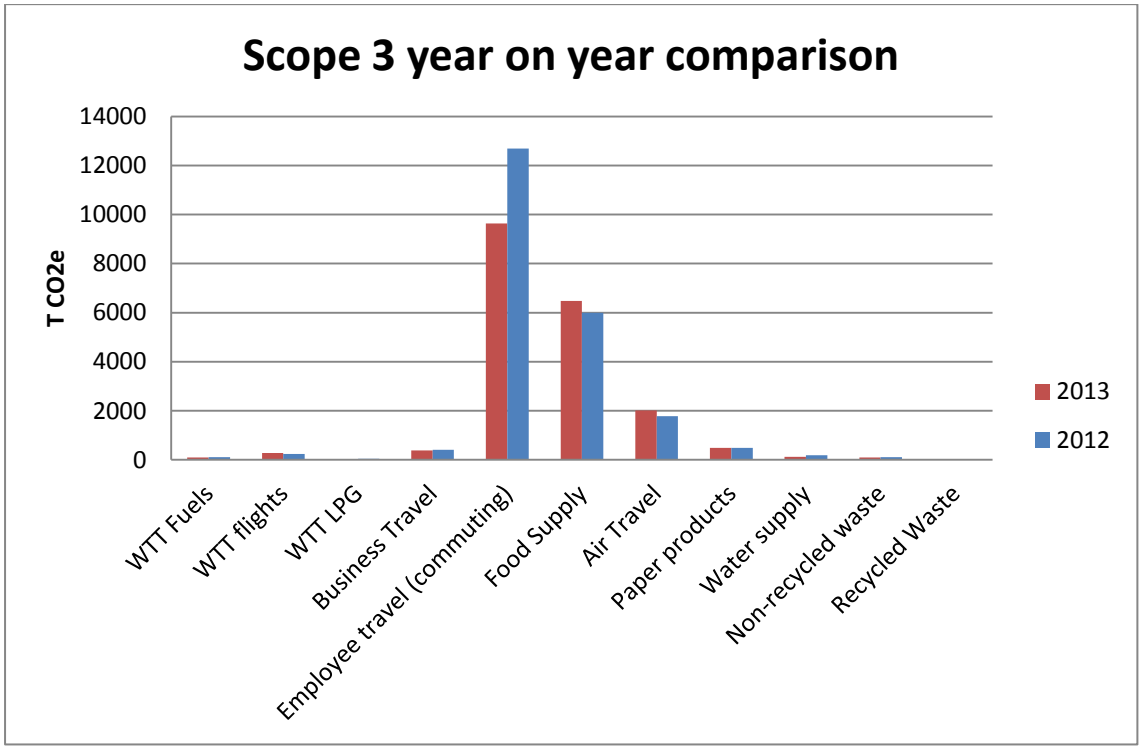


Figure 6: Scope 3 year on year comparison

Table 2: Comparison of 2012 and 2013 Carbon Footprints

CATEGORY	SOURCE	EMISSIONS 2013 t CO_2-e	EMISSIONS 2012 tCO_2-e	Diff	%
Scope 1:	**Direct Emissions**	**755**	**888**		
	UCT vehicle Fleet	**465.41**	*556.74	-91	-16.4
	LPG	**289.38**	331.48	-42	-12.7
Scope 2	**Indirect Emissions**	**64 888**	**64 830**	58	0.09
	Electricity: Main Campus	**42 582.81**	*42 393.61	189	0.4
	Electricity: Medical campus	**10 647.97**	11 043.53	-396	-3.6
	Electricity: Off Campus Residences	**10 124.12**	9 914.29	210	2.1
	Electricity: GSB	**1 416.65**	1 363.00	54	3.9
	Electricity: Hiddingh	**116.50**	116.00	0	0.4
Scope 3:	**Other indirect emissions**	**19 717**	**21 299**		
	WTT Fuels	**94.81**	112.97	-18	-1.6
	WTT flights	**278.39**	239.12	39	1.6
	WTT LPG	**36.25**	41.48	-5	-12.6
	Business Travel	**384.57**	*408.25	-24	-5.8
	Employee travel (commuting)	**9 634.20**	*12 684.71	**-3 051**	-24.0
	Food Supply	**6 484.63**	6 000.00	485	8.1
	Air Travel	**2 021.23**	*1 781.21	240	13.5
	Paper products	**487.41**	*487.37	0	0.0
	Water supply	**120.56**	182	-61	-33.8
	Non-recycled waste	**155.52**	109.73	46	41.7
	Recycled Waste	**19.63**	12.36	7	58.8
	TOTAL	**85 360.02**	**87 777.85**	**-2 360**	**-2.7**

* Indicates 2012 values that have been restated

3.1 Scope 1: Direct Emissions from Owned/Controlled Operations

Direct emissions comprise the UCT-owned vehicle fleet and the use of LPG gas for research in laboratories. All Scope 1 emissions account for only 0.88% of the total carbon footprint, with the vehicle fleet comprising 0.55%.

Vehicle fleet data

UCT's vehicle fleet consists of around 130 vehicles. Fuel for these vehicles is either processed through the Bankfin fuel system or a UCT staff member buys fuel and is then reimbursed by the university. Another sub-category, 'Staff Reimbursements' relates to staff reimbursements associated with travelling in non-UCT owned vehicles (i.e. the staff members' cars) which, according to the methodology, is classified as a Scope 3 emission source. This was included with vehicle fleet emissions in the 2012 report and has been shifted to the Scope 3 category of Business Travel. Another change in methodology is the removal of Scope 3 indirect emissions from this value to the Well-to-tank category under Scope 3. The results of vehicle fleet emissions (after restatement of the 2012 data) show a significant decrease of 16.4% compared to 2012.

Vehicle Fleet -Data quality
The Bankfin system data used contains the exact number of litres of fuel filled per vehicle; however since the fuel type was not provided, an assumption was made that the same split as 2012 between fuel types would apply (petrol/diesel). This result is considered to have a ***high*** *confidence level.*

Liquid Petroleum Gas (LPG)
LPG is used for research purposes, such as fuelling laboratory burners, water heating and for cooking in residence kitchens. For the period a total of 92,803kg was ordered for the bulk LPG tanks located at the Medical School and Main Campus, and 5,700kg for the Off-campus Residences, a reduction of 12.7% compared with 2012. This is attributed to the removal of the last remaining boilers for hot water generation and two bulk tanks from Upper campus and a shift to electric heat pumps for water heating. 'Well-to-tank' (WTT) emissions, reported under Scope 3, are the indirect emissions associated with using LPG.

Data quality
It is likely that some LPG use that occurs in Off-campus Residences has not been captured; therefore there is a ***medium*** *level of confidence in the quality of the data supplied for LPG.*

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 in the form of screen snapshots from the internet-based electricity metering system managed by Properties and Services. Anomalies in the data for Main Campus were observed and investigation of these found a technical error in the reporting function of the software platform that had affected reporting for 2012 and 2013. This resulted in the 2012 emissions for Main campus being revised upward by 5,779,552 kilowatt hours or 5,027 tCO_2e. This has had a significant effect on the total carbon footprint reported in 2012.The data for all other areas was provided in Excel spreadsheets based on the billing information.

Overall, electricity emissions have increased very slightly by 0.1%. Taking into consideration the population increase of 1.5% and floor area increase of 2.9%, the result can be considered positive. Emissions for Main campus increased marginally by 0.4%, while the area increased by 3.9%, reflecting a reduction. A reduction in electricity of 3.6% or 369 tCO_2e has occurred for Medical campus (floor area increased by 1.5%), due to energy efficiency measures. However, greater reductions in consumption might have been expected due to ongoing the retrofitting of end-of-life equipment with new efficient technologies. Electricity emissions for Off-campus residences increased by 2.1%, while the area included in this study increased by 2.5% to 119,436m². It was found that a few properties on the register could not be accounted for in terms of electricity consumption and this needs to be rectified in the next report.

Electricity emissions account for 76% of the total UCT Carbon Footprint, with Main campus contributing 49.9% of the total emissions; Medical campus 12.48%, Off-campus Residences 11.87%; the Graduate School of Business 1.6% and Hiddingh Arts campus 0.14%.

Scope 2: Electricity – Data quality
Data for Main Campus and for the Medical campus were provided in the form of screen snapshots from the digital metering system (after errors in the platform were corrected) and therefore the confidence level is ***high****.*

*Data for the GSB was provided in Excel spreadsheet format. A **medium** confidence level is assigned since an apportionment (46%) of electricity consumption is made between the GSB and Breakwater Lodge. A more accurate apportionment is expected to be available for the next report.*

*For the Off-campus Residences, the data set provided by Student Housing comprised consumption in kilowatt hours (kWh) for each month in Excel format and a **high** confidence level is assigned to these results. The granularity of the data allows for analysis by residence and by month.*

It became apparent during this study that electricity data for certain off-campus properties have not yet been captured and this should be addressed in future. Responsibility for payment of the accounts, between Properties and Service and Student Housing needs to be clearly established.

3.3 Scope 3: Other indirect GHG emissions

Scope 3 is an optional reporting category dealing with all other indirect emissions that are a consequence of the activities of the entity, but occur from sources not owned or controlled by the entity (GHG Protocol, 2013). The GHG Protocol guidelines acknowledge that data availability and reliability may influence which Scope 3 activities are included in the inventory, and that data accuracy may be lower. The objective of the Scope 3 inventory may be more about understanding the relative magnitude of and possible changes to Scope 3 activities. Thus emission estimates are acceptable as long as there is transparency with regard to the estimation approach.

Components of Scope 3 identified for UCT include Business Travel and commuting (entitled Employee Travel), Food Supply, Air Travel, Paper Products, Water Supply, and Waste. For this report, new 'Well-to-Tank (WTT)' categories have been added to Scope 3 in accordance with the GHG Protocol guidelines, including WTT emissions for Fuels, Flights and LPG. 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.

Scope 3 emissions account for a relatively high proportion of 23% of the total carbon footprint, with Employee Travel (commuting) the largest portion at 11.3%, and Food Supply the second highest component in Scope 3 at 7.6% (Refer Table 1).

Business Travel
Business Travel comprises two subcategories, Hired Cars and Staff Reimbursements (for fuel purchased in the course of their work in their own vehicles). In the 2013 report, all this activity data was included in the 'Staff and Student Commuting' category, which has been split for this report into 'Business Travel' and 'Employee Travel', in line with current best practice. 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 as data on the vehicle and fuel type was not available.

For Hired Cars, it was found that the calculation for 2012 did not fully account for all emissions (direct and indirect), so the figure was revised up from 70.48 tCO_2e to 347.02 tCO_2e. Results for Hired Cars, which account for over 75% of the total for Business Travel, show a decrease of 16.3% from 2012 to 2013. This activity is reported to fluctuate depending on conferencing and visiting academics for a particular year. This was assumed to be the primary reason for the change in emissions for this category, year on year.

Staff Reimbursements, (previously included in Scope 1 Vehicle Fleet emissions) was provided as kilometres travelled, recorded by the SAP system. The kilometres travelled increased by a significant

53.6%, from 320,871km in 2012 to 493,044km in 2013. Reasons for this trend are not understood and require further research.

Business Travel - Data quality
For Hired Cars the data set first received reflected a reduction of over 94% and this was therefore queried with the service provider. Investigation revealed that the data set was incomplete, recording 97,137km in lieu of 1,417,697km. The confidence level of the revised data set is considered to be ***high.*** *The service provider has committed to upgrading data collection systems to avoid such errors in future.*

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 Travel (Staff and student commuting)
Employee Travel comprises various forms of commuting by students and staff, including the use of the Jammie Shuttle, private car use, and public transport.

For the Jammie shuttle, the fuel report provided was used to calculate emissions. In comparison to 2012, the fuel consumption of Jammie Shuttles decreased by 0.79%, while passenger numbers decreased from 4,804,165 to 4,667,753, a decrease of almost 3%. In terms of emissions, it was found that the calculation for 2012 did not fully account for all emissions of the Jammie shuttle, and so the figure was revised up from 228 tCO_2e to 1076 tCO_2e, using the appropriate emission factor. The result is a minor decrease of emissions from this activity of 0.79%.

To estimate the split between all other modes of transport, the Information Systems students (Green Force, 2014) conducted a survey, both online and in person. There were a total of 400 respondents and averaging methods were used to account for the entire staff and student body. Results show a decrease of 26.2% in 2013, with the total emissions of the student and staff commuting totalling 8,566 tCO_2e for the year, compared to 11,608 tCO_2e in 2012. This decrease is attributed to improvements in the accuracy of data. In terms of the popularity of each mode of transport, 34% of survey respondents use the Jammie; 44% private car; 6% walking or by bus; 5% by train; and 1% cycling (see Figure 7). Considering the use of cars versus the Jammie shuttle, a factor in this choice may be distance as the survey established that the average distance commute by car is 12.12km, which is further than the outlying Jammie route to Hiddingh of 8.8km (Green Force, 2014).

In the analysis of total contribution of emissions for Employee Travel including the Jammie Shuttles, an increase is found from private cars contributing 74% of emissions in this category, as opposed to 70% in 2012. The Jammie Shuttles contribute 11% as opposed to 22% of carbon emissions in the staff and student commuting.

The emissions from Employee Travel contribute 11.3% to the total carbon footprint, making this an important activity to target for emissions reduction.

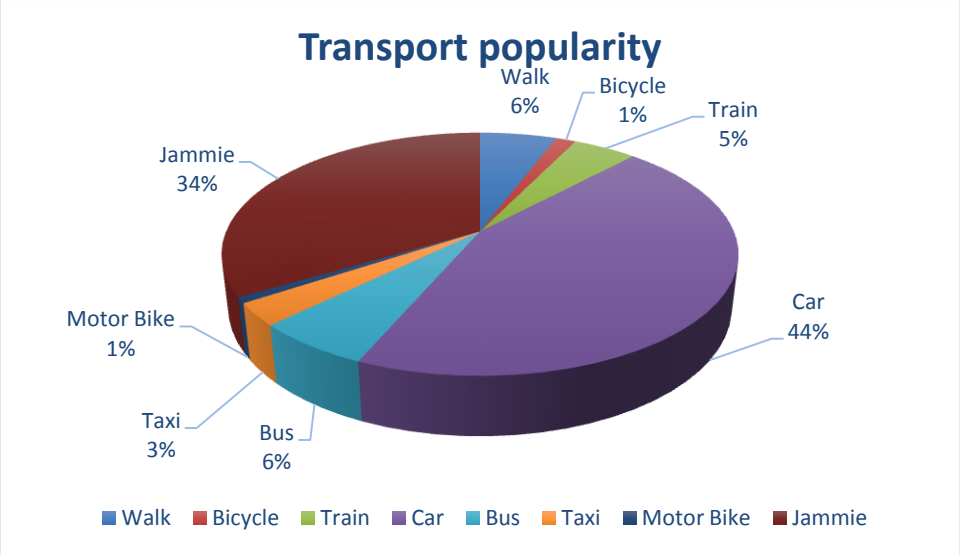


Figure 7: Transport modes popularity to/from Main Campus 2013

Employee Travel – (Staff and student commuting) - Data quality
Commuting:-Students conducted a commuting survey both online and in person, achieving a sample of 400 respondents on Main campus only, from a population of 31,041. Averaging methods were used to account for the entire staff and student body. These results are therefore assigned a ***low*** *confidence level.*

Jammie Shuttle:-Fuel report figure received appears to be an estimate based on the previous year (a round number was provided) and a monthly breakdown was not provided, therefore confidence level is ***medium****.*

Food Supply
The food system at UCT consists of two independent parts: the Residence food system, which feeds 4,100 Residence students in 17 residences; and the Campus food system, which is operational during weekdays and feeds up to 26,000 students (including residence students) and up to 5,000 staff on all campuses. The catering at residences is out-sourced to a single service provider, whereas the Campus food system consists of a number of small- to medium-scale food service providers, or vendors, also contracted by UCT.

The footprint of Food Supply at UCT was first introduced in the 2012 report. In 2013, the results of a post-graduate student dissertation on food sustainability were incorporated (Gravenor, 2013), while this report used only the emission factors from that study, since accurate meal data was available for the residences and to an extent, for food vendors.

Data was provided on all meals supplied in first-tier residences for 7 months when students are present. For the campus vendors, the figures for the Campus food system were calculated from annual 2013 sales data provided by a major campus food outlet. Certain assumptions and extrapolations were required to account for all vendors across the university.

Results:

- Total footprint from food for UCT: 6,484.63 tCO_2e
- Residences: 2,973.43 tCO_2e
- Campus Vendors: 3,511.20 tCO_2e

This amounts to 7.6% of the total carbon footprint, making this component the third highest across all scopes, after electricity and transport. Compared to 2012, these emissions have increased by 485 tCO_2e, or 8.1%, due to the more accurate data provided. Efforts to develop more accurate measurement methodologies should be pursued in future.

Food Supply - Data quality
Residences - The emissions of meals were estimated using averaging methods based on the dissertation by Gravenor (2013), which in turn drew upon Audsley et al. (2009). Confidence level is ***medium-low****.*

The food from campus vendors was 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.***

Air Travel
Data gathered for this report included more accurate air travel information for both 2012 and 2013. The Air Travel data was provided in Excel format, showing the number of times each route was travelled during the year, but not the route distance. 'Travelmath[1]' distance calculator was used to obtain the distance of each route. Journeys were classified as Domestic, Regional (<3,700km) or International (>3,700km) and the relevant DEFRA factors applied. The calculations were based on fewer assumptions than the previous report. Since accurate data for 2012 was provided together with the 2013 data, the 2012 figure has been recalculated in this report, using the same emission factors to make these comparable. The data only includes air travel booked through UCT's preferred travel agencies.

Results show an increase in emissions of 13.5% over 2012 and an increase in the number of flights from 2,756 to 3,257. Air Travel comprises a relatively low percentage of the total footprint at 2.4%; however this increase is of significant quantity. Of the total air travel emissions, Domestic travel contributes 38.5%; Regional travel 6% and International travel a significant 55.5%. Domestic travel alone has increased by almost 17% year-on-year from 2012 to 2013.

The alternative to air travel, video conferencing, was introduced at UCT a few years ago. For the first time, some data for video conferencing was received from the ICTS department for this report. Over the 12 month period since July 2013, there were a total of 930 video conferences lasting 270 hours, averaging about 23 hours of video conferences a month. Trends relating to this activity can be tracked in future studies.

Air Travel – Data quality
Detailed data was made available for both 2012 and 2013; therefore a ***high*** *confidence level has been assigned here. The data only includes air travel booked through UCT's preferred travel agencies, which excludes air travel booked by external funders and booked by staff on the Internet. It should be noted that the accuracy of the distance estimation tool has an inherent inaccuracy of between 5-10%, as it uses a straight-line distance.*

Paper products
The category includes printing and photocopy paper, toilet paper and paper towels; however paper towels have not been included in this study due to lack of an emission factor and a weight for that type of paper.

[1] www.travelmath.com/

Data for printing and photocopy paper was received from the ICTS Department for printers under their control, and from the campus copy centres. Since recycled content of paper purchased is not known, a conservative assumption was made of no recycled content. The total number of paper sheets for the year amounted to 64,721,695, compared to 63,240,680 in 2012, a 2.3% increase**.** It was also found that the 2012 figure for office paper was undercounted by 20 million sheets due to an error in data gathering and therefore the figure was restated. Though the increase in paper usage is small, it is a surprising result given that a digital platform is in use for student assignments (i.e. it was hoped that this initiative would have had a more observable impact on paper usage).

For toilet paper the data received initially reflected a large increase and therefore the 2012 data was rechecked. Revised data was made available and the 2012 emissions figure was recalculated. The result for 2012 and 2013 are almost the same figure, reflecting no change.

Paper products - Data quality
It is expected that this result is an underestimation since paper is not purchased centrally at UCT, but by each department or research unit. Other paper products such as paper towels were not included. A ***low*** *confidence level is therefore assigned.*

Water supply and wastewater
Water supply data was provided from billing data. The emissions for 2013 amounted to 120.56 tCO_2e, compared with 182 tCO_2e for 2012; therefore the results show a decrease in consumption of 33.8% over 2012. Since there were no known water conservation initiatives, this data was checked and investigation of these figures found that municipal billing anomalies for both 2012 and 2013 have been identified and addressed to the local authority, but have not yet been resolved. Therefore this result is considered anomalous and highlights the need for better data collection and digital water metering.

Water treatment (wastewater) has not been included in this study, as per the 2012 footprint. The GHG Protocol recommends that an entity that measures its water supply should also measure water treatment. However, the emissions factors for water treatment vary widely depending on the country/local technology used and therefore the use of DEFRA factors for this component is not considered applicable. Further, since it can be argued that water treatment is wholly out of the control of an entity, water treatment has been omitted from this study. This should be reviewed in future.

Water supply- Data quality
All water data is derived from municipal bills from either Properties and Services or Student Housing for Off-campus residences. Data was provided as an annual total for the entire campus, including Off-campus residences, without monthly breakdowns. Subsequently, the Student Housing provided the data for Off-campus residences from the utility accounts with monthly breakdowns. This could then be compared to the 2012 data, the result being a 32% decrease from 2012 (212 205kl) to 2013 (144 221kl). Due to unresolved billing anomalies reported by Properties and Services, the confidence in these results is ***low****.*

Solid waste
Data has been reported by the service provider Wasteman since 2009. Consistency and frequency of reporting have been problematic, however in the last year good progress has been made in terms of the regularity of reporting. In addition, the service provider has now launched an interactive website to make this data available, with breakdown by waste type and collection point. Waste is measured

as 'Wet' (non-recyclable) or 'Dry' – (recyclable) and submitted monthly to Properties and Services. At this stage no independent verification of data is being undertaken.

Overall the quantity of waste removed from UCT increased from 967 tons in 2012 to 1365 tons in 2013, and increase of 40%. This is surprising given the relatively small growth in population. In terms of emissions, a total of 109 tCO_2e was reported for Non-recycled waste for 2012, and 155 tCO_2e for 2013, an increase of 41%. Recycled waste emissions increased from 12.36 tCO_2e reported for 2012, to 19.63 tCO_2e for 2013, a significant 58% increase. Over 11% of the increase in Recycled waste is attributed to the inclusion of new recycled waste categories, namely Hazardous Waste (Chemical and Medical), e-Waste, and printer cartridges. These were previously omitted due to uncertainty around emission factors. The percentage of waste recycled remained the same as in 2012 at 60%. This is a disappointing result given the efforts of Properties and Services and the Green Campus Initiative during the last five years to provided recycling infrastructure, training and awareness campaigns.

New categories of waste in this report were included in the Recycled waste category. The same emission factor as Recycled waste was used for these waste components i.e. 21 $kgCO_2e$ per ton of waste.

Solid waste - Data quality

Solid waste data comprised a breakdown of waste collected and recycled in each month of 2013, and for the years 2009 to present. A monthly breakdown of 'Recycled' (Dry) waste and Non-recycled (Wet) waste was provided with totals and percentages of each category for each month. However, waste statistics are highly generalised and based on an estimate of volume and weight per 'wheelie' bin collected by Wasteman; therefore the confidence level of these results is ***low****. This is considered adequate for Scope 3 reporting measurement methods are based on practicality and affordability.*

Data on ***e-Waste*** *was provided by ICTS and Properties and Services since there are presently two e-Waste collection systems at UCT. Data comprises annual totals of e-Waste collected in kilograms per year from 2010 to 2013. The confidence level of these results is* ***high.***

Data on ***Hazardous waste*** *for the last 3 years was provided consisting of totals collected per year in kilograms and litres. The amount of waste represents two components; Medical waste and Chemical waste removed from UCT. This data collection system is required for compliance purposes, and therefore accurate. The confidence level of these results is* ***high.***

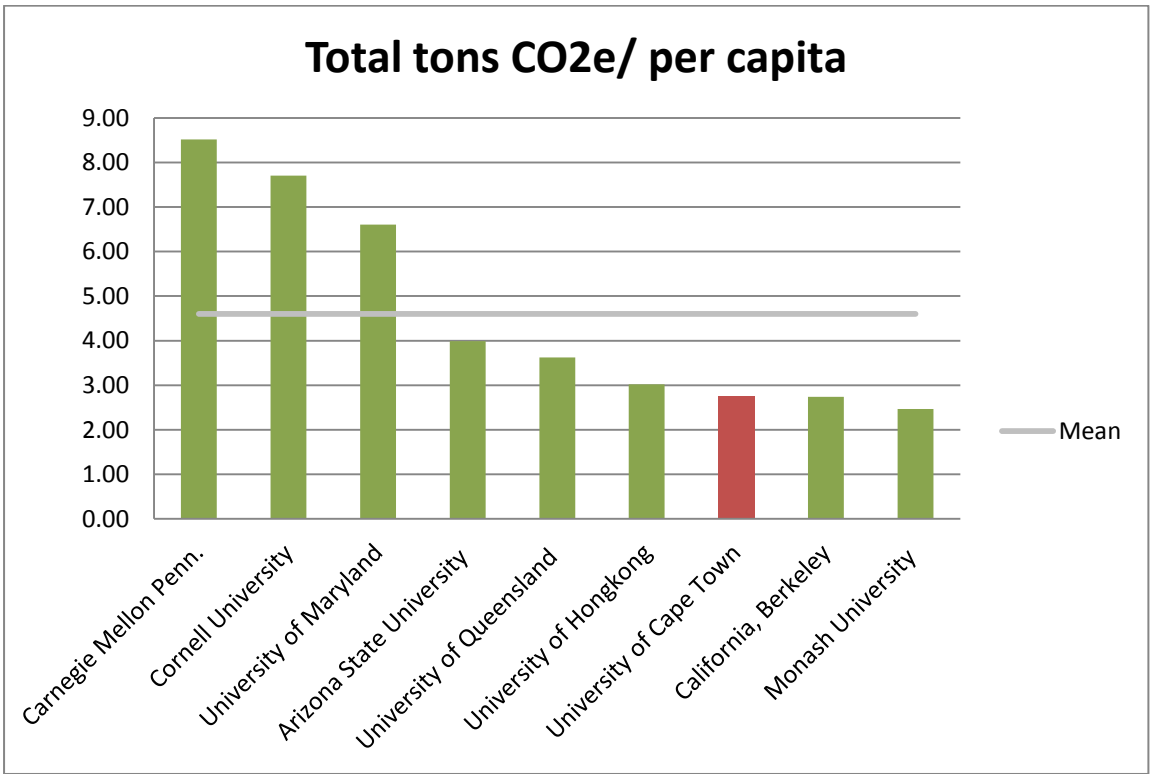
4 BENCHMARKING AGAINST OTHER UNIVERSITIES

The emissions produced by UCT have been compared with that of other universities from a selection of those that use the GHG Protocol and of varying geographic and climatic regions in Table 3 below, using a per capita intensity benchmark. The latest GHG emission reports available for each university have been used to update the table. Results show that UCT has relatively low emissions at 2.75 tCO_2e per capita, (compared to 2.87 tCO_2e in 2012) with the Mean for this sample range being 4.60 tCO_2e per capita. Students and full-time staff were included in the calculation. In comparison the University of California, Berkeley, with a cool summer Mediterranean climate, has per capita emissions of 2.74 tCO_2e. Monash University (2013) in Melbourne, Australia has the lowest per capita emissions of the samples selected at 2.47 tCO_2e per capita. No examples of South African universities using the GHG Protocol and measuring Scopes 1, 2 and 3 could be found.

Table 3: Comparison with other Universities - Emissions per capita

University	Reporting year	Population (students & staff)	Total tCO_2e	Intensity tCO_2e per capita
Carnegie Mellon Penn.	2012	17 200	146 514	8.52
Cornell University	2012	28 306	218 000	7.70
University of Maryland	2013	42 308	279 572	6.61
Arizona State University	2013	78 861	314 748	3.99
University of Queensland	2011	52 096	188 607	3.62
University of Hongkong	2011	32 654	98 550	3.02
University of Cape Town	2013	31 041	85 360	2.75
California, Berkeley	2012	50 511	138 500	2.74
Monash University	2013	79 558	196 471	2.47
Mean		**45 837**	**185 140**	**4.60**

Figure 8: Comparison of per capita emissions of selected universities



5 CONCLUSIONS AND RECOMMENDATIONS

The results of this study, as reflected in Table 1, show that the total carbon footprint has decreased by 2.7% after the 2012 results have been restated. The 1.5% increase in population and the 2.9% increase in floor area since 2012 indicate a neutral to positive trend with respect to carbon emissions, reinforcing the 9.7% reduction between 2012 with the baseline study for 2007.

Positive trends emerging from this study are the reduction in electricity consumption of 3.6% on Medical campus (while floor area increased by 1.5%); Main campus electricity increased by only 0.4% in spite of a 3.9% increase in floor; and a reduction in Business Travel and Employee Travel (the latter due to better data). The fact that greater electricity emissions reductions were not found in this study indicates the need to invest in further retrofitting of electrical equipment with more efficient technologies across the campuses. Investment in renewable energy generation on site at UCT should also be explored and feasibility studies undertaken. These investments are likely to make business sense due to the reductions in annual operating costs that would be achieved. Behaviour change by the UCT community, with regards to the use of lighting, computers and heating or cooling, is needed to reduce electricity consumption. The decrease in emissions intensity from 2.87 tCO_2e per capita in 2012, to 2.75 tCO_2e per capita in 2013 is a positive trend.

A negative trend is the increase in solid waste of 40%, given the relatively small growth in population of 1.5%. Further, the percentage of waste recycled did not improve and remained the same as 2012 at 60%. This is a disappointing result given the efforts during the last five years to provided recycling infrastructure, training and awareness campaigns. Research is required to understand this trend and to understand how to improve behaviour and attitudes to reducing and recycling waste.

A further negative trend is the 13.5% increase of emissions for Air Travel and an increase in Domestic flights of 17% over one year. Efforts should be made to understand this trend, possibly through research. The alternative to air travel, video conferencing is growing in usage, but has not reduced air travel. Staff may need incentives or disincentives around air travel in order to promote the use of video conferencing. If reduction in frequency of air travel is unlikely to be achieved through behaviour change, or is considered essential for research purposes, consideration should be given to an appropriate offset approach for these emissions.

There remains a challenge comparing Business Travel and Air Travel year-on-year as the activity data fluctuates considerably due to non-annual conferences, visits by academics and ad hoc projects requiring travel. It is expected that more useful comparisons will be possible once a number of footprints have been undertaken allowing for trend analysis, or when more information is made available to link the activity data to changes in key drivers such as travel-intensive research, visiting academics, and conferences.

Results show that Employee Travel (commuting transport) emissions comprise 11.3% of the total emissions, making this an important activity to target for emissions reduction efforts. It is also an area where personal choice of students and staff can be exercised. The commuting survey has brought to light some useful information in terms of modes of transport that could be used for infrastructure planning purposes and to target modal shift initiatives by the administration and the Green Campus Initiative. Private cars contribute 74% of all commuting emissions; therefore shifting away from private car use to public transport, cycling or walking is clearly the most effective way to reduce the carbon footprint. Official traffic surveys should be conducted to confirm the results of the student survey. It is recommended that a questionnaire on transport modes for commuting be completed by each student upon registration as suggested by the Green Force (2014) student

report. Further, the transport sector priority actions recommended by the *Green Campus Action Plan* should be pursued, namely:

- Promote cycling by providing adequate infrastructure, secure bicycle storage and shower facilities at key locations and transport hubs
- Provide more dedicated parking for scooters and motorbikes
- Develop Park and Ride schemes
- Promotion of the existing 'Ridelink' carpooling scheme

The Food Supply emissions amount to 7.6% of the total carbon footprint, making this component the third highest after electricity and transport. Of the total emissions the Residence food system accounts for 46% and Campus food system 54%. In general, meals containing meat have a higher carbon footprint than vegetarian and vegan meals, so this should be considered for residence meal plans and campus vendor food offerings. Research for this study found few universities that included food supply in their GHG emissions inventories, but sustainable food programmes were more common. The carbon emissions of the Food Supply system are a limited indicator of full environmental impact of the food supply chain. It is recommend that the university adopt a sustainable food programme in line with international practice, where broader sustainability concerns are addressed, such as the social, ecological and economic impact of the food supply chain.

Solid waste management requires attention, in particular to understand the slow pace of behaviour change for recycling at source that is evident in these results. There is still much contamination of recyclables and incorrect separation into bins. Further research on this issue is recommended. Waste management training for staff and students at UCT should remain well supported by the administration. Further, greater awareness and use of the existing systems at UCT for the recycling of e-Waste, printer cartridges and white office paper is needed and should be addressed by education and communication initiatives.

The next carbon footprint study should aim to ensure that all relevant activities and products are included to enhance comparability going forward. In terms of the 'Completeness' principle of the GHG Protocol, all relevant emissions sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled.

Finally, the findings of the UCT Carbon Footprint 20013 need to be communicated to the UCT community and forums or media for exploring ways of reducing emissions supported and promoted. Public access to this information should be provided to enhance transparency and accountability.

The process

Overall, the carbon footprinting process was more effectively planned in terms of data gathering and storage, and certain activity data sets were greatly improved. Refinements have been made to the methodology. Together these improvements to the process should mean that the results are more robust. Properties and Services were provided with a full list of data requirements, which was received timeously by the end of February 2014. This report has been compiled in a shorter time period than the previous Carbon Footprint Report; however delays were caused by incomplete and incorrect data provision in the early stages of the study. These anomalies did not become apparent until the data analysis phase and then had to be rectified. This problem is likely to decrease as participants in this annual process become more familiar with requirements and adjust their own reporting processes to align with these annual reports. This study found that the data holders understanding of and cooperation with, this annual process improved over the previous year.

This reporting process did not, as previously, have the benefit of expertise from the Energy Research Centre, UCT. This was dealt with by obtaining guidance on methodology and a full review of this report from Anthony Dane, the former ERC member who had been involved in the 2013 study. This approach proved to be successful and a similar approach should be continued in future if possible.

The approach in terms of the student projects worked well in 2014 and showed improvements over 2013. This study was done independently and ahead of the student programme, which proved effective as it enabled better guidance for the students, and their work could be used for checking and comparison of this study. The student work enhanced this report and provided some primary research towards the calculations, such as the commuting survey. In addition, one of the student groups (Green Walkers, 2014) was given access to the digital electricity metering platform and they identified errors in the reporting function of the platform dating back to 2012, which had not been noticed.

The need for a secure and accessible platform for data storage was identified in the 2013 study, and a temporary solution to this adopted, using the UCT intranet site Vula[2] for this study. The development of such a platform should therefore be planned and implemented before the beginning of 2015, if the need for this is agreed. Most importantly, activity data templates produced by Information Systems students this year should be given to data holders for next year, which will ensure more complete and accurate data.

This process has highlighted the importance of obtaining a robust baseline against which to track performance over time. The recalculation of 2012 results, due to incorrect data or incorrect methodology, made comparison with this study somewhat confusing; however developments in methodology and emission factors are likely to make some degree of restatement of earlier values an ongoing feature of this reporting. Finally, any activity data that is considered to be outstanding from this study should be identified immediately, and the gathering of those data sets planned ahead of the next annual report.

Recommendations for more effective reporting

1) Develop a secure and accessible platform for the collection of the carbon footprint data.

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

3) 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, enhancing awareness of resource use and environmental impacts, leading to behaviour change.

[2] UCT's online collaboration and learning environment

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Green Food	Food Supply
Green Force	Commuting, Air Travel and Jammie Shuttle
Green Transport	Vehicle fleet, Hired cars and LPG
Green Walkers	Electricity consumption
Paper Police –	Paper products and Solid Waste
The Lumias ES	Water, E-Waste and Hazardous Waste

APPENDIX 1: LIST OF INFORMATION SOURCES

CATEGORY/SECTOR	CONTACT	DESIGNATION	METRIC
Building List & Areas	Nigel Haupt	P&S: Physical Planning Unit	m^2
Population data	Linda Jones	Registrar's office	Students & staff (FTE)
Electricity: Main campus; Medical campus	Andre Theys	P&S: Engineering Services	kWh
Electricity: Hiddingh Campus	Fahmza Jaffar	P&S: Finance	kWh
Electricity: Off campus Residences	Linda Tsipa	Student Housing	kWh
Electricity: GSB	Rayner Canning; Charlene Paris	GSB Finance Dept	kWh
LPG	Di de Villiers	Procurement and Payment Services	Kilograms
Water: per campus	Fahmza Jaffar	P&S Finance	Kilolitres
Water: Off campus Residences	Linda Tsipa	Student Housing	Kilolitres
Water: GSB	Rayner Canning; Charlene Paris	GSB Finance Dept	Kilolitres
Solid Waste	Duke Metcalf	P&S: Custodial and Estates Manager	Tons Wet/Dry
Paper products purchased	Duke Metcalf/Charl Souma	P&S/ICTS	Kilograms
Paper (Campus copy centres)	Therese Wiborg	Nashua	sheets
Hazardous Waste: Medical/Chemical	Brett Roden	P&S: Environmental Risk Officer	L/kg
E-Waste via P&S	Brett Roden	P&S: Environmental Risk Officer	Kilograms
E-Waste via ICTS	Charl Souma	ICTS	Kilograms
Transport: Jammie Shuttle	Roland September	P&S: Traffic manager	Litres fuel/km
Transport: Hired cars	John Pretorius	Procurement	Kilometres
Transport: Fuel UCT Vehicle Fleet	John Pretorius	Procurement	Litres fuel
Air travel	John Pretorius	Procurement	Kilometres
Toilet paper & paper towels	Duke Metcalf/ Adele Moller	P&S/Supercare	Rolls/weight
	Clive Damonse	Metro	Rolls/weight
Food supply: Residences	Grant Willis	Student Housing and Residence Life	Meals
Food supply: Vendors	Duke Metcalf/Wayne Tsemis	Zemonfoods	Meals