# UNIVERSITY OF CAPE TOWN

## CARBON FOOTPRINT REPORT 2016

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## ACKNOWLEDGEMENTS

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### About this report

This is the sixth carbon footprint report of the University of Cape Town for the calendar year 2016. The first report, for the year 2007, was completed in 2009; however, the boundaries of that report were limited to Main Campus. The first report with the current boundaries and using the current methodology was for 2012, which can be considered a baseline. The report covers the entire university across all campuses of 706 125 square metres ($m^2$) and a total population of 34 965 students and staff.

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External review: Anthony Dane, director at Change Pathways.

Previous reports can be downloaded at http://www.uct.ac.za/main/explore-uct/sustainability.

## INTRODUCTION

The University of Cape Town has adopted internal and external environmental policies that commit to reporting and mitigating carbon emissions. The *UCT Green Campus Policy Framework* developed by the office of Deputy Vice-Chancellor Martin Hall was adopted by the university Council in 2009. This policy was followed by the *Green Campus Action Plan* drafted under the direction of the Properties and Services Department (P&S) and the Environmental Management Working Group (EMWG). In 2012 Vice-Chancellor Dr Max Price signed the ISCN-GULF Sustainable Campus Charter, an environmental policy that integrates sustainability in education, research, outreach, strategic planning and operations. The results of the UCT Carbon Footprint Reports form a key component of the reporting in terms of the ISCN-GULF Charter. These reports can also be downloaded at http://www.uct.ac.za/main/explore-uct/sustainability.

South Africa has made international commitments to progress its contribution to the global effort to mitigate climate change. Under the United Nations Convention on Climate Change, South Africa's nationally determined contribution (NDC) refers to various policy instruments, including "… company-level carbon budgets, as well as regulatory standards and controls for specifically identified GHG [greenhouse gas] pollutants and emitters".

The expectation is that carbon budgets will be defined for larger emitters among private companies (and state-owned companies like Eskom, the national electricity utility). It is not expected that public universities like UCT would be assigned individual carbon budgets, at least not in the first phase. UCT may, however, be subject to energy reporting (DoE 2015) and GHG reporting (DEA 2017), if energy use exceeds 180 Terajoules (TJ) and/or direct (Scope 1) emissions exceed 0.1 Mt $CO_2$-eq per year. Energy use at UCT is currently around 250 TJ and Scope 1 direct emissions are 0.002 Mt $CO_2$-eq per year. UCT would do well to proactively set targets that are more ambitious than, or at least consistent with, the national GHG emission trajectory[1].

The key issues regarding reporting and mitigating greenhouse gas emissions for the university are driven by the need for austerity measures and to reduce water consumption in the severe drought[2] circumstances in Cape Town.

- Resource cost savings contributing to austerity: Some successes in electricity consumption and the Jammie Shuttle fuel consumption, but more effort is needed to reduce air travel and improve recycling rates.
- Water consumption reduction in the context of drought: Reducing water consumption is critical in response to the severe drought in Cape Town and would also reduce emissions and costs.
- Innovation and leadership: Leveraging this reporting process for educational benefit; exploring emissions offsets; mitigation measures; and coordination and alignment of the reporting processes.

[1] Harald Winkler, Director: Energy Research Centre, UCT, pers. comm.

[2] Research on long-term weather data done by UCT's Climate System Analysis Group found that the period from 2015–2017 has been the driest three-year period since 1933 and that a drought of this severity will statistically occur only once every 311 years. https://www.news.uct.ac.za/article/-2017-08-31-how-severe-is-the-drought

| | |
|---|---|
| **Methodology** | - The *Greenhouse Gas Protocol – Corporate accounting and reporting standard.*<br>- Emission factors are from the UK Department for Environment, Food and Rural Affairs (Defra)[3], except for electricity supply where the Eskom factor was used as described below.<br>- Results are reported in metric tonnes of carbon dioxide equivalent – $tCO_2e$. |
| **Inclusions** | - The entire university across all campuses and properties.<br>- Staff: 5 891 full-time equivalent (FTE).<br>- Students: 29 074<br>- Scope 1 refrigerants included for the first time.<br>- Electricity grid emission factor: 1.03 $kgCO_2e/kWh$ |
| **Exclusions** | - Data required for emissions calculation is not currently available for:<br>  - Commuting – no research undertaken; 2014 data used; population increase accounted for.<br>  - Campus food vendors – no data provided; 2014 data used, and population increase accounted for. |

The *Greenhouse Gas Protocol* requires carbon footprint calculations to include all direct emissions under Scope 1 and indirect emissions from purchased electricity under Scope 2 as compulsory reporting. Other activities under indirect emissions, Scope 3, are voluntarily reported.

## Emission Factors

Emission factors convert operational activity data (e.g. kilometres driven, kilowatt hours of purchased electricity) into a value indicating the greenhouse gas (GHG) emissions generated by that particular activity, reported as carbon dioxide equivalent ($CO_2e$).

## Electricity grid emission factor

The Grid Emission Factor (GEF) is the total amount of greenhouse gases emitted per unit of electricity generated for and distributed by an electricity grid. South Africa has a carbon intensive grid and therefore efforts to reduce electricity consumption not only save money but also significantly reduce the university's carbon footprint.

Electricity use is a major component of the UCT carbon footprint, typically around 75%. The calculation of the carbon footprint since 2015 uses an emission factor of 1.03 $kgCO_2e/kWh$ published by Eskom, in line with the practice of most companies in South Africa. In reports prior to 2015, an emission factor generated by an industry partnership was used: 0.94 $kgCO_2e/kWh$ (MAC Consulting 2013). It is expected that the Eskom grid emission factor should decrease over time if there is increased investment in lower carbon electricity generation.

[3] Emission factors obtained from https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2016

**KEY FINDINGS**

- Emissions increased in 2016 by 3.3% over 2015; population increased by 5.3%.
- Intensity metrics reflect a substantial decrease in per capita emissions of 6.5% from 2.25 $tCO_2e$, to 2.10 $tCO_2e$.
- Electricity emissions decreased by 2.3%, a positive trend. The accuracy of electricity data has improved with the installation of digital metering.
- Jammie Shuttle emissions decreased by 8.3% due to optimisation of routes.
- Scope 1 refrigerant emissions are included for the first time, contributing to completeness of the carbon footprint (also required under the GHG Protocol reporting methodology)
- Air travel emissions are estimated to have increased significantly by 81.6%. This may be partly due to a more complete data set, but it reinforces the trend of increased travel observed in previous years.
- The reporting process reflects some improvement; however further improvement is required with respect to data gathering and accuracy, and to streamline the annual process.
- Opportunities exist for mitigation measures that would result in cost savings especially in the context of rising electricity prices. Further opportunities exist to explore potential revenue generating options (carbon credits) and to involve students and staff in this process.
- The quality of data for Scope 1 is based on measurements and therefore of high quality. Scope 2 data has improved to medium-high quality since data is being gathered from digital meters for the major portion of electricity supplied. In general, Scope 3 results can be considered to be of low quality, using an estimation approach, which is acceptable in terms of the GHG Protocol.
- Key recommendations comprise a focus on actions that would save operational costs as well as emissions: investment in energy efficient equipment retrofits and renewable energy generation; introducing electric vehicles to the fleet; avoidance of unnecessary air travel; water metering and monitoring; and adequate resourcing of the solid waste and recycling programme.

## RESULTS SUMMARY

The total greenhouse gas emissions recorded for 2016 are 99 281 $tCO_2e$ (Table 1). This is an increase of 3.3% or 3 127 $tCO_2e$ compared to 2015. Given an increase in population of 5.3%, this result is positive.

Scope 2 indirect emissions from purchased electricity comprise 72% of overall emissions. A positive finding is that emissions decreased by 2.3% or 1 713 $tCO_2e$. This is due to a decrease in emissions of 4.8% on Main Campus. Reasons for this decrease are uncertain as no initiatives were implemented for electricity efficiency[4]. Disruption of normal operations due to student protests[5] may be a factor. The data quality for electricity supply is considered to be significantly improved due to the extensive installation of digital meters for Main Campus, Medical campus and Hiddingh campus.

The main contributor to the increase in total emissions is from air travel, which increased by 81.6%, or 3 259 $tCO_2e$ over 2015. This increase is to an extent a result of improved data collection: Data was provided from the SAP system and includes all direct ticket purchases by staff in addition to those purchased from preferred travel agencies. A similar trend was observed in the increase in air travel from 2014 to 2015. However, the quality of this data is considered to be low since the actual kilometres travelled was not provided as previously, only the number of tickets purchased.

A further contributor to the increase in overall emissions is the inclusion for the first time of fugitive emissions from Scope 1 refrigerants used in air-conditioning and refrigeration equipment. Inclusion of this activity represents a significant improvement in reporting completeness. Refrigerants contribute 0.73% to overall emissions, and an amount of 733 $tCO_2e$ of the total Scope 1 direct emissions of 2 188 $tCO_2e$.

In terms of the intensity of emissions (includes Scope 1 and 2 only), the emissions per square metre decreased from 0.106 $tCO_2e$ to 0.104 $tCO_2e$ or 1.6%. This is a positive trend, given that the total building area remained the same. The per capita emissions decreased more substantially by 6.5% from to 2.25 $tCO_2e$, to 2.10 $tCO_2e$ with a 5.3% increase in population (Figure 1).

| **INTENSITY METRICS** (Scope 1 and 2 only) | **2016** | **2015** | **2014** | **2013** | **2012** | **% change 2015–2016** |
|---|---|---|---|---|---|---|
| Gross area | 706 125 | 706 125 | 705 653 | 672 858 | 649 404 | **0,0** |
| **Tonnes $CO_2e$/sqm/annum** | **0.104** | **0.106** | **0.098** | **0.099** | **0.103** | **-1.6** |
| Population – staff and student FTE | 34 965 | 33 204 | 31 329 | 31 041 | 30 579 | **5.3** |
| **CO2e/person/annum** | **2.10** | **2.25** | **2.21** | **2.15** | **2.18** | **-6.5** |

**Figure 1: Intensity metrics comparison 2012–2016**

[4] Christo Odendaal: director Maintenance and Operations, Properties and Services Department.
[5] Student protests in 2016 resulted in four weeks of classes being shut down; two days in 2015.

**Table 1: Comparative GHG emissions $tCO_2e$ (tonnes) –** Eskom emission factor (1.03 $kgCO_2e/kWh$)

| CATEGORY | 2016 | 2015 | 2014 | 2013 | Diff 2015 to 2016 | % Change 2015–2016 |
|---|---|---|---|---|---|---|
| **Scope 1 Direct Emissions** | **2 188** | **1 658** | **1 792** | **1 823** | 530 | **32.0** |
| Jammie Shuttle | 790 | 861 | 1 006 | 1 068 | -71 | -8.3 |
| UCT vehicle fleet | 475 | 503 | 556 | 465 | -28 | -5.5 |
| Liquified petroleum gas (LPG) | 191 | 160 | 230 | 289 | 31 | 19.2 |
| Diesel for generators | - | 134 | - | - | - | - |
| Refrigerants | 733 | - | - | | - | - |
| **Scope 2 Indirect Emissions purchased electricity** | **71 273** | **72 986** | **67 447** | **65 835** | -1 713 | **-2.3** |
| Electricity: Main Campus | 45 543 | 47 862 | 44 219 | 42 583 | -2 319 | -4.8 |
| Electricity: Medical campus | 12 125 | 12 265 | 11 239 | 10 648 | -140 | -1.1 |
| Electricity: Off-campus residences | 11 063 | 11 065 | 10 149 | 10 729 | -2 | 0.0 |
| Electricity: GSB | 1 438 | 1 415 | 1 393 | 1 417 | 23 | 1.6 |
| Electricity: Hiddingh | 549 | - | 111 | 116 | - | 0.0 |
| Electricity: ICTS on Main | 555 | 379 | 335 | 342 | 176 | 46.5 |
| **Scope 3 Other Direct Emissions** | **25 819** | **21 510** | **18 446** | **18 547** | 4 310 | **20.0** |
| Fuel- and energy-related | 890 | 581 | 341 | 409 | 309 | 53.3 |
| Business travel | 228 | 262 | 124 | 385 | -34 | -13.0 |
| Business travel – airlines | 7 255 | 3 996 | 2 628 | 2 021 | 3 259 | 81.6 |
| Employee commuting | 9 071 | *8 465 | *8 217 | 8 566 | 606 | 7.2 |
| Purchased goods – food | 7 022 | *7 128 | 6 549 | 6 485 | -105 | -1.5 |
| Purchased goods – paper | 667 | 382 | 305 | 386 | 285 | 74.7 |
| Purchased goods – water | 233 | 138 | 139 | 121 | 95 | 69.1 |
| Waste | 452 | 558 | 143 | 175 | -106 | -19.0 |
| **TOTAL emissions tCO2e** | **99 281** | **96 154** | **87 685** | **86 205** | **3 127** | **3.3** |

Notes to Table 1:

1. New category added for 2016 report as data became available.
2. Floor area for Rochester Residence (accommodating over 300 students and staff) remains an estimate; to be updated by P&S.
3. Hiddingh electricity data for 2015 included in Main Campus data.

* Indicates a restated result that may differ from the original report for that year. This may be due to improvements in data collection or changing emission factors. A decision to restate a result is always considered against the principle of comparability of the GHG Protocol.

**Table 2: Carbon emissions per category, indicating percentage of total emissions**

| CATEGORY | | $tCO_2e$ | % of Total |
|---|---|---|---|
| Scope 1 | **Direct Emissions** | **2 188** | **2.2** |
| | Jammie Shuttle | 790 | 0.80 |
| | UCT vehicle fleet | 475 | 0.48 |
| | LPG | 191 | 0.19 |
| | Refrigerants | 733 | 0.74 |
| Scope 2 | **Indirect Emissions** | **71 273** | **71.79** |
| | Electricity: Main Campus | 45 543 | 45.87 |
| | Electricity: Medical campus | 12 125 | 12.21 |
| | Electricity: Off-campus residences | 11 063 | 11.14 |
| | Electricity: GSB | 1 438 | 1.45 |
| | Electricity: Hiddingh | 549 | 0.55 |
| | Electricity: ICTS on Main | 555 | 0.56 |
| Scope 3 | **Other Direct Emissions** | **25 819** | **26.01** |
| | Fuel- and energy-related | 890 | 0.90 |
| | Business travel | 228 | 0.23 |
| | Business travel – airlines | 7 255 | 7.31 |
| | Employee commuting | 9 071 | 9.14 |
| | Purchased goods –food | 7 022 | 7.07 |
| | Purchased goods – paper | 667 | 0.67 |
| | Purchased goods – water | 233 | 0.23 |
| | Waste | 452 | 0.45 |
| | **TOTAL EMISSIONS** | **99 281** | **100** |

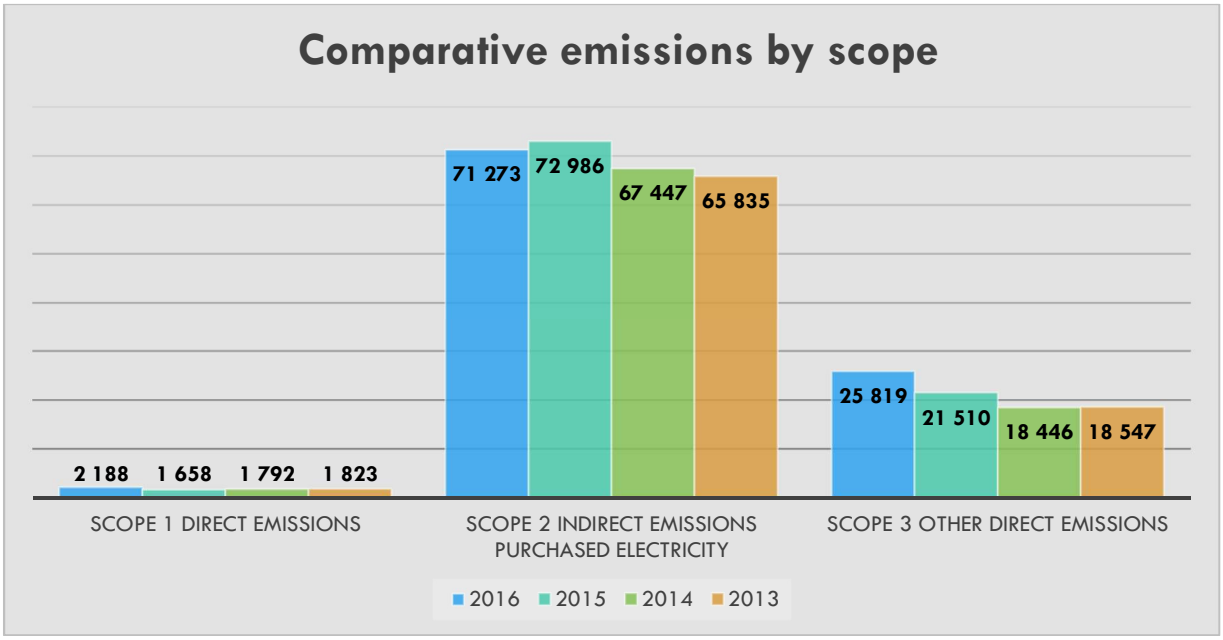


Figure 2: Comparative emissions by scope

## EMISSIONS BY SCOPE

### Scope 1 – Direct emissions

Emissions from all Scope 1 activities increased to 2.2% of total emissions, a 32% increase (Tables 1 and 2). This is largely due to the inclusion of emissions from refrigerants for the first time, a breakthrough in terms of data acquisition. Records of the amount and type of gas refills to equipment were obtained from the service providers, via Properties and Services. This brings the report into compliance with the requirement for completeness in Scope 1 emissions reporting of the GHG Protocol. The next step is to shift towards refrigerants with lower global warming potential in line with best practice.

In a positive trend for the second consecutive year, the Jammie Shuttle emissions decreased by 8.3%, apparently due to rationalisation of the routes. Passenger rides increased by 23% over 2015[6] and by 15% over 2014.

Emissions from the vehicle fleet decreased by 5.5% compared to 2015, while the vehicle fleet actually increased from 235 to 253 vehicles. The decrease may be due to a response from staff to the call for austerity measures or due to newer, more fuel-efficient vehicles. Once again, it may be a result of suspension of normal activities during student protests.

Emissions from the use of liquified petroleum gas (LPG) are a minor component of emissions at only 0.19%. For 2016, emissions increased by 19.2%. Of the total LPG purchased, around 11% is for the residences and the remainder is used for research, primarily in the Faculty of Health Sciences. The use of LPG for water heating has been steadily declining in recent years as heat pumps are installed for this purpose.

**Table 3: Total Scope 1 emissions**

| Description | Units | Consumption | tonnes CO2e |
|---|---|---|---|
| **Total emissions from transport service (Jammie)** | | | **789.50** |
| | Litres of diesel (100% mineral) | 295 008 | 789.50 |
| **Total fugitive emissions from refrigerants** | | | **732.52** |
| | kg of R22 | 232.2 | 420.28 |
| | kg of R410A | 3 | 6.26 |
| | kg of R134a | 87.6 | 125.29 |
| | kg of 407C | 12 | 21.29 |
| | kg of R507A | 40 | 159.40 |
| **Total emissions from vehicle fleet** | | | **475.34** |
| | Litres of petrol (100% mineral) | 120 352 | 277.11 |
| | Litres of diesel (100% mineral) | 74 073 | 198.23 |
| **Total emissions from LPG gas** | | | **190.64** |
| Medical | kg of LPG | **57 261** | 168.45 |
| Upper Campus | kg of LPG | 268 | 0.79 |
| Residences | kg of LPG | 7276 | 21.40 |

[6] Passenger numbers in 2015 may have been low due to student protests.

| | |
|---|---|
| **TOTAL SCOPE 1 DIRECT EMISSIONS** | **2 188.01** |

## Scope 2 – Indirect emissions from purchased electricity

A positive trend is found for emissions from purchased electricity, decreasing by 2.3% over 2015, declining from 72 986 to 71 273 $tCO_2e$ (Table 1). The emissions were calculated for both 2015 and 2016 using the updated Eskom emission factor of 1.03 kg CO2e/kWh to align with current best practice. Emissions from electricity consumed decreased for both Main Campus (-4.8% or 2 319 $tCO_2e$) and Medical campus (-1.1% or 140 $tCO_2e$). This decrease may be attributed to ongoing maintenance upgrades (end-of-life replacement of equipment) or to more accurate data from the new digital metering system, or both factors.

An extensive roll-out of digital electricity meters at building level across Main and Medical campuses has been implemented from 2014 onwards. The first 12-month data set from these meters was available for this report, and therefore these results are considered to be more robust. However, municipal billing data is still used for all off-campus residences (11% of total emissions) and the Graduate School of Business (1.4%). The marked increase in consumption at the Information and Communication Technology Services (ICTS) facility of 46.5% is attributed to the establishment of the new Research Data Centre in support of research at UCT[7]. This is driven by an increase in equipment required for high-performance computing and research data storage, as well as additional air-conditioning demands for cooling this equipment.

There were no nationwide planned power outages occurring in 2016, so a figure in the category of diesel fuel for generators, included in the 2015 report, has not been included.

## Scope 3 – All other indirect emissions

Scope 3 emissions increased overall by 20% to 25 819 $tCO_2e$, from 21 510[8] tonnes in 2015, a peak since 2013 reflected in Figure 2. Of the total Scope 3 emissions, 7 255 $tCO_2e$ is due to air travel, which increased by 81.6%. Scope 3 air travel comprises 7.2% of the overall footprint.

### Air Travel

A new, more complete, data set was provided for 2016, drawn from the SAP system and including all travel agencies, and all direct online ticket purchases by UCT staff. While this makes year-on-year comparison difficult, it is an important development in terms of the completeness of data. Unfortunately, this large data set could not be analysed for kilometres travelled, the metric used for this category in all previous reports. The number of air tickets purchased was therefore estimated and a significant increase in the number of tickets purchased of 85% over 2015 was found, from 6 888 to 12 775 tickets. The trend of increased air travel also occurred in 2015, where the increase in count of flights was 47%. With guidance from the external reviewer, a new methodology and a range of assumptions was applied to the data set to arrive at a result. Reasons for this significant increase in air travel in recent years could not be determined and would require further research.

### Fuel and Energy-related

Scope 3 fuel and energy-related emissions increased by over 53%, attributable to the massive increase in air travel, comprising 771 of the total 890 $tCO_2e$.

[7] Sakkie Janse van Rensburg, executive director of Information and Communication Technology Services (ICTS)

[8] Restated figure; previously reported as 20 919; changes in Commuting and Food categories

## Business Travel

Emissions from business travel, comprising the Hired Cars and Staff Mileage subcategories, decreased by 13% overall. Hired-car emissions increased by 87% and may be related to increased air travel. The results for hired cars were fairly consistent over the years 2013–2015, evident in Figure 3.

Staff mileage decreased by 39%. Once again, no insight into these trends could be obtained from the data holders. In this subcategory, results appear unreliable, increasing in 2015 and declining again in 2016 (Figure 3).

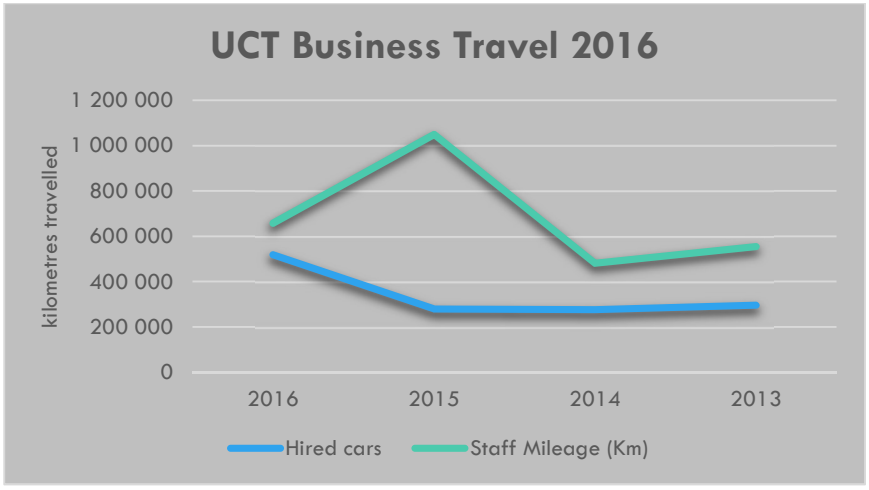


Figure 3: Business travel 2013–2016

## Commuting

For reporting on emissions produced by the various commuting modes of students and staff, previous reports used the results of surveys undertaken by Information Systems students. Since no survey has been undertaken since the 2014 report, a methodology for estimation was developed with the external reviewer. The revised calculation uses the modal split from the 2014 student survey data; however, the methodology differs in that the differing modal splits for students and staff are used instead of an average between the two; and the differing working days per annum are used (students: 152; and staff: 250 days). Both 2014 and 2015 results have been restated using this calculation method for comparability. The result is an increase in emissions of 7.2% in 2016 over 2015, likely due to the higher than normal increase in staff population in 2016 as a result of insourcing staff and the increased number of working days for staff in the calculation.

## Food Supply

The Food Supply category has two components: first-tier residences and campus food vendors (±30) contracted by Properties and Services. The number of meals served in residences declined by 9% in 2016 over 2015. Student protests with resultant shutdowns are likely to have affected the quantity of food

consumed in dining halls[9]. The residences supply students with meal vouchers[10] which they redeem off campus and these are widely used during protest actions. Lunch packs have decreased over the years as students find it easier to take a voucher which they redeem on campus. As in 2015, no data was provided for the food vendors, therefore the figure from 2014 was used, and adjusted for population growth.

### Paper Purchased

The quantity of paper products purchased at UCT remained fairly constant for 2016; however, a new emission factor from the major office-paper producer Mondi was applied in lieu of the former Defra UK factor, leading to an increase in emissions of 74% from 382 $tCO_2e$ to 667 $tCO_2e$[11]. Office paper comprises around 80% of the total emissions in this category. Paper products measured include office and printing paper, exam papers and books, and custodial paper (toilet paper, hand towels). Data was provided for the products, except for exam papers and books, where assumptions were made based on population figures.

### Water Supply

Emissions associated with accessing municipal water supply reflect a significant increase of 69% above 2015, likely due to a more complete data set extracted from the university's SAP system. However, as in previous years, data quality is highly unreliable as the source is municipal billing data with many billing reversals and estimates affecting data quality. Since water conservation has become a critical issue due to a severe drought in Cape Town and the introduction of water restrictions in late 2016, the more accurate measurement of water consumption needs to be addressed through the installation of digital meters.

### Solid Waste

The waste types reported under solid waste including solid waste-related emissions decreased by 19%, with waste to landfill reducing from 1 201 tonnes to 1 059 tonnes. There had been a sharp increase in 2015 compared to 2014, with general waste sent to landfill (non-recycled) increasing by 290% from 440 tonnes to 1 201 tonnes, evident in Figure 4 below. This trend in 2015 was thought to be due to a different measurement methodology used by the new service provider, rather than an increase in waste.

[9] Paul Marais, catering manager, Student Housing and Residence Life, personal communication.

[10] Meal voucher numbers are reported, but not included in residence meal figures to avoid double-counting of meals supplied by campus food vendors.

[11] In accordance with the GHG Protocol, when local emission factors become available they should be used in reporting, although this does affect comparability. The Mondi factor is 1 880.49 kg $CO_2e$ per ton of paper, compared to only 680kg for the Defra factor.

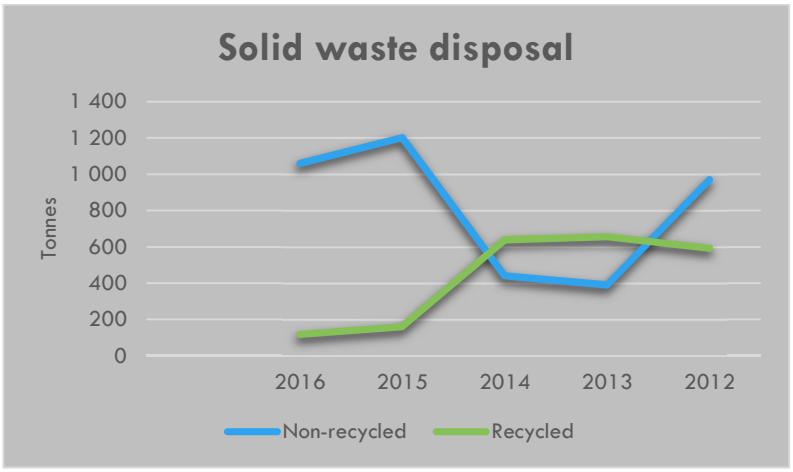


Figure 4: Solid waste disposal at UCT 2012–2016

A negative trend emerged for recycled waste, with an average of only 9% being recycled, excluding food[12]. A lack of effective separation at source on campus is reported, requiring renewed efforts to manage and promote recycling. One factor in the low recycling figures could be the transition to insourced cleaning staff. The impact of low recycling quantities has a significant effect on the monthly waste contract cost, where credit is received for recyclables. In spite of the concerted efforts of the student-led Green Campus Initiative and Properties and Services since 2009, including provision of outdoor bins and signage and staff training, success in this arena remains elusive.

Materials being recovered from the waste stream have continually been expanded to a wider range of waste categories. Types of waste included in the reporting are mixed recyclables (paper, cardboard, cans and bottles), hazardous waste, electronic waste and IT equipment, fluorescent light tubes, polystyrene, Tetrapak and printer cartridges. Food waste from catering residences continues to be sent to a maggot farming facility where the nutrients are recycled into animal feed, reducing landfill space and emissions.

## REPORTING PROCESS

The data gathering process for this report lost momentum, as compared to the previous reporting period. A decline in the momentum and effectiveness of the process has occurred since a peak in 2014.

The process commenced in March 2016 with a meeting of key data holders and line managers, to resolve data gathering issues from the previous year. Renewed commitments to timeous annual data provision were made, and staff responsibilities clarified. Detailed data requests were then issued via P&S to each data holder across the university. In spite of these efforts, a complete data set, with all gaps and anomalies resolved, was only received by November 2017. The process was once again characterised by a lack of responsiveness to data requests or queries regarding anomalies; and data sets being submitted that were not in the required format with relevant metrics.

Categories where data sets need improvement are:

[12] Noelene le Cordier, Gardens & Grounds Department, Waste Analysis Report 2016-2017.

1. Commuting – surveys of commuting modes have not been undertaken by the university for many years. Either P&S should conduct a survey or support student surveys in the Department of Information Systems.
2. Air travel – information system needs improvement to provide kilometres travelled. Department-level data capturing should be aligned to a uniform standard.
3. Water data – found to be incomplete for Main Campus (also historically) and only resolved in November 2017; P&S, Finance and Student Housing need to coordinate their records to ensure no double counting or gaps in the data set,
4. Hired cars – service provider submitted an initial data set that was incomplete and incorrect; a correct data set was submitted in November 2017, 4–5 months after being queried.
5. Food vendors – no data provided by major vendor; responsibility for data provision by the vendors should be formalised through their contracts.

One improvement in the data gathering process for 2016 was that the external consultants monitoring the electricity on behalf of Properties and Services collaborated to resolve data analysis queries.

For this report, unlike previous years, the Information Systems students did not participate in the calculation of the carbon emissions as part of their curriculum, due to the lack of data at the start of the first semester. It is important for the university, as a learning and research institution, to continue to involve the Information Systems students in the carbon footprint measurement process. This can deliver a range of enhanced learning outcomes already recognised by the Higher Education Learning and Teaching Association and the International Sustainable Campus Network (ISCN). Among these are preparedness for the challenges of climate change, developing literacy and understanding of sustainability, and a capacity for responsible local and global citizenship.

## CONCLUSIONS AND RECOMMENDATIONS

The inclusion of **refrigerants** in the Scope 1 emissions is a noteworthy improvement in this report. The categories in Scope 1 can now be considered to be inclusive of all material GHG emissions activities. A shift to the procurement of refrigerants with lower global warming potential is the next step towards continual improvement.

While the **vehicle fleet** at UCT is only 0.5% of overall emissions, this is an area with scope for mitigating emissions through the purchase of electric vehicles powered by solar energy. The global and local market has developed rapidly for both electric vehicles and batteries for storage of solar power. Such an initiative presents an opportunity for demonstration of leadership and commitment to sustainable transportation and has educational value for the students and the broader community.

The decrease in emissions from **Jammie Shuttle** operations appears to be a positive trend. Furthermore, new Jammie shuttles were ordered to a higher specification (EU5), so a further reduction in these emissions is expected in future.

While the decrease of 2.3% in Scope 2 emissions from electricity use is positive and a more robust result, this is an important area to focus on in terms of mitigation measures. Electricity supply is a major annual operational cost to the university and energy security and rising tariffs are a further risk given the status of the power utility Eskom. There is an opportunity to save operational costs through energy efficiency measures that could be diverted to other needs such as student bursaries. A programme of investment in

energy efficient equipment, such as air-conditioning chillers, elevators and lighting would be likely to produce cost savings in the short term, making financial sense. Investment in renewable energy generation on site is a further mitigation measure with multiple benefits. This would reduce emissions, contribute to energy security and could have a significant educational value. Feasibility studies should be conducted to demonstrate economic viability and access funding.

A key strategy, started in 2016, has been the **communication of electricity** demand trends on the UCT website, featuring a few selected buildings. This campaign needs to be upscaled to reporting on the majority of buildings, to identify substantive uses, facilitate management and encourage behaviour change. Real-time communication of consumption trends to the UCT community via digital dashboards with an effective communication strategy would significantly enhance this campaign.

As previously recommended, the ongoing trend of increasing **air travel** emissions in recent years at UCT needs to be understood through research and analysis. A first priority is to improve the information system to simplify the gathering of accurate data. This should be relatively simple to implement on the existing SAP system. Training of staff who enter the data when purchasing air tickets is essential to improvement of the data quality. While growth in travel for research collaboration is undoubtedly core to the university's mission, the use of alternative technologies needs to be strongly promoted to avoid unnecessary travel, related emissions and high costs. The management of air travel emissions is one of the few components of the carbon footprint where the UCT community can contribute to mitigation through behaviour change. An appropriate offset approach for these (and other) emissions should be investigated and debated, using the expertise of UCT's academics and involving relevant stakeholders. Globally, and in South Africa with the pending implementation of the Draft Carbon Tax Bill, there is a move towards carbon taxes that will see the development of a carbon market. A carbon market could potentially benefit UCT with a new revenue stream from the sale of carbon credits. The Carbon Tax Bill is expected to be phased in from 2019.

While only comprising a minor portion of overall emissions (0.23%) **water** conservation has become a critical issue due to a severe and prolonged drought in Cape Town, with rising tariffs and the introduction of water restrictions in late 2016. The risks of exponentially higher water supply costs for UCT, as well as punitive fines for non-compliance with water restrictions, need to be addressed with urgency. Along with accurate measurement of consumption, the identification of substantive uses of potable water and any opportunities to use alternative water sources is recommended.

The impact of the poor **solid waste** management and low recycling performance has a significant effect on the cost of the monthly waste contract, where credit is received for recyclables. Renewed efforts to manage and promote recycling are clearly needed, with the appropriate allocation of resources towards infrastructure, staff training and communications.

In conclusion, there is an urgent need for more **coordinated and concerted efforts** to reduce emissions in line with local and global climate goals, given cost-saving opportunities. The administration, the executive and academics should explore ways of using the information in these carbon reports to deliver innovative strategies to reduce resource consumption and emissions, raise awareness and encourage behaviour change among the UCT community. To remain a leading university on the African continent, foresight in planning towards a low carbon economy and supporting reliable emissions reporting is considered to be essential.

**SUMMARY OF KEY RECOMMENDATIONS**

1. Invest in a programme of electricity efficiency measures to save operational costs and emissions.

2. Invest in on-site renewable energy generation to reduce emissions and save operational costs.

3. Introduce electric vehicles, powered by solar energy, into the vehicle fleet as a demonstration of leadership in sustainable transportation.

4. Reconfigure the air travel information system towards obtaining accurate data and understanding trends of rapidly increasing travel.

5. Develop and implement an accurate water-use monitoring system and identify substantive uses towards conservation.

6. Allocate adequate resources to the solid waste management and recycling programme to achieve recycling rates in line with best practice.

## REFERENCES

DEA (Department of Environmental Affairs) 2017. National Greenhouse Gas Emission Reporting Regulations, Goverment Gazette No. 40762, Notice 275 of 2017, dated 3 April 2017. Pretoria. http://www.gov.za/sites/www.gov.za/files/40762_gen275.pdf

DoE (Department of Energy) 2015. Draft regulations regarding registration, reporting on energy management and submission of energy management plans. Published for public comment. Government Gazette no 38614, 27 March Pretoria. http://www.gov.za/sites/www.gov.za/files/38614_reg10402_gon259.pdf

RSA (Republic of South Africa) 2016. South Africa's Nationally Determined Contribution (NDC). 1 November September 2016. Pretoria. http://www4.unfccc.int/ndcregistry/PublishedDocuments/South Africa First/South Africa.pdf

UNFCCC (United Nations Framework Convention on Climate Change) 2014. Decision 1/CP.20: Lima Call for Action. Document FCCC/CP/2014/10/Add.1. Lima, Peru, United Nations. http://unfccc.int/resource/docs/2014/cop20/eng/10a01.pdf

Hall, M. (2008), *Green Campus Policy Framework*. Office of the Deputy Vice-Chancellor, University of Cape Town.

Rippon, S. (2008), *Green Campus Action Plan*. Policy document prepared for the Properties and Services Department, University of Cape Town, available at http://www.uct.ac.za/main/explore-uct/sustainability

Greenhouse Gas Protocol Initiative (n.d.) *A Corporate Accounting and Reporting Standard Revised Edition,* developed for the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD), Geneva, Switzerland.

MAC Consulting (2013), *South Africa's Grid Emission Factor*, paper prepared for Exxaro and supported by Eskom.

**Websites:**

Carbon Tax in South Africa**:** http://www.thecarbonreport.co.za/the-proposed-south-african-carbon-tax/

Emission factors: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2016

Greenhouse Gas Protocol: http://www.ghgprotocol.org/

International Sustainable Campus Network (ISCN): http://www.international-sustainable-campus-network.org/

**INF3011 Student Project Reports:** available at:
Vula Student Reports 2015

| | |
|---|---|
| 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 |

| CATEGORY/SECTOR | DESIGNATION | METRIC |
|---|---|---|
| Electricity: GSB | GSB Finance Dept | Kilowatt hours |
| Water: GSB | GSB Finance Dept | Kilolitres |
| E-Waste (ICTS) | ICTS | Kilograms |
| Video Conferencing | ICTS | Hours |
| Paper Products – print paper ICTS | ICTS | Sheets |
| Commuting | n/a | Calculated by IS students |
| Paper Products (Campus copy centres) | Nashua | Sheets |
| Transport: Jammie Shuttle | P&S Transport Manager | Litres fuel/passengers |
| Water: Main Campus; Medical | P&S Finance | Kilolitres |
| Water: Hiddingh Campus | P&S Finance | Kilolitres |
| Solid Waste | P&S: Custodial and Estates | Tons Wet/Dry |
| Electricity: Main & Medical campuses | P&S: Maintenance & Operation | Kilowatt hours |
| LPG | P&S: Vendor Management | Kilograms |
| Hazardous Waste: Medical/Chemical | P&S: Environmental Risk Officer | Litres/kilograms |
| E-Waste | P&S: Environmental Risk Officer | Kilograms |
| Printer cartridges (Green Office) | P&S: Environmental Risk Officer | Kilograms |
| Electricity: Hiddingh Campus | P&S: Finance | kWh |
| Paper Products – custodial | P&S: Finance | Rolls |
| Building List & Areas | P&S: Physical Planning Unit | Metres squared |
| Transport: Hired cars | Procurement | Kilometres |
| Transport: UCT Vehicle Fleet | Procurement | Litres fuel; diesel/petrol |
| Transport: Staff reimbursements | Procurement | Kilometres |
| Air travel | Procurement | Kilometres |
| Population data | Registrar's office | Students & staff (FTE) |
| Electricity: Off-campus Residences | Student Housing | Kilowatt hours |
| Water: Off-campus Residences | Student Housing | Kilolitres |
| Food supply: Residences | Student Housing | Number of meals served |
| Food supply: Vendors | Zemonfoods | Number of meals served |