University of Cambridge Footprinting and Analysis of Scope 3 Emissions

Element 1: Final Report

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University of Cambridge: Element 1: Final Report

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Acronyms

CCC	Cambridge City Council
CO_2e	A unit encompassing a range of greenhouse gases which are all converted to the equivalent carbon dioxide emissions
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
EMR	Estate Management Record
GHG	Greenhouse Gas
GHGP	Greenhouse Gas Protocol
GIS	Geographic Information System
HEFCE	Higher Education Funding Council for England
HEI	Higher Education Institution
HESA	Higher Education Statistics Agency
SUPC	Southern Universities' Purchasing Consortium
SWMP	Site Waste Management Plan
T & D	Electricity transmission and distribution losses
UoC	University of Cambridge
WEEE	Waste Electrical and Electronic Equipment
WTT	Well to tank emissions

Capabilities on project:
Building Engineering

Executive Summary

Context

The University of Cambridge (the "University") is required to report on carbon dioxide (CO_2) emissions as a condition of its funding and reporting process. These CO_2 emissions can be broken down into the following types:

- Scope 1. Emissions resulting from the direct use of fuel; for example, from the consumption of gas.
- Scope 2. Emissions associated with indirect energy consumption; for example, from the consumption of electricity, where the emissions are as a result of energy conversion by another organisation (the electricity generator).
- Scope 3. Emissions associated with other activities where expenditure by the organisation results in emissions, but it is not directly responsible for them.

This study has been conducted by AECOM to provide an assessment of the University's Scope 3 emissions. It calculates and reports on the CO_2 equivalent (CO_2e) emissions, which include direct CO_2 and other greenhouse gases which contribute to climate change. The information in this assessment is also provided for the purpose of contributing to the Estate Management Record (EMR) which will be submitted by the University to the Higher Education Statistics Agency (HESA).

This report is part of a two-part report for the University which covers:

- Element 1. The assessment and reporting of Scope 3 CO_2e emissions.
- Element 2. Analysis of commuting transport and impact of transport policies on Scope 3 CO_2e emissions.

A summary of Element 2 is included in Appendix 2: Executive summary from Element 2 report, and the Element 2 report provides full details of the transport analysis.

Approach

The assessment of Scope 3 CO_2e emissions in this report is primarily based on the methodology published by the Higher Education Funding Council for England (HEFCE) which describes the calculation process for each Scope 3 emissions sector. This includes the type and level of data which should be collected, the emissions factors to be used, and the process for conducting the emissions calculations. Where alternative data sources, or levels of data detail, are available, HEFCE provide alternative calculation options. All assumptions relating to the type of data collected and the level of methodology chosen are included in this report.

Where recent changes to the methodology for the accounting of Scope 3 emissions have been made in the latest DEFRA guidance (which include new conversion factors), these changes have been implemented and supersede the HEFCE guidance. The inclusion of these updates in the analysis is based on advice received by AECOM from HEFCE. To calculate Scope 3 CO_2e emissions, AECOM have conducted a data collection exercise for the financial year 2012/13 and we have used this information to calculate the overall emissions for each sector.

Scope of works

Scope 3 emissions effectively cover all sectors which are not direct fuel (Scope 1), or direct energy / indirect fuel (Scope 2) consumption. Scope 3 emissions therefore arise from the procurement of other products and services which result in indirect CO_2 emissions. The nature of Scope 3 emissions means that there is potential for double counting (they may be allocated to bodies other than the University). Therefore a clear delineation is applied to ensure the Scope 3 emissions are only attributed to activities which directly result from, or are paid for by the University.

The following sectors are included in this report, as specified in the scope of services provided to AECOM:

- Water supply
- Waste water treatment
- Waste collection and management
- Transport – commuting (excepting student commuting which is excluded from the analysis as is not deemed to be of significance – please see section 3.2.5 for further details)
- Transport – business
- Procurement (of goods and services other than the above).
- Upstream emissions from scope 1 and 2 energy use - electricity transmission and distribution losses (T & D), and well-to-tank (WTT) emissions for fuels).[1]

Further analysis of the commuter transport emissions is provided within the Element 2 report.

Results

The total Scope 3 emissions for the reporting period financial year 2012/13 amounted to approximately 170,000 tonnes of CO_2e. Figure 1 shows a high level breakdown of the Scope 3 emissions and the percentage contributions from the activities listed above.

This figure will become the Scope 3 emissions *baseline* to allow comparative analyses in future, enabling the University to evaluate progress towards targets and/or the effect of measures undertaken.

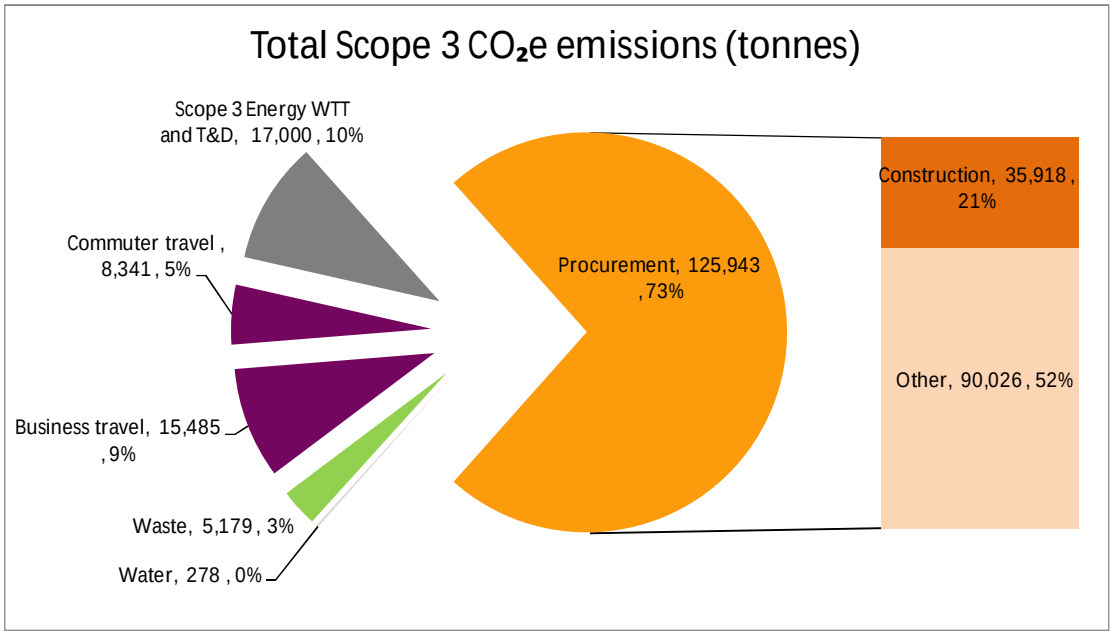

Figure 1: Breakdown of the total Scope 3 CO_2e emissions (tonnes) for the University

[1] Note: These figures are based on preliminary calculations using the FY12/13 data; the official figures are calculated by HESA, based on submission of energy consumption data. Therefore these figures are only an approximation to understand the relative scale of the reporting categories, and may change subject to external calculation processes.

The following key results can be observed:

- 73% of overall Scope 3 emissions are produced by procurement activities.
- About 14% of Scope 3 emissions are derived from transport activities; 9% correspond to business travel and around 5% are estimated to be from staff commuting.
- Waste disposal and materials use emissions are estimated to contribute around 3% of total Scope 3 emissions. Materials use is the biggest contributor: about 85% of the 5000 t CO_2e per year assigned to these categories correspond to materials use emissions (also known as emissions from the production of virgin material).
- Upstream emissions from Scopes 1 and 2 include Transmission and Distribution (T&D) losses from electricity and Well-to-Tank (WTT) emissions from fuel supply. These account for 17,000 t CO_2e per year, or around 10% of Scope 3 emissions.
- Water and waste water treatment emissions amounted to less than 1% of overall Scope 3 emissions.

To put these figures in context, the overall Scope 1 and 2 emissions for the University are approximately 73,000 tonnes CO_2e per year [2] (approximately 8% is Scope 1 – primarily gas consumption, and 22% is Scope 2 – electricity). Therefore whilst CO_2e emissions are most commonly associated with direct energy and fuel use, just over two-thirds of the University's overall annual emissions are the result of indirect Scope 3 activities. Furthermore, procurement of goods and services accounts for over half of the total Scope 1, 2 and 3 CO_2e footprint.

Figure 2 shows the overall breakdown of the University's CO_2e emissions.

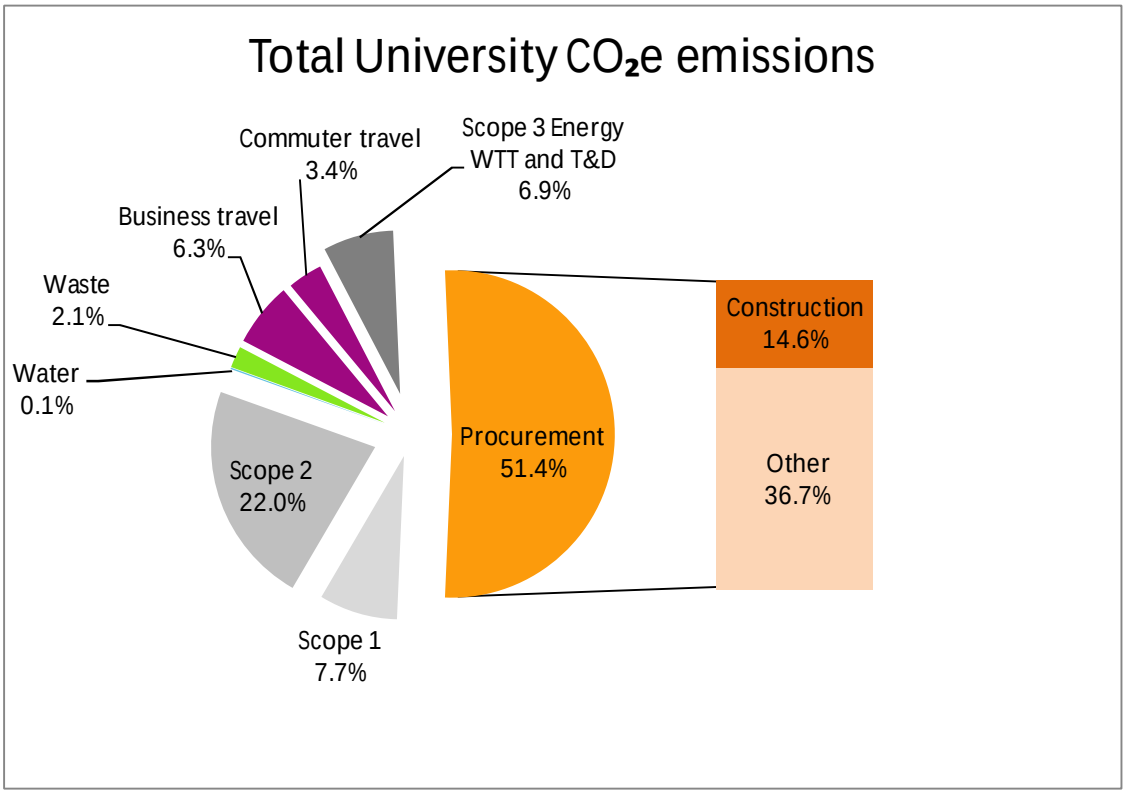

Figure 2: Pie chart showing the breakdown of emissions from Scope 1, 2, and 3 activities

[2] See footnote 1.

Recommendations

During the study AECOM identified and made use of large amounts of information and data to calculate the Scope 3 emissions. However the data available were not designed for Scope CO_2e emissions calculations or reporting and so we have provided a set of recommendations for improving the process in future. The recommendations fall under two main categories: those which propose increased detail in information, data collection or monitoring to improve the accuracy; and those which propose different methods for collection to make the current monitoring more manageable and consistent with current reporting requirements. AECOM have also identified which role or department the recommendations would affect and the potential impact of the recommendation on the scale of the Scope 3 CO_2e emissions for the University.

The main recommendations are as follows:

- Waste data – increase the detail and scope of data collection, such that masses are measured rather than estimated, and data are collated in one central document addressing all University waste. This is likely to require a waste audit.
- Travel data - collect travel expenses requests on line, such that inputs are specific and categorised to improve accuracy and limit time required for manual processing. This includes the provision of dropdown boxes for travel mode, destination, and department name.
- Travel data - encourage the use of a single travel agency, which can calculate CO_2e emissions on behalf of the University.
- All data - standardise building and department naming systems to allow for automation of site allocation for future reporting. This would improve the ease of updating calculations annually and comparison of annual emissions. Make use of defined fields in systems wherever possible to simplify data analysis.

Conclusions

The Scope 3 CO_2e emissions assessment has been produced using a toolkit developed by AECOM and provided to the University for future use. This model has been designed to:

- Provide an assessment of Scope 3 CO_2e emissions broken down by University site (where data is available at a disaggregated level).
- Provide an assessment of Scope 3 CO_2e emissions which is compliant with HEFCE and HESA methodology and guidelines and which generates data for direct reporting for the EMR.
- Allow updating in future years though the addition of new data for each sector.
- Enable the assessment of policy impacts though simple scenario development, allowing the University to examine potential new policies, by adopting a “what if?” approach.

Alongside the toolkit, a training session will be provided to University officers to provide an understanding of the results obtained and facilitate future use of the tool.

The total Scope 3 CO_2e emissions assessment for the University amounts to 170,000 tonnes per year. These results demonstrate that the Scope 3 emissions represent the largest source of CO_2e emissions for the University, making up around 70% of the total annual emissions, when combined with the figures for Scope 1 and Scope 2; note the University calculates these figures itself.

Within the Scope 3 category, the procurement of goods and services is the largest CO_2e emissions sector, with the procurement categories combined accounting for more than half of the University’s total annual emissions. This is significant in that the single largest emissions sector is the one which is the least understood in terms of the way it is calculated by the SUPC, and over which the University has least control.

Recommendations to improve the data collection and assessment of the Scope 3 emissions have also been provided.

In some areas of reporting there is a lack of clarity over the correct methodology to be followed, due to updates in DEFRA guidance since the HESA and HEFCE guidance was written. In each case the options are discussed and the HESA method is followed. However AECOM recommend that the areas be clarified with HESA, as it could result in a 5% reduction in Scope 3 CO_2e emissions reported.

The two reports, the Element 1 report and the Element 2 report, together with the development of the data collection and analysis tool, and training for University staff in its use, successfully deliver the aims of the project.

The next steps for the University are to:

- Review all of the recommendations and determine which to prioritise, based on achieving a balance between the effort required to achieve improvement and the impact of the changes made.
- Engage with HESA and HEFCE to clarify the methodology in line with on the latest update of DEFRA emissions factors, with particular emphasis on waste.
- Determine how best to reduce emissions from procurement: either by further discussion with HEFCE to improve the reporting tool, gain understanding of the methodology used, and input into potential future updates; or by development of a University specific tool which examines the impact of choosing particular low CO_2e products. The former is likely result in a reduction in the reported Scope 3 emissions, whereas the latter would be independent of Scope 3 reporting, based on actual emissions from changes in practice.

1 Introduction

1.1 Background

AECOM has been engaged by the University of Cambridge (the University) to provide an assessment of its Scope 3 Greenhouse Gas (GHG) emissions, with a particular emphasis on commuting travel related emissions. The emissions have been reported as tonnes of carbon dioxide equivalent gases (CO_2e). This study identifies the sources of the University's Scope 3 GHG emissions and associated available data; it describes the approach and methodology used to evaluate emissions; and it provides a full analysis of the Scope 3 emissions produced by the University during the 2012 to 2013 financial period. We have also provided context to the total Scope 3 CO_2e emissions by presenting them as part of a total Scope 1, 2 and 3 emissions footprint for the University.

The scope of the work undertaken is divided into two parts:

- Element 1 includes the identification and evaluation of Scope 3 emissions. The purpose of Element 1 is to support the identification, analysis, and reporting of the University's Scope 3 CO_2e emissions for a baseline year of August 2012 to July 2013 – the University's financial year.
- Element 2 is a detailed investigation of CO_2e emissions from staff commuter travel to inform plans to reduce these emissions if possible.

This report covers on the work carried out for Element 1.

As this is the first time that an assessment of Scope 3 emissions has been undertaken by the University, the results obtained for the 2012/13 period will be set up as the baseline emissions against which any future emissions will be evaluated to measure and assess performance improvements.

The scope of this project is scope 3 carbon emissions (from waste, water, travel and procurement) associated with the teaching, research and administrative functions of the University (the University Estate). It does not extend to the 31 Cambridge Colleges, which are independent institutions with their own property and income. Neither does it include activities by associated businesses such as Cambridge University Press and Cambridge Assessment.

1.2 Categorising sources of Greenhouse Gas Emissions

The Greenhouse Gas Protocol (GHGP) allocates Greenhouse Gas emissions into different categories called Scopes for GHG accounting and reporting purposes[3]:

- Scope 1: Direct GHG emissions. These emissions occur from sources that are owned or controlled by the organisation, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; and emissions from chemical production in owned or controlled process equipment. Direct CO_2 emissions from the combustion of biomass are not included in Scope 1 but reported separately
- Scope 2: Electricity indirect GHG emissions. These include emissions from the generation of purchased electricity consumed by the organisation. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organisational boundary of the company. Scope 2 emissions physically occur at the facility where the electricity is generated.
- Scope 3: Other indirect GHG emissions. Scope 3 is an optional reporting category that allows for the accounting of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the organisation, but occur from sources not owned or controlled by them. Some examples of Scope 3 activities are extraction and production of purchased materials, transportation of purchased fuels, and use of sold products and services.

[3] The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard REVISED EDITION, www.ghgprotocol.org/files/ghgp/public/ghg-protocol-revised.pdf

1.3 Reporting on Scope 3 emissions

Reporting of Scope 3 emissions under the GHGP is optional, but it provides an opportunity to be innovative in GHG management. Organisations may want to focus on accounting for and reporting those activities that are relevant to their business and goals, and for which they have reliable information. Since organisations have discretion over which categories they choose to report, Scope 3 does not lend itself well to comparisons across organisations.

Scope 3 emissions include emissions from activities such as the following (when the organisation does not own or have control over these activities):

- Extraction and production of purchased materials and fuels
- Transport-related activities (when the organisation does not own or have control over these activities)
- Transportation of purchased materials or goods
- Transportation of purchased fuels
- Employee business travel (on methods of transport not owned or control by the organisation)
- Employees commuting to and from work (on methods of transport not owned or control by the organisation)
- Transportation of sold products
- Transportation of waste
- Electricity-related activities not included in Scope 2
- Extraction, production, and transportation of fuels consumed in the generation of electricity (either purchased or own generated by the reporting company)
- Purchase of electricity that is sold to an end user (reported by utility company)
- Generation of electricity that is consumed in transmission and distribution (reported by end-user)
- Leased assets, franchises, and outsourced activities - emissions from such contractual arrangements are only classified as Scope 3 if the selected consolidation approach (equity or control) does not apply to them
- Use of sold products and services
- Waste disposal
- Disposal of waste generated in operations
- Disposal of waste generated in the production of purchased materials and fuels
- Disposal of products sold at the end of their life.

Due to the large number of types and complexity of Scope 3 emissions, the GHGP advises that organisations focus on determining which Scope 3 categories are most relevant to their activities. Only some types of upstream or downstream emissions categories might be relevant, and this could be for several reasons:

- They are large (or believed to be large) relative to the company's Scope 1 and Scope 2 emissions
- They contribute to the company's GHG risk exposure
- They are deemed critical by key stakeholders (customers, suppliers, investors, or civil society) or
- There are potential emissions reductions that could be undertaken or influenced by the organisation.

The requirements for Higher Education Institutes and Cambridge University's requirements for this study are discussed in Section 2.

2 Drivers and background for Scope 3 reporting

2.1 Reporting requirements

The University is required to report on CO_2e emissions as a condition of its funding. The Higher Education Statistics Agency (HESA) requires Higher Education Institutions to provide data on Scope 3 emissions for the 2012-2013 reporting year, via the Estate Management Record (EMR). This data will be used in addition to existing Scope 1 and Scope 2 carbon emissions data to provide a more robust understanding of the carbon emissions associated with Higher Education activities.

A number of reports have been written for the Higher Education Funding Council for England (HEFCE) on the measurement of Scope 3 carbon emissions; these have led to the production of guides for good practice for calculation of emissions, covering transport, water and waste, and an emissions reporting framework for procurement. The availability of these guides helps to ensure a consistent approach in methodology and assumptions for all Higher Education Institutions (HEIs). The requirement for assessment of Scope 3 emissions for the University includes all types of emissions specifically required by HESA:

- Business Travel
- Staff commuting
- Student commuting
- Waste
- Water supply
- Wastewater treatment
- Supply chain

An extract of the HESA Estates Management Statistics (EMS) record template with the Scope 3 emissions data requirements is shown in Section Estate Management Reporting to HESA

Whilst the work done for this report has evaluated Scope 3 emissions for all of the required categories, HEFCE have proposed that the emissions for water supply and waste water treatment will be calculated by HESA as part of the Estates Management Statistics (EMS). The mandatory element for waste is for reporting of volumes of waste, not for emissions.

Table 1 below shows who under the HEFCE proposals is responsible for calculating the Scope 3 CO_2e emissions[4]:

Table 1 - Summary of Scope 3 Carbon Emissions – EMS Collection & Analysis

Category	Mandatory	Emission calculations undertaken by
Water Supply	√	HESA
Wastewater Treatment	√	HESA
Waste*	√	HEIs (Provision of the emission figures is not mandatory.)
Travel		HEIs
Supply Chain (Procurement)		Procurement consortia – and provided to HEIs for inclusion in EMS returns.

*The mandatory element for waste is for reporting of volumes of waste, not for emissions.[5]

[4] http://www.hefce.ac.uk/whatwedo/lgm/sd/carbon/carbonfaq/

HEFCE identifies in Table 1 which emission sectors are mandatory and which are optional. The assessment of Scope 3 emissions undertaken in this work for the University includes an evaluation of all mandatory and non-mandatory emissions.*The mandatory element for waste is for reporting of volumes of waste, not for emissions.

2.2 Setting a baseline

The University has a Carbon Management Plan for 2010-2020 setting out its policies, strategies and targets to achieve absolute reductions across Scope 1, 2 and 3 carbon emissions. Its primary focus is on the reduction of Scope 1 and 2 emissions, and it provides Scope 1 and 2 emissions baselines. An estimate of the Scope 3 emissions baseline has been provided in the past in the Carbon Management Plan and the University is looking to improve this for the initial EMR submission. Therefore the results obtained from this evaluation of Scope 3 emissions for financial year 2012/13 will form the measured baseline for Scope 3 emissions from this point forward.

[5] http://www.hesa.ac.uk/component/option,com_studrec/task,show_file/Itemid,233/mnl,12042/href,coverage.html/ lists all mandatory fields for EMR entry.

3 Methodology, data acquisition and review

3.1 Introduction and approach

The assessment of Scope 3 CO_2e emissions in this report is aligned with the latest HESA reporting requirements, and primarily based on guidance and methodology published by HEFCE with more recent updates. This guidance includes the type and level of data which should be collected, the emissions factors which must be used, and the process for conducting the emissions calculations. Where alternative data sources, or levels of data detail, are available, HEFCE provide alternative calculation options. All assumptions relating to the type of data collected and the methodology chosen are included in this report.

The HEFCE guidance indicates that the latest Defra guidance and emissions factors should be used. During the development of the methodology for this analysis it has come to light that the latest Defra guidance and factors have made significant changes to the calculation methodology and factors to be used in some areas (e.g. waste disposal). This has been done to correct some major issues with the previous methodology and factors in the Defra guidance which did not meet the requirements of the GHGP. As the HEFCE guidance was developed following the previous Defra guidance, there are now some discrepancies on the advice on methodology and application of factors provided by HEFCE and Defra. In these instances, we have sought the advice of the University and HEFCE on how to proceed to clarify confusing issues.

To calculate Scope 3 CO_2e emissions, AECOM have conducted a data collection exercise for financial year 2012/13, accessing a large range of sources to calculate the overall emissions for each sector. This will form the baseline year assessment.

GHGs can be measured in a range of ways - recording emissions at source; through continuous emissions monitoring; or estimating the amount emitted by multiplying activity data (such as the amount of fuel used) by relevant emissions conversion factors. These conversion factors allow activity data (e.g. litres of fuel used, number of miles driven, tonnes of waste sent to landfill) to be converted into kilograms of carbon dioxide equivalent (CO_2e) and ultimately tonnes. Our work has used activity and financial data and conversion factors to determine the CO_2e emissions for Scope 3.

The conversion factors used are the latest Defra/DECC conversion factors[6], in line with the Government's Reporting Guidelines[7], and as advised by HEFCE guidance. Following this guidance, CO_2e emissions reported[8] include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

3.2 Data availability and sources

The University provided a wide range of activity data of varying detail to enable the calculation of emissions from different categories. Where information for the period was not available, previous years' data was used as an approximation.

As data for each category comes from different sources, there is no consistency in the composition of buildings to which the data and corresponding emissions relate. This means that emissions from each category correspond to different buildings depending on data availability and there is a lack of overall completeness in the data sets available for each building. For the purpose of reporting to HESA this makes no difference, as reporting is required at the level of the whole University, so this is only an issue for internal allocation of responsibility.

[6] Available at http://www.ukconversionfactorscarbonsmart.co.uk/

[7] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69554/pb13773-ghg-conversion-factors-2012.pdf

[8] Defra Environmental Reporting Guidelines: Including mandatory greenhouse gas emissions reporting guidance June 2013, available at https://www.gov.uk/government/publications/environmental-reporting-guidelines-including-mandatory-greenhouse-gas-emissions-reporting-guidance

A summary of the data used for estimating the Scope 3 emissions is provided**Error! Reference source not found.** in Table 2.

Table 2 - Summary of data used to estimate the University's Scope 3 GHG emissions

Category	Information provided	Units	Baseline year	Key assumptions
Water supply and waste water treatment	Metered water consumption	m^3	2012-2013	- Assume wastewater volume is 95% of water supply volume[9] - Residential water not included because not reported to HESA due to low volumes
Waste	Council figures for general waste and recycling under Council's control	kg	2012-2013 Quarters 2, 3 and 4	- Figures cover all sites under Council's control - Residential waste not included because not reported to HESA due to low volumes
Waste	UoC figures on waste, recycling, composting and paper shredding for waste outside Council's control (via private commercial operators)	tonnes	2012-2013	- Collection of information is of variable detail for non-council waste streams, some private operators are able to provide summary reports whereas some figures are estimated.
Waste	WEEE collection data [10]	Number and kg of items	2012-2013	- Actual data from Computer Disposals Ltd
Waste	Construction waste data collected from SWMP[11]	tonnes	2012-2013	- Assume all construction waste is included in SWMPs.
Business Travel	Travel insurance data for international travel (3 data sets for single destination journeys by one passenger; multiple destination journeys by one passenger; and multiple passenger journeys –field trips) Travel expenses data	Each journey	2012-2013	- It is assumed that not all international travel is covered in the insurance data and therefore an uplift factor has been estimated and applied to the data provided.
Business Travel	Expenditure on travel categories from Annual Returns database	£ per category	2012-2013	- Mode of transport is not always clear in expenses, so assumptions required for allocation of mode.

[9] 95% is the default value defined in HEFCE guidance

[10] Excluding events, such as Waste Electrical and Electronic Equipment (WEEE) collection days on the Sidgwick site, which are open to non-University users too.

[11] SWMP = Site Waste Management Plans

Category	Information provided	Units	Baseline year	Key assumptions
Business Travel	List of Individual and employee expenses processed via paper expense claims	£ per claim	2012-2013	- Mode of transport is not always clear in expenses, so assumptions required for allocation mode.
Business Travel	University 4 Bus data including 2005 survey by Peter Brett	% business travel and km/journey	2005	- Estimate fraction of staff journeys taken for business travel. - Estimate typical journey length based on Uni 4 Bus survey.
Business Travel	Count of University card use per week for Uni 4 Bus travel	No. of journeys	2012-2013	- Assume out of term University Card use represents all staff using the Uni 4 bus.
Staff Commuting travel	- Commuting tool outputs	CO_2e	2012	Input data to commuting tool includes: - Travel for Work Survey 2012, to extrapolate volumes. Data for 1 week in Oct 2012. 24% of staff who responded to survey is considered representative of all staff - Average distance per mode derived from Home and Work location 2012 - Mixed emissions factor for cars based on survey responses to fuel type.
Supply Chain	- Proc-HE tool[12] used to obtain calculated HEI procurement CO_2e emissions from expenditure	CO_2e	2011-2012	Input data to HEFCE Procurement tool is an extract from Annual Returns database containing a listing of all contracts with contract values over £5,000.
Capri Data	- List of every University room including Department, School, Building (eg . A123: Name), floor, Name , room code, floor area		2012-2013	This is used to determine floor areas relating to each site and room type. The Building Code could be used to automatically allocate Sites.

The full datasets for the information provided above are used in the Scope 3 emissions toolkit which was created in conjunction with this report and has been passed to the Environment and Energy Section, within the University's Estate Management Department. For more information see Appendix 1: Overview of Scope 3 emissions toolkit .

3.2.1 Water supply and wastewater treatment data

Data for water usage was provided by the University Estates Management Energy Manager, in a spreadsheet containing a listing of all buildings/sites together with their total metered m^3 consumption from Aug 2012 for 12 month(s). The spreadsheet is labelled **"Metered water consumption - 2012-13 Q4 Water KPI".**

[12] Proc-HE tool is provided by Southern Universities Purchasing Consortium (SUPC) based on the Annual Returns Database submitted by the University.

It is assumed that this data will be compiled from this source on an ongoing basis and therefore available in a similar format and status of completeness. This data appears to include 100% of the University estate and comprises 86 entries each referring to either a building or site. Each entry is referenced by a 4 digit code which is used by Estates Management to relate to the different buildings, some of the water meters relate to several buildings and therefore list a number of these codes (from Capri Data). The 86 entries are reallocated into one of the 18 larger Sites identified by AECOM (Listed in Appendix 1: Overview of Scope 3 emissions toolkit), this is done manually but could be automated in the future using the 4 digit code provided. Being metered data this source is deemed to be of high quality and reliability to reflect the actual emissions from water supply and wastewater treatment.

Water usage from residential properties is not included in the analysis of Scope 3 emissions because due to low volumes, the University is not required to report this consumption to HESA. There are 360 residential units owned by the University, all but about 20 of these pay their own water bill and so are not counted as contributing to University emissions. The remaining 20 or so dwellings operated by the University are considered to have a comparably small water consumption relative to the rest of the University estate and are therefore considered immaterial and not included in the calculations.

3.2.2 Waste data

Waste data was available from the following sources:

- Waste under control of Cambridge City Council (CCC): data on quarterly waste was provided by CCC on a spreadsheet labelled **“2012-13 quarterly recycling figs_CamCityCouncil_woking out”.** This data set included weight (kg) of general waste sent to landfill and weight of recycled waste for quarters 2 (Jul 12 – Sep 12), 3 (Oct 12 – Dec 12) and 4 (Jan 13 – Mar 13) for buildings/sites for which the Council has responsibility. Therefore this includes a subset of all University buildings/sites as some have private commercial arrangements for waste disposal and recycling which are not included in this data set. It is believed this data is obtained as estimates from the CCC but the estimate sources or methodology are not known.

  One of the reporting lines is labelled as “Other sites". This line includes the following building/sites:

  - Douglas House, Trumpington Rd
  - Isaac Newton Institute, Clarkson Road
  - University athletics track, Wilberforce Road
  - Archaeological unit, Storeys Way
  - 10 Peas Hill
  - Education, 184 Hills Road
  - The Old Music School, Downing Place.

  The CCC data only contains figures for 3 quarters, where a quarter is missing it has been estimated by averaging quarters for which data is available.

- Waste outside the control of CCC: the Facilities Support Manager at the University Estates Management provided estimates of the annual total weight and/or volume of waste sent to landfill, recycled waste, and composted waste (identified as food and drink waste) for those buildings/sites with private commercial arrangements for disposal and not under the control of the CCC. This information is not currently collected for the University and figures have been estimated for the areas managed by the Facilities Support Manager. It is not known how these figures have been estimated nor their level of coverage (whether they cover all building/sites outside CCC’s control).

  Information on shredded waste: (confidential documents sent to a secured private facility for disposal there) has been provided as a summary report from PHS Datashred.

- WEEE Data: data on disposal of WEEE was provided by the UoC appointed contractor, Computer Disposals Ltd, on a spreadsheet containing the type, number and weight of items disposed of during the reporting period. This covers all of the University and therefore has a high level of accuracy and completeness.
- Site Waste Management Plans (SWMP): the Environmental Officer at the University has collected figures for the construction waste produced from the larger building projects, which are outlined in the Site Waste Management Plans. This information provided details the site location, the materials disposed and the waste disposal method.

The sites listed for CCC collected waste match the general site allocation for reporting. All other waste streams were reported as totals for the University, so cannot be allocated to a specific site.

In addition to the waste streams reported above, it is known that there are other waste streams that are organised by individual departments, such as recycling of metals and papers. No data was available for these and therefore it is known that the waste disposal emissions are underreported due to the emissions associated with these additional waste streams. However these emissions are not likely to be significant and AECOM would not recommend this practice is changed just for the improvement of data accuracy.

3.2.3 Procurement data

Following HEFCE guidance, the Head of Procurement of the Finance Division at the University provided an extract from the Annual Returns database containing a listing of all contracts and contract values over £5,000 to the Southern Universities Purchasing Consortium (SUPC). This data corresponded to 2011/12 as no more up to date data is available. Data have then been input by SUPC onto a tool developed for HEFCE which provides two output tables, one with tonnes of CO_2e and another with aggregated spend figures per category as seen in Table 3 and

Table 4 below. The spreadsheet is labelled **“201205 Cambridge Scope 3 Report”.**

Table 3 - Output table from the HEFCE procurement tool showing calculated emissions by category

Year	2011-2012
	Tonnes CO_2e
Business services	**11,271**
Paper products	**4,900**
Other manufactured products	**16,114**
Manufactured fuels, chemicals, and gases	**10,190**
Food and catering	**9,962**
Construction	**35,918**
Information and communication technologies	**12,272**
Waste and water	**2,532**
Medical and precision instruments	**14,269**
Other procurement	**5,806**
Unclassified	**2,711**
Total	**125,943**

Table 4 - Output table from HEFCE procurement tool showing aggregated expenditure by category

Year	2011-2012
	Spend
Business services	**£37,670,178**
Paper products	**£9,033,930**
Other manufactured products	**£15,239,520**
Manufactured fuels, chemicals, and gases	**£8,623,993**
Food and catering	**£5,613,437**
Construction	**£53,258,470**
Information and communication technologies	**£19,721,791**
Waste and water	**£1,800,339**
Medical and precision instruments	**£26,342,521**
Other procurement	**£10,688,853**
Unclassified	**£4,875,113**
Total	**£192,868,145**

The emissions shown in

Table 4 are used for the reporting of emissions from procurement.

3.2.4 Business Travel - International Air and Rail Travel data

Travel data has been provided by the UoC's Insurance Department. Three separate lists are compiled annually (from May to April) with all insured journeys. For this analysis, the extracts corresponding to trips between May 2012 and April 2013 were provided. In addition, a one-off extract was provided with data for trips between May 2013 and August 2013. These lists include the following data:

- List of journeys with one destination made by one passenger: for each journey the Department, purpose of visit, destination country, from and to dates, number of days and method of travel are provided. Labelled **"Online System Travellers All Destinations employee..." "Online System Travellers All Destinations BGS..."** and **"Online System Travellers All Destinations non BGS..."**
- List of journeys with more than one destination made by one passenger: for each journey the Department, purpose of visit, destination country, from and to dates, number of days and method of travel are provided. These spreadsheets are the last tab in the files listed above.
- List of journeys (field trips) with more than one person: for each journey the country category, start and end date of the trip, country, Department, reason, number of travellers, number of days and method of travel are provided. This spreadsheet is labelled **"Registered Fieldtrips".**

3.2.5 Business Travel - Other Travel data

Other travel data is provided by the Head of Procurement (HoP) at the UoC as follows:

- Expenditure categorised as travel: a summary of expenditure categorised as travel per mode of transport is obtained from the Annual Returns Database covering all total annual spend to agencies of over £5,000. The spreadsheet is labelled **"201205 Cambridge Scope 3 Report".**
- Individual / Employee Expenses recovered using University paper expense claims. A table of these is provided by the HoP. This spreadsheet is labelled **"Ind_employee bas data edited CBE 22 nov13"**
- Uni 4 bus travel data provided by the Uni 4 bus operator, Stagecoach. This provides a count of tickets sold each week over the reporting year, with information showing numbers of passengers who used a University card. This spreadsheet is in a file labelled **"Uni 4"**
- Uni 4 travel survey conducted by Peter Brett Associates in 2005, which shows the distribution of journeys during the day over sample weeks in term, and out of term. (This is the most recent data showing the daily profile). This document is in a file labelled **"Uni 4"**

3.2.6 Commuting Travel

The Element 2 Commuting calculation tool developed by AECOM provides an output with the CO_2e emissions from commuting travel. The results from this commuting tool are incorporated into the Scope 3 Toolkit.

3.3 Calculation Methodology

3.3.1 Water supply and wastewater treatment

HEFCE guidance on measuring Scope 3 emissions from water[13] defines emissions from water use as those associated with the energy used to supply water to the customer, and from the wastewater treatment processes. These emissions are classified under Scope 3 because they occur at the individual water utilities premises that supply water to the institutions or treat the wastewater they discard. However, these emissions are a consequence of the activities of each HEI and they can be reduced by more efficient and responsible water consumption by the HEI. Water use related emissions are calculated using metered or estimated water consumption and wastewater volume data and life cycle conversion factors provided by Defra/DECC.

The methodology applied to calculate the emissions from water supply has been based on a straight application of the Defra water supply conversion factor (0.3441 kg CO_2e) to the overall metered water consumption figures (m^3) to obtain the total kg CO_2e emissions from water supply.

It is not easy to calculate the volume of wastewater sent for treatment unless it is monitored and metered. Utility companies often use estimates based on the volume of water supplied to calculate the volume of wastewater disposed of and treated. This varies, but is usually between 90 per cent and 95 per cent of the water use volume. Following the guidance from HEFCE, a factor of 95% of water supply is applied to estimate the volume of wastewater. The Defra water treatment conversion factor (0.7085kg CO_2e) was then applied to the overall wastewater figures (m^3) to obtain the total kg CO_2e emissions from wastewater treatment.

3.3.2 Waste

The importance of waste management within the Higher Education (HE) sector has increased significantly due to increased legislation for waste as a whole and the inclusion of waste related information within the Higher HE sector benchmarking tools[14]. According to HEFCE guidance, invoices and transfer notes should contain data on the quantity and type of waste collected. Data for waste quantities can be provided by volume or by mass. If waste quantity data are provided by volume, it is desirable to convert it into mass units, using appropriate volume to mass conversion factors[15]. Waste data for buildings should be reported based on the actual figures provided by waste management contractors according to the length of contract. For the University this data is only available for WEEE but not for other waste streams.

According to HEFCE guidance HEIs must measure carbon emissions associated with the production and treatment of waste. As a result of the great variations in the scope of data on waste, waste composition, waste volumes and recyclables composition, a tiered approach is proposed by HEFCE for calculating carbon emissions from waste:

- Basic approach: where waste data are very limited for both residential and non-residential properties.
- Medium approach: where waste data and recycling data are available for non-residential and/or residential buildings.
- Detailed approach: where good quality in-house waste data are available.

This analysis for the University has followed the Medium approach, and includes only non residential waste as residential waste is not material.

3.3.2.1 Waste CO_2e conversion factors – the difference between "material use" and "waste disposal".

For most waste types, two different conversion factors are used in the HEFCE guidance:

[13] Measuring scope 3 carbon emissions – water and waste: A guide to good practice, available at http://www.hefce.ac.uk/pubs/year/2012/201201/#d.en.68742

[14] Measuring scope 3 carbon emissions – water and waste: A guide to good practice, available at http://www.hefce.ac.uk/pubs/year/2012/201201/#d.en.68742

[15] http://www.hesa.ac.uk/component/option,com_studrec/task,show_file/Itemid,233/mnl,12042/href,a%5E_%5EWasteMass.html/ lists documents used for conversion from volume to mass of waste.

1. "Production of virgin material". This accounts for the emissions associated with the production of the material which is sent to waste, and includes all greenhouse gas emissions from the point of raw material extraction or material input, through to the point at which the finished goods are manufactured and provided for sale.
2. "Waste disposal" factor. This accounts for the emissions generated in the action of processing the waste material.

Since the Defra guidance has been updated in line with the GHGP[16], the "production of virgin material" has been re-named "materials use". This latest guidance states that these emissions should not be included as waste CO_2e emissions, but are as a result of the production of the material, and therefore incurred by the producer (as Scope 1 and 2 emissions) and by the eventual waste generator (through Scope 3 procurement emissions). Therefore if they are also included as waste, there is significant potential for double counting.

The current HEFCE guidance and HESA requirements however pre-date the latest Defra guidance (and conversion factors) and therefore state that the "production of virgin material" (or the newer "materials use") factors should be included. However HESA also states that the latest Defra guidance should be used.

It is therefore unclear whether for reporting purposes the "materials use" element should be included or not, although for robust accounting reasons, AECOM believes it should not be.

Due to this, AECOM has included the factors in the Scope 3 calculation tool and the results in this report, but a facility has been included in the tool to exclude the factors. This needs to be considered in line with the fact that this year's reporting sets the baseline for future analyses and reporting.

AECOM requested further guidance from HESA on whether these should be included or not for reporting but did not received a reply.

3.3.2.2 Waste controlled by CCC

To estimate the breakdown into different waste types, national average waste compositional data is used for residual and general waste data sent to landfill. Waste Watch's Further and Higher Education Institutions (FHEIs) waste compositional estimates are used for non-residential buildings[17], as shown in Table 5 below.

[16] 2013 Government GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors, available at https://www.gov.uk/government/publications/green-house-gas-conversion-factors-for-company-reporting-2013-methodology-paper-for-emission-factors

[17] www.wastewatch.org.uk/

Table 5 – Breakdown of main types of waste produced by FHEIs surveyed from Waste Watch 2005 report: Resource management in the education sector – key findings from a study[18], and the latest CO_2e emissions factors from Defra

Waste fractions	Estimated composition (%)	Defra CO_2e emissions factor (kg CO_2e per tonne waste)
Paper	55%*	954.5
Cardboard		1038.2
Metal	2%	3126.0
Glass	4%	894.6
Plastic	17%	3178.7
Food and green waste	18%	0
Other	4%	0
Total	**100%**	

** Note that a 50:50 split has been assumed between paper and cardboard in line with HEFCE guidance rather than using the mixed paper and cardboard emissions factor from Defra.*

Waste sent to landfill

Following the HEFCE guidance for calculation of emissions from waste for the non-residential estate, the mass of waste sent to landfill is split to estimate the mass of each waste component applying the percentage in Table 5.

The emission factors for each waste component to landfill are then obtained from Defra and applied to each component mass. This provides the emissions from waste disposal to landfill.

Recycled waste

The mass of waste sent for recycling is split to estimate the mass of each waste component by applying the percentage in Table 5.

The emission factors for each waste component closed loop are then obtained from Defra and applied to each component mass to provide the emissions from disposal of recycled waste.

3.3.2.3 Waste disposed via private commercial contractors

Waste sent to landfill

Following the HEFCE guidance for calculation of emissions from waste for non-residential estate, the mass of waste sent to landfill is split to estimate the mass of each waste component applying the percentage in Table 5.

The emission factors for each waste component to landfill are then obtained from Defra and applied to each component mass. This provides the emissions from waste disposal to landfill.

Recycled waste

Recycled materials and their mass (tonnes) should be provided for each material type, and then the appropriate carbon conversion factors for recycling should be applied. HEFCE advises that if the institution has a 'mixed recyclables' waste stream as well as recycling waste material, the institution can provide a compositional breakdown of these materials based on:

[18] Available at http://www.eauc.org.uk/file_uploads_waste/education_sector_report.pdf. Note that these figures are shown incorrectly in the HEFCE guidance.

- Waste contractor figures on recycling rates for different materials
- HEI waste audit.

The waste fractions are then added to the respective recycled waste streams. Where the compositional breakdown of the mixed recycling stream is unavailable, as is the case for the University, the CO_2e conversion factor for '*mixed municipal waste'* should be applied to the mixed recycling tonnage. This has been the approach used in this analysis. This provides the emissions from recycled waste.

Shredded waste

The mass of waste sent for shredding is all understood to be paper. It is currently unclear whether the disposal contractor recycles or incinerates the waste (AECOM have been provided with conflicting information from the contractor and University). However the CO_2e conversion factor for both methods is identical and therefore this has no effect. This provides the emissions from shredded waste.

Composted waste

The mass of waste sent for composting is all understood to be food and drink, therefore the emission factor for Composting Refuse: Organic: food and drink waste has been applied to the mass of waste disposed via composting to obtain the corresponding emissions.

WEEE

Defra emission factors for WEEE are categorised into:

- WEEE – fridges and freezers
- WEEE – large
- WEEE – mixed
- WEEE – small
- Batteries

Therefore, the data obtained from the WEEE contractor identifying the WEEE items disposed of has been assigned to a corresponding category based on the weight of items as shown in Table 6.

Table 6 - Allocation of UoC WEEE disposed items to Defra emissions categories

UoC WEEE item	Defra category
PC	WEEE - small
Laptop	WEEE - small
Server	WEEE - mixed
General	WEEE - small
Printer	WEEE - mixed
TFT Monitor	WEEE - small
CRT Monitor	WEEE - small
White Goods	WEEE - fridges and freezers

Ultimately, the above categorisation is of limited value at this point as the value for all WEEE factors provided by Defra is the same, 21 kg CO_2e per tonne of WEEE for recycling. However the breakdown has been applied in case separate factors are provided by Defra in future for different WEEE categories.

Construction Waste

The masses of construction materials sent to waste disposal are collected within the SWMP for each University construction site. HEFCE guidance recommends that:

> *Construction, demolition and excavation (CD&E) waste is excluded from the carbon emissions estimation because disposal of this waste is likely to be the construction contractor's responsibility. However, CD&E waste arising from construction and demolition is likely to represent a large proportion of total waste arising in an HEI and should continue to be reported as part of the EMS. Under the Site Waste Management Plan Regulations 2008, construction contractors are required to report the waste arisings on projects valued over £300,000 in a Site Waste Management Plan (SWMP). For small works projects with a value of less than £300,000, HEIs should include a contract requirement that relates to the contractor submitting waste data.*

HESA requires the *masses* of construction waste to be reported via the EMR, and categorised by disposal method. However, the requirements for reporting of emissions from construction waste are less clear; HESA guidance states that "*all waste types that have an associated conversion factor should be included*", which includes construction waste, but also references the HEFCE guidance for further information, which specifically recommends exclusion of emission from CD&E, above. The HEFCE guidance states that it will be superseded by the HESA definitions.

For the purpose of this report (and based on guidance from the University), emissions from construction waste are included in Scope 3 emissions reporting from waste to ensure that HESA reporting requirements are met. The reporting of these emissions can be easily removed if and when further clarification is provided.

HESA reporting on masses categorises the waste by disposal method only. To calculate the CO_2e emissions, the masses are multiplied by the appropriate Defra conversion factors, which are based on material type and waste disposal method. The disposal methods listed for HESA mass reporting and under the Defra factors are not the same, but have been reallocated under a set of headings, see

Table 7.

Table 7 – Allocation of EMR construction waste disposal methods to Defra categories

HESA category for EMR	DEFRA category
Recycled	Recycling - Open loop, or closed loop
Incineration	Combustion
Composting	Composting
Anaerobic Digestion	Recycling - Open loop, or closed loop
Landfill	Landfill
Create energy	Recycling - Open loop, or closed loop
Other	Recycling - Open loop, or closed loop

Several of the EMR defined waste streams are reallocated to recycling under the Defra categorisation as shown in Table 7 this is because the emissions conversion factor calculated by Defra for recycling considers transport to an energy recovery facility or materials reclamation facility only. Emissions from other processes downstream are allocated to other organisations and are therefore outside of Scope 3 reporting for the University to avoid double counting of emissions involved with the production of energy or new products.

It is assumed that all recycling is open loop, unless there is no factor available in which case the factor for closed loop is used. For most waste streams these values are the same[19].

The waste streams provided by Defra for calculation of emissions from construction waste are as follows.

- *Aggregates*
- *Average construction*
- *Asbestos*
- *Asphalt*
- *Bricks*
- *Concrete*
- *Insulation*
- *Metals*
- *Soils*
- *Mineral oil*
- *Plasterboard*
- *Tyres*
- *Wood*

Within the SWMPs the "average construction" is the most frequently defined waste stream. In the latest Defra guidance, there is no emissions conversion factor for "materials use" associated with average construction, and therefore these emissions are not included for construction waste (See section 3.3.2.1)

3.3.3 Procurement

Procurement emissions are calculated externally by SUPC using the HEFCE calculation tool. No information on the methodology used in the tool is provided. It is not known how emission factors are applied to the expenditure data to calculate procurement emissions.

AECOM carried out a brief check on the HEFCE procurement tool to determine if there is any risk of double counting (the aggregation methodology in the tool cannot be interrogated). The titles of the input categories defined by the Proc-HE reporting codes suggest that some of the inputs may already be accounted for in other Scopes or sectors, such as electricity use or waste disposal.

To determine how important this difference is, AECOM removed the spend under the following titles, which were thought to be double counted:

Code	Description
TB	Air Travel
TC	Ferry Travel
TD	Taxi Hire
TE	Mileage (Private Vehicles)
TF	Rail Travel
TH	Car Hire
TJ	Van Hire
TK	Coach Hire
TL	Boat Hire & Charter

Code	Description
JA	Electricity Supply and Services
JC	Oil Supply and Services
JD	Solid Fuel, supplies and services
JE	Water and Sewerage Services
JZ	Other/General Utilities
UA	Confidential Waste Disposal
WQ	Waste & Refuse Disposal
WS	Water and Sewerage Services

After the spend for the Proc-HE input categories listed above were removed, the outputs from the HEFCE tool were rechecked, to calculate the emissions represented in the results in Figure 10 (see Section 4.5).

The only categories of emissions that noticeably changed with the removal of the above inputs are "Business services" and "Waste and water". (Smaller changes are: an increase in other manufactured products; decrease in

[19] Open loop recycling is the process of recycling material into other products. Closed loop recycling is the process of recycling material back into the same product

food and catering; and an increase in construction emissions, but these changes are insignificant at the order of one to five tonnes CO_2e).

By varying the inputs to the Proc-HE categories, and noting the change in emissions, the following can be concluded.

- The tool does not calculate emissions from direct travel (TB to TL from the list above), but does calculate emission from “TM - Travel Agency Services” and “TZ –Other/General Travel &Transport”. These emissions are allocated to the “Business services” category.

  As direct travel is not included in the procurement emissions, this spend is used for the calculation of Scope 3 CO_2e emissions due to business travel, so that it is counted under the correct sector, and not ignored. Spend for TM and TZ are left in the model and reported under procurement emissions.

- Changing spend for “JA - Electricity Supply and Services” to “JZ – Other/General Utilities”, results in a change in the emission reported under the “Waste and Water” reporting category.

  It is uncertain why these categories are allocated to emissions for waste and water. For reporting to HESA these emissions are left in, but it is easy to remove them in the future if required, the effect of this removal is shown Figure 10.

- The remaining spend categories listed above are also allocated to the “Waste and water” reporting category.

  It is assumed that all water and waste emissions for the University are already calculated under the correct reporting sectors for Scope 3, therefore AECOM recommend that these emissions are removed from the procurement reporting section to avoid double counting. The total emissions calculated in this report, for the baseline emissions, include all emissions from procurement in line with HESA recommendations, but there is an option within the AECOM toolkit provided (see Appendix 1: Overview of Scope 3 emissions toolkit) to remove the emissions listed above. The effect of this exclusion is shown in Section 4.5.

3.3.4 Business Travel

Business travel emissions are calculated from a range of sources. The two key sources are personal paper expense claims and central travel procurement. It is understood that these are mutually exclusive data sets, and therefore data can be added from both to obtain an understanding of overall travel use.

All journeys outside of the UK are required to be covered by the University travel insurance policy. This is via a system of registering the travel event. It is not certain which journeys (from expenses or procurement) the insurance information corresponds to (the data sets are not comparable) and therefore an assumption has been made that the insurance data journeys are all processed via manual expenses paper claims and are not included in the travel procurement data set.

Figure 3 shows the different travel categories assessed and how they fit in with the two primary data sources. Further information is provided in each of the sections below.

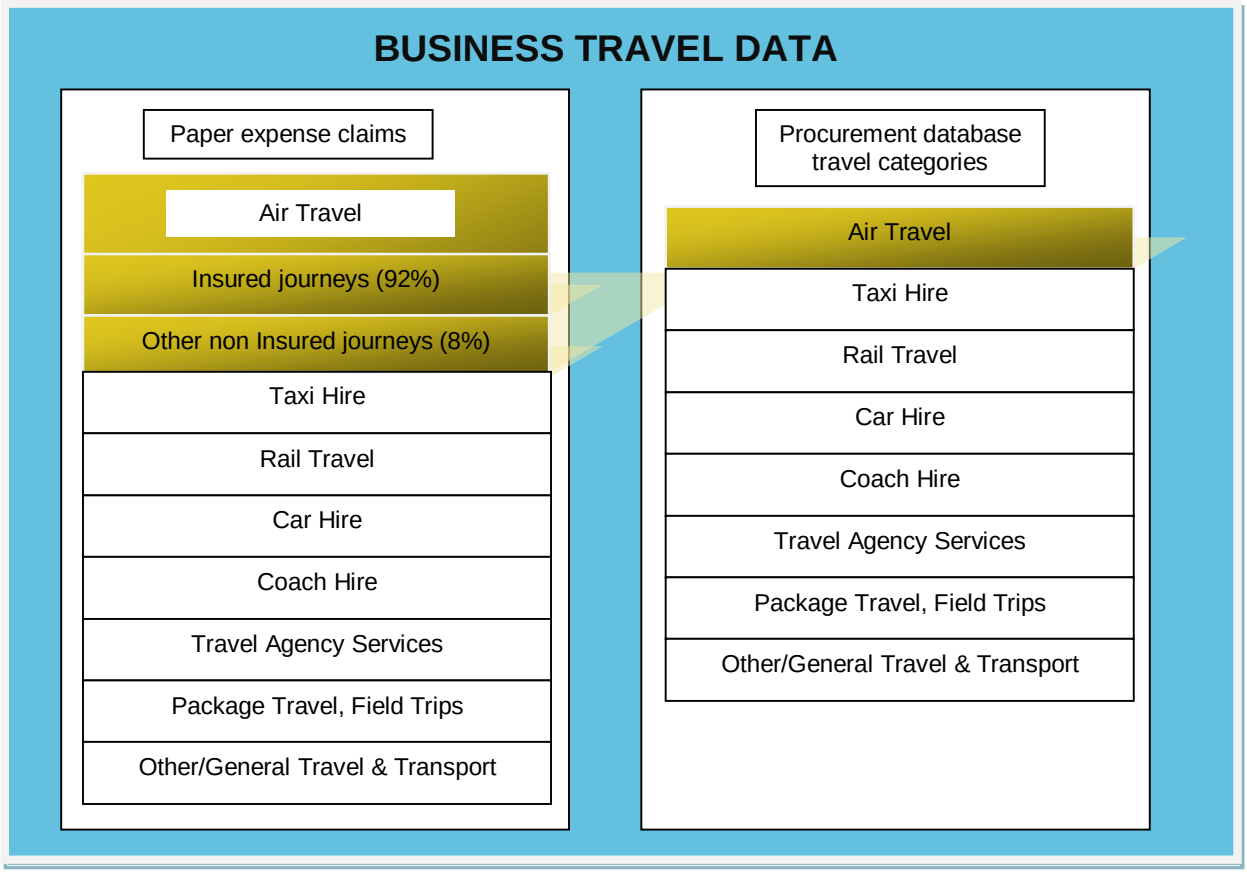

Figure 3: Schematic showing the travel categories and two primary datasets and mutuality. The highlighted cells show the split in air travel between paper expense claims, and the procurement database. It is assumed for simplicity that all insured journeys fall under the paper expense claims (see section on Air Travel).

3.3.4.1 Air Travel

Paper expenses claims/journeys

The air travel insured journeys data contains information describing the destination of each visit, and therefore acts as a proxy for the passenger km travelled on each journey. The total number of km for each journey is identified by the country of destination using a lookup table with distances in kms between Heathrow and main country of destination airports[20]. Through this, the type of journey (Short Haul at <=3,700 km, or Long Haul at >3,700 km) [21] is identified and the number of kms for each journey accounted for. There are no Domestic flights in the data provided which could be identified. Where a journey has more than one passenger (for example, a field trip), the insurance dataset provides the number of passengers.

Processing of the paper expense claims dataset has been conducted to exclude any trips outside the reporting period (outside of August 2012 to July 2013), and to exclude all modes of travel other than air. By looking at the total number of paper expenses claims and assuming that each entry corresponds to a return journey, this data can be used to provide the total number of flights. The number of flights suggested by the insurance data set is 92% of the number in the expenses claims. Therefore it is assumed that the 8% difference is due to uninsured journeys. Therefore the total km for both Short and Long Hauls has been increased by 8% to take these uninsured trips into consideration. This methodology means that the paper expense data information is used to calculate the number of

[20] Bureau of Transportation Statistics (BTS) available at http://www.transtats.bts.gov/Distance.asp?pn=0

[21] Measuring scope 3 carbon emissions - transport: A guide to good practice, available at http://www.hefce.ac.uk/pubs/year/2012/201202/name,68754,en.html

journeys, and the insurance data is used to calculate the distance travelled. The latter provides a more accurate basis for the calculation of CO_2e, rather than expenditure which is more variable.

An estimate has been made of the split in air travel between business class and economy class through a search of the paper expenses data base and the travel procurement data set. This results in approximately 60% of flights being classified as economy class, and 40% business class. This split has been pro-rated across all air travel information where the class is unknown. This allows use of the relevant CO_2e conversion factors for each type of travel class.

The emission factors used for air travel use the 'With RF' values which include both the 8% distance uplift and a 90% increase in the CO_2e factor to account for radiative forcing[22].

In addition to the CO_2e emissions generated from flying, the analysis has also included well to tank (WTT) business travel emissions to account for the upstream Scope 3 emissions associated with extraction, refining and transportation of the aviation fuel to the plane before takeoff. It is not clear whether the HEFCE guidance includes or excludes the WTT emissions due to a changing in name with the revised Defra guidance. However in line with the latest Defra guidance, it should be included.

For the final calculation of emissions, the emission factors (expressed in terms of kg CO_2e emitted per passenger per km travelled) are multiplied by the relevant distances and the number of passengers. This is done for short haul and long haul flights separately for each class of travel.

For journeys with multiple destinations, it is complex to estimate the number of km travelled. Therefore the furthest destination is firstly identified and the total number of km to and from this destination is taken as the distance travelled in the trip. Due to the way the data has been collected and presented, whereby different users record the multiple destinations in different ways (sometimes country name is not shown, inconsistent way of describing the trip, etc) there could be potential for missing or misidentifying some of these final destinations.

<u>Journeys recorded as Air Travel in the procurement dataset</u>

Air Travel from the procurement dataset is calculated similarly to the paper expenses claims air travel based around a kg CO_2e emitted per passenger per km travelled conversion factor. These emissions have been excluded from the procurement reporting category.

The total amount of expenditure recorded as Air Travel in the procurement database is converted into average passenger km travelled, based on a £/km benchmark calculated from the paper expenses claims air travel. This gives a value of £2.80 / 100km. This figure is then split between short and long haul travel following the existing distribution split from the insured data. The final total passenger km for each short and long haul type of journey is then multiplied by the corresponding emission factors (for travel plus WTT) as described above to obtain the emissions from air travel for those journeys recorded under Air Travel in the procurement database.

3.3.4.2 Other travel data categories

The remaining entries bullet pointed below, contain expenditure from the procurement database over £5,000, under the travel spend category. However, on inspection these do not appear to relate directly to travel, and are therefore the following categories from procurement are not included in the calculation of CO_2e emissions from business travel:

- Travel & Transport (incl. Vehicle hire & subsistence)
- Accommodation & Hotels, including room bookings and restaurants
- Subsistence
- Aircraft & Helicopter Hire
- Storage & Warehouse Services

[22] Note these figures were different in previous versions of Defra factors

- Student Travel Arrangements
- Conferences, Meetings and Room Bookings
- Relocation and Household Removal Expenses
- Spare

3.3.4.3 Business travel emissions from expenses

The list of individual / employee expenses recovered using University paper expense claims is believed to contain an entry per journey and method of transport, together with the expense value. For each method of travel, the expenses are aggregated, together with those shown in the extract from the procurement database.

In addition to the categorised travel expenses, there is a generic category labelled “Other/General Travel & Transport” in the paper expense claims dataset with no specific mode of transport shown. The amount of expenditure allocated to this category has therefore been distributed to individual travel modes based on the distribution of the know travel modes. The total spend for each mode is an adjusted expenditure, which is the sum of the correctly allocated spend and reallocated spend from “Other/General Travel & Transport”.

For individual modes:

- Ferry Travel: the number of journeys (passengers) is multiplied by the km of the return journey from Harwich to Holland to provide the passenger km to which the corresponding ferry emissions factor is applied.
- Car and Van Hire: the spend to distance conversion for Car and Van Hire is based on information received from "Enterprise Rental", and their account with the University between Nov 2012 and Oct 2013. There was a total spend of £28,550 and mileage of 60,875. This is assumed to be representative of typical Cambridge University car hire. The adjusted expenditure is divided by £0.47/mile to obtain the total passenger miles. The corresponding emissions factor per mile (for an average car, with unknown fuel source) is then applied to this figure.
- Coach Hire: the adjusted expenditure is divided by £2.16/km[23] to provide the passenger.kms to which the corresponding km emissions factor is applied.
- Mileage Private Vehicles: the adjusted expenditure is divided by £0.45/mile (this is the rate of claim reimbursement per mile) to obtain the total passenger miles. The corresponding emissions factor per mile is then applied to this figure. This emission factor is for an average size car, with unknown fuel source.
- Taxi travel: a similar approach is used to calculate emissions, where the adjusted expenditure and number of journeys are used[24] to provide the passenger.kms to which the corresponding km emissions factor is applied.
- Rail travel: the adjusted expenditure is divided by £0.13/km[25] to provide the passenger kms to which the corresponding km emissions factor is applied.
- Boat Hire and Charter: the small number of expenses entered appear to be for canoes/punts and therefore have not been included in the emissions calculation.
- ZipCar information provides a detailed calculation of the emission based on the measured mileage emission factors specific to the vehicle used. However this is only for 29 journeys, which is too small to offer any meaningful contribution to the data collected, therefore this information is not used in for this report.

[23] https://www.gov.uk/government/statistical-data-sets/bus04-costs-fares-and-revenue

[24] £2.80 for the first 92 metres, then 20p per 183 metre, https://www.cambridge.gov.uk/hackney-carriage-and-private-hire

[25] Revenue per passenger kilometer and revenue per passenger journey (Office of Rail Regulation), http://dataportal.orr.gov.uk/displayreport/report/html/07cef579-4eed-48eb-94e8-dcb7d874d390

3.3.5 Commuting Travel

HESA requires CO_2e emissions from commuting travel to be recorded separately for staff and students. Student commuting considers travel from term time residential address only, and not travel from home to Cambridge for term time.

3.3.5.1 Student commuting

University students are required by statute to live within 5 miles of the centre of Cambridge (with the majority of students living in the centre of Cambridge), and so most travel is by foot or bicycle, which produces no emissions.

Students wishing to use a car have to apply for, and be granted, a permit by the Motor Proctor. The University has provided a list of the student car permits provided, which indicates that the majority of car permits (1764 issued in 2013/14) are justified on the need for a car for outside activities and not for commuting, and the associated emissions are therefore outside the University's Scope 3 reporting requirements. In practice, the difficulty and inconvenience of using a car in central Cambridge means that the likelihood of cars being used for any commuting purposes from a central residence is extremely low. Therefore the emissions from car travel for commuting by students is assumed to be zero.

Finally, it is also assumed that the emissions from the use of other motor vehicles by students for commuting (for example bus or taxi) are not material, and are therefore not calculated in the model. Whilst some student use of the Uni 4 bus is likely, no robust data is available which separates out student use from staff use, so this is also ignored for reporting of Scope 3 emissions from student commuting.

3.3.5.2 Staff commuting

Emissions from staff commuting travel are estimated in the Commuting Emissions tool developed in Element 2 of this project. For the baseline CO_2e emissions, data from the Travel for Work Survey 2012 was used to extrapolate volumes. This data came from a survey carried out for travel taken place during one week in October 2012. The response from the 24% of staff who responded to the survey was considered sufficiently large and therefore representative of all staff and overall volumes were extrapolated from this. Average distance per mode was derived from a listing of home and work location postcodes 2012. For further details on the methodology used in the calculation of emissions from commuting please refer to the Element 2 tool and final report.

3.4 Methodology Summary

Guidance on how best to calculate Scope 3 CO_2e emissions, and the factors and method used for calculations, are regularly updated by DEFRA. Additional guidance by HESA and HEFCE is not updated at the same time. This results in some mixed guidance in some cases, which requires further verification. Table 8 contains a summary of which method has been followed in this report for the calculation of Scope 3 emissions, and the effect of following an alternative method.

Table 8 - Summary of methodology used for each reporting category

Reporting Category	Calculation Method aligned with	Alternative method	Change due to alternative method	
			% of category	Tonnes CO_2e
Water	HESA	-	-	-
Waste	HESA: Include construction waste emissions	HEFCE: Exclude construction waste emissions	-16%	-760
	HESA / HEFCE: Include “materials use” emissions	DEFRA: Exclude “materials use” emissions	-85%	-4370
Procurement	HESA: Include all inputs to Proc-HE tool	AECOM: Exclude some travel, water and waste inputs to Proc-HE tool	-2%	-2670
Business travel	HESA	-	-	-
Commuting travel	HESA	-	-	-

The total potential change in reported emissions is a reduction of 7770 t CO_2e, which is approximately 5%. These potential changes should be discussed with HESA to determine whether they can be suitably applied. The Scope 3 emission toolkit allow for these alternative methods to be applied with a simple yes/no option (see Appendix 1: Overview of Scope 3 emissions toolkit for further details).

4 Scope 3 analysis and results, including figures for the HESA report

4.1 Introduction

This section provides an overview of the baseline Scope 3 emissions for financial year 2012/13 and the breakdown for the University. The toolkit developed by AECOM allows assessment of the emissions across the whole University, and where information is available on a disaggregated basis by site (see Appendix 1: Overview of Scope 3 emissions toolkit, for more information). In this report, emissions are primarily shown at a University-wide level.

4.2 Total Scope 3 CO_2e emissions

The total Scope 3 CO_2e emissions for the reporting period are approximately 170,000 tonnes CO_2e per year. This will become the Scope 3 emissions baseline to enable the University to evaluate progress towards targets and/or the effect of measures undertaken to reduce Scope 3 emissions in future years. Figure 4 provides a breakdown of the total Scope 3 emissions by reporting sector.

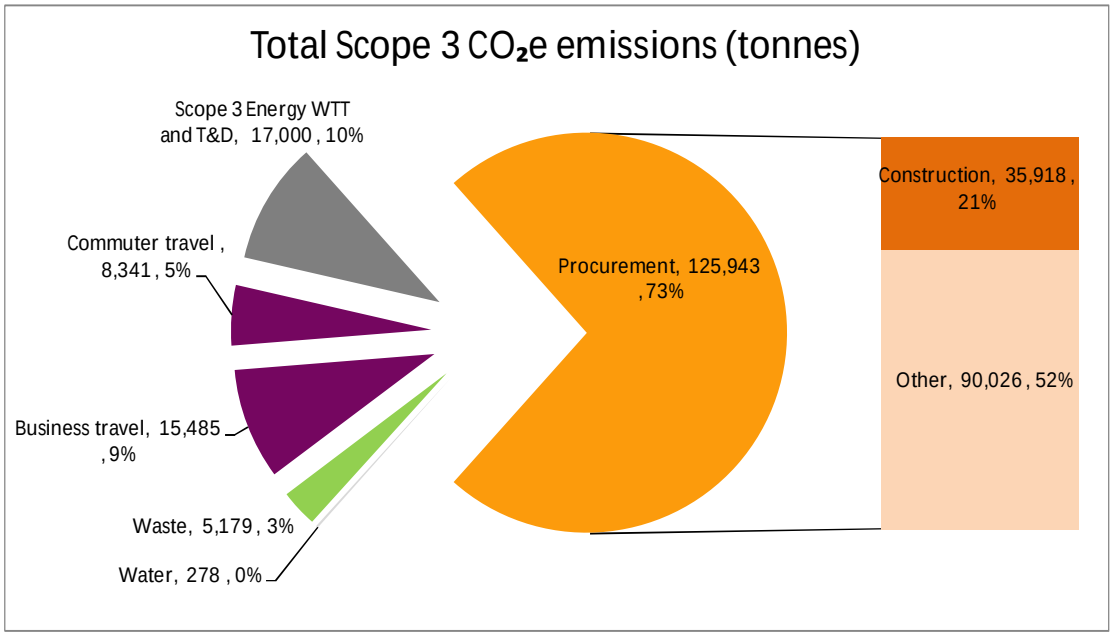

Figure 4: Pie chart showing the break-down of the total Scope 3 CO_2e emissions (tonnes) for the University

The following key results can be observed:

- The total Scope 3 emissions are approximately 170,000 tonnes CO_2e per year.
- The largest sector for Scope 3 emissions is the procurement of goods and services which accounts for around 126,000 tonnes per year, or 73% of the overall Scope 3 emissions.
- Transportation represents a more significant proportion of the emissions, with 15,000 tonnes CO_2e from business travel and 8000 tonnes CO_2e from commuting, per year.
- Upstream emissions from Scopes 1 and 2 include Transmission and Distribution (T&D) losses from electricity and Well-to-Tank (WTT) emissions from fuel supply. These account for 17,000 tonnes CO_2e per year, or around 10% of Scope 3 emissions.
- Waste collection and treatment accounts for around 5000 tonnes CO_2e per year, or around 3% of overall Scope 3 emissions.

- Water and waste water treatment are the smallest sectors and account for approximately 300 tonnes CO_2e per year, or around 0.2% of the overall Scope 3 emissions.

To put these figures in context, the overall Scope 1 and 2 emissions for the University are approximately 73,000 tonnes CO_2e per year[26] (approximately 8% is Scope 1 – primarily gas consumption, and 22% is Scope 2 – electricity). Therefore whilst CO_2e emissions are most commonly associated with direct energy and fuel use, just over two-thirds of the University's overall annual emissions are the result of indirect Scope 3 activities. Furthermore, procurement of goods and services accounts for over half of the total Scope 1, 2 and 3 CO_2e foot-print.

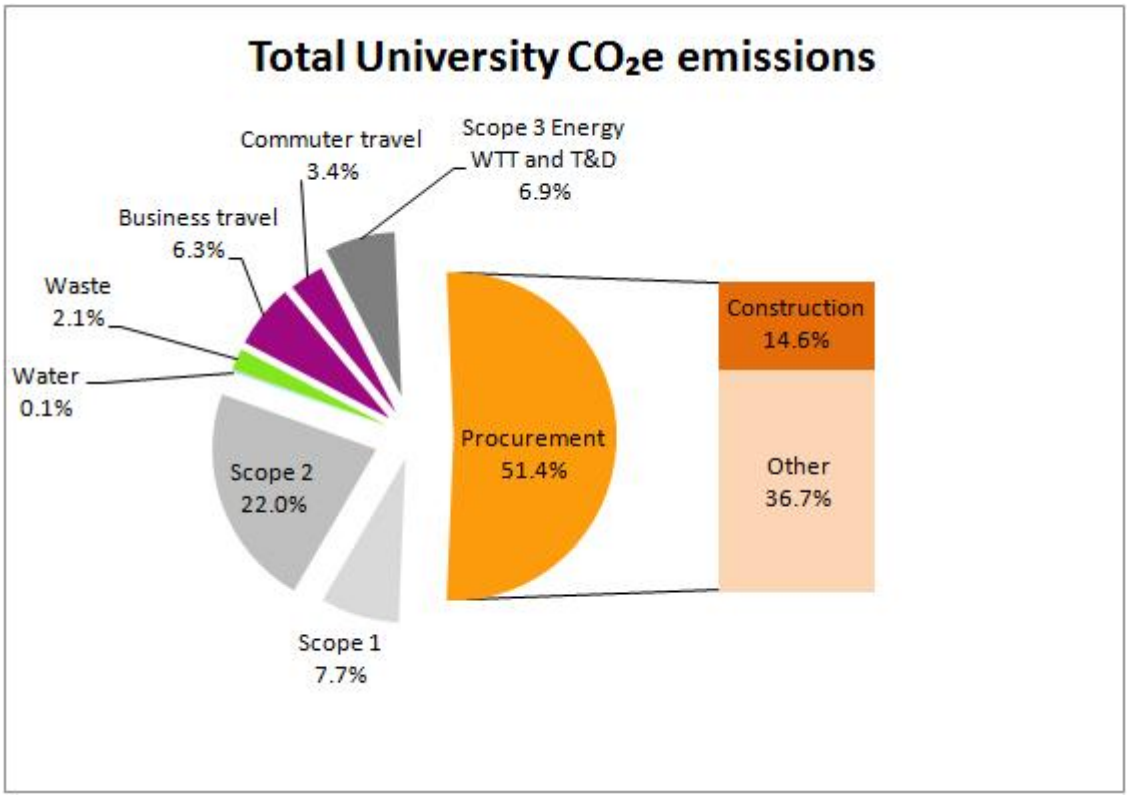

Figure 5 shows the overall breakdown of the University's emissions including Scope 1 and Scope 2 to illustrate the breakdown.

[26] See footnote 1

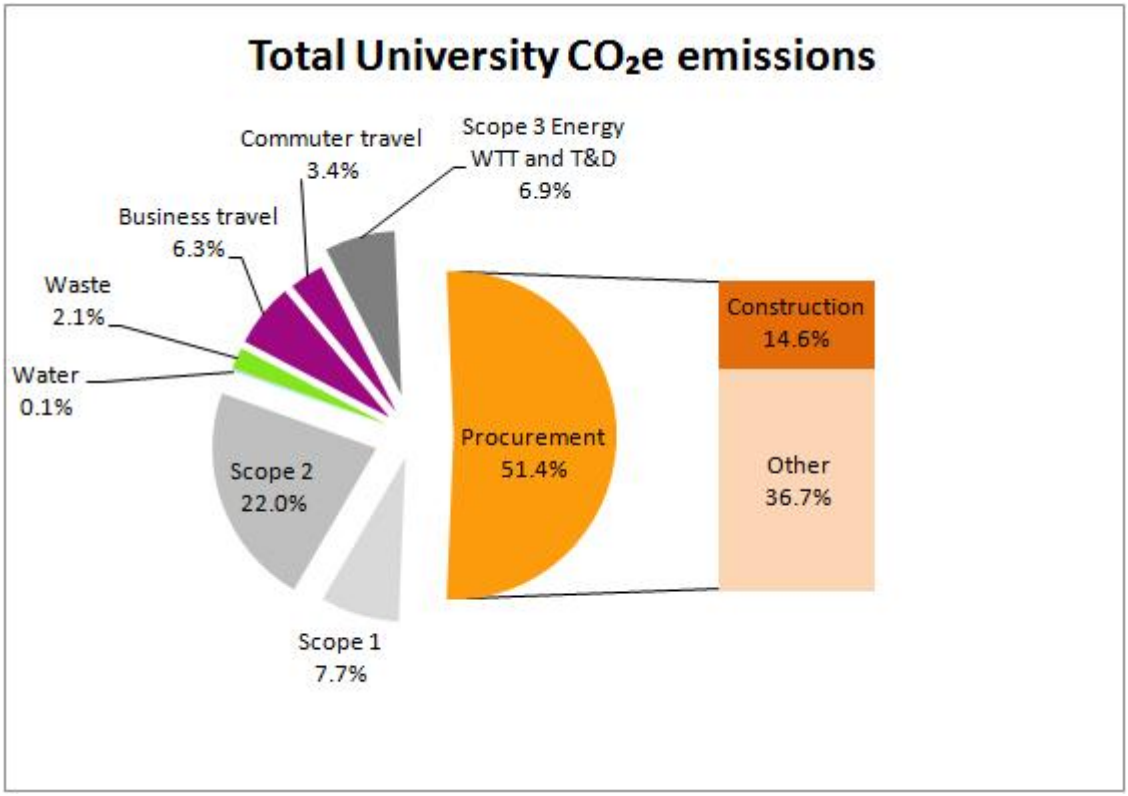

Figure 5: Pie chart showing the breakdown of emissions from Scopes 1, 2, and 3 activities

4.3 Water supply and wastewater treatment

Annual emissions of CO_2e from water supply and waste water treatment account for the smallest reporting sector within Scope 3 for the University at about 278 t CO_2e (0.2% of overall Scope 3 emissions).

The 86 sites listed for the water data have been manually regrouped into the 18 general sites (See Appendix 1: Overview of Scope 3 emissions toolkit) and therefore emissions from water associated with each site can be allocated and reported. These groupings are manually defined in the reporting model and assuming that the meter reporting format remains the same in the future, the data input will not require changing except in the case of new sites being added to the reporting.

Figure 6 below shows the breakdown of CO_2e emissions from water by site.

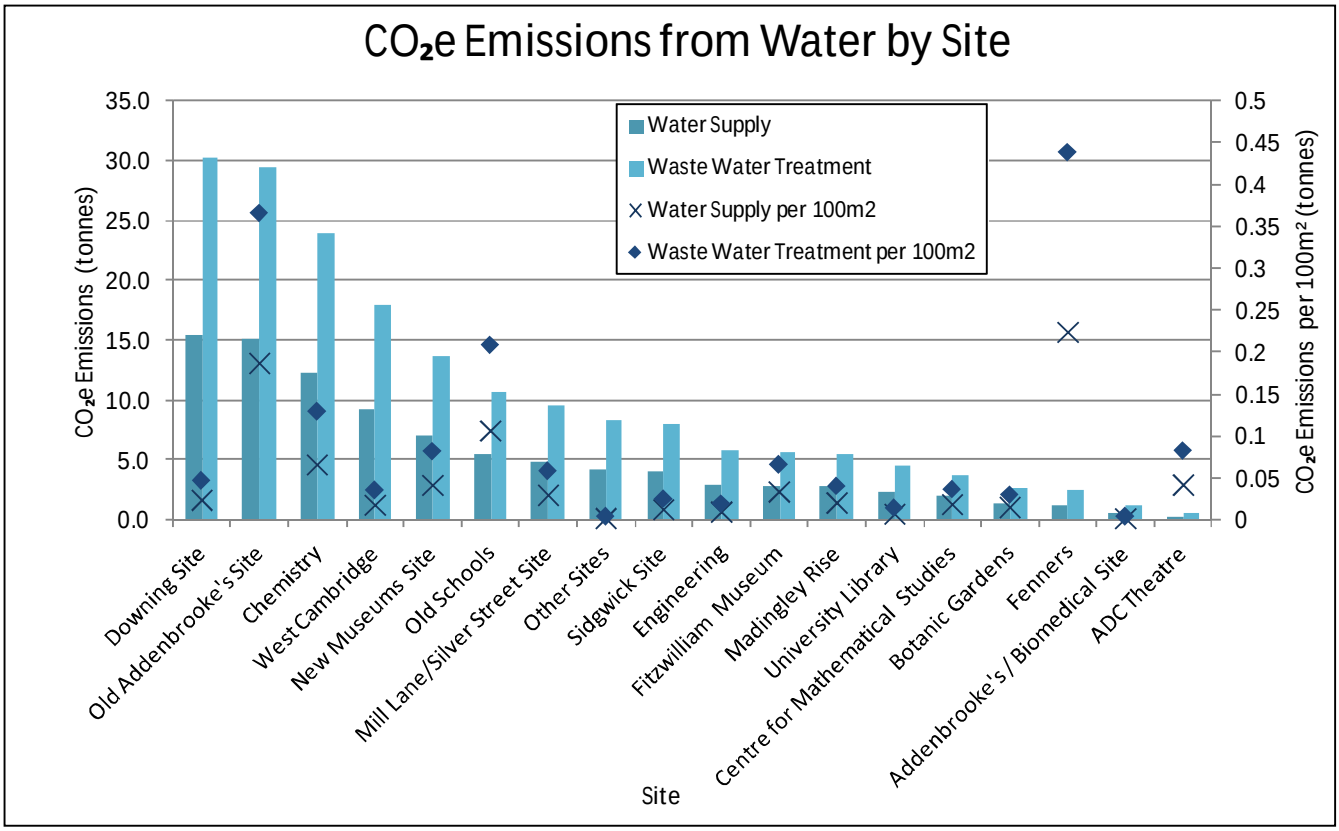

Figure 6: Breakdown of CO_2e emissions (in tonnes) from water by site and per $100m^2$ total floor area.

It should be noted that for any site the ratio between emissions from water supply and waste water treatment will be the same as any other site. This ratio is fixed due to the assumption that volume of waste water is 95% of the volume supplied. If the waste water were separately metered, for uses such as irrigation, this ratio may vary from site to site.

The Old Addenbrooke's site and Downing Site both have the highest level of water consumption, followed by the Chemistry Department. Due to the low intensity of CO_2e associated with water supply, the emissions may not be significant and CO_2e is not a particularly important metric, but from a water sustainability perspective, the results for the Old Addenbrooke's Site, Old Schools and Fenners are significant as they show the highest water consumption per m^2 of floor area.

4.4 Waste

The data for waste arises from various sources as discussed earlier. For clarity, the emissions relating to each data source are calculated separately. The total emissions arising from waste are about 5179 tonnes CO_2eper year (3% of overall Scope 3 emissions).

This level of disaggregation is shown in Figure 7 and Figure 8 below, with a further breakdown provided where suitable information is available.

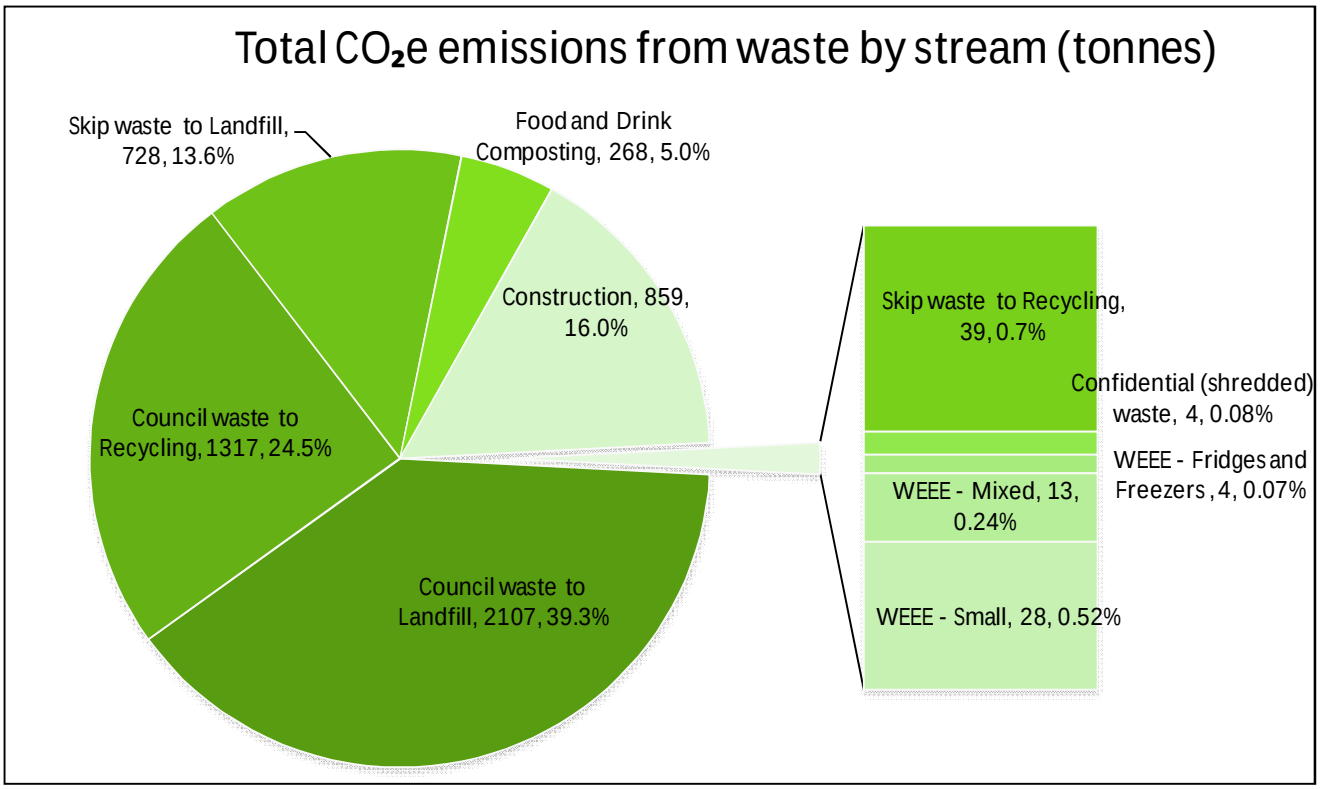

Figure 7: Breakdown of CO_2e emissions (in tonnes) from waste disposal and material use by data source and waste stream. "Materials Use" emissions are included in line with HEFCE guidance.

As discussed in the methodology section, there is some uncertainty regarding the inclusion of emissions from "material use" within waste. We would advise that if the University/HEFCE (and therefore HESA) wish to report these emissions under Scope 3, then this is done either separately as *Material Consumption/Use* emissions and *Waste Disposal* emissions, or aggregated under a different heading as *Material Consumption/Use and Waste Disposal emissions*. This is of importance due to the heavy weighting of material use emissions in comparison with waste emissions which may provide a misleading interpretation of actual waste emissions. Figure 8 shows the emissions from waste if "material use" is excluded from reporting of waste emissions.

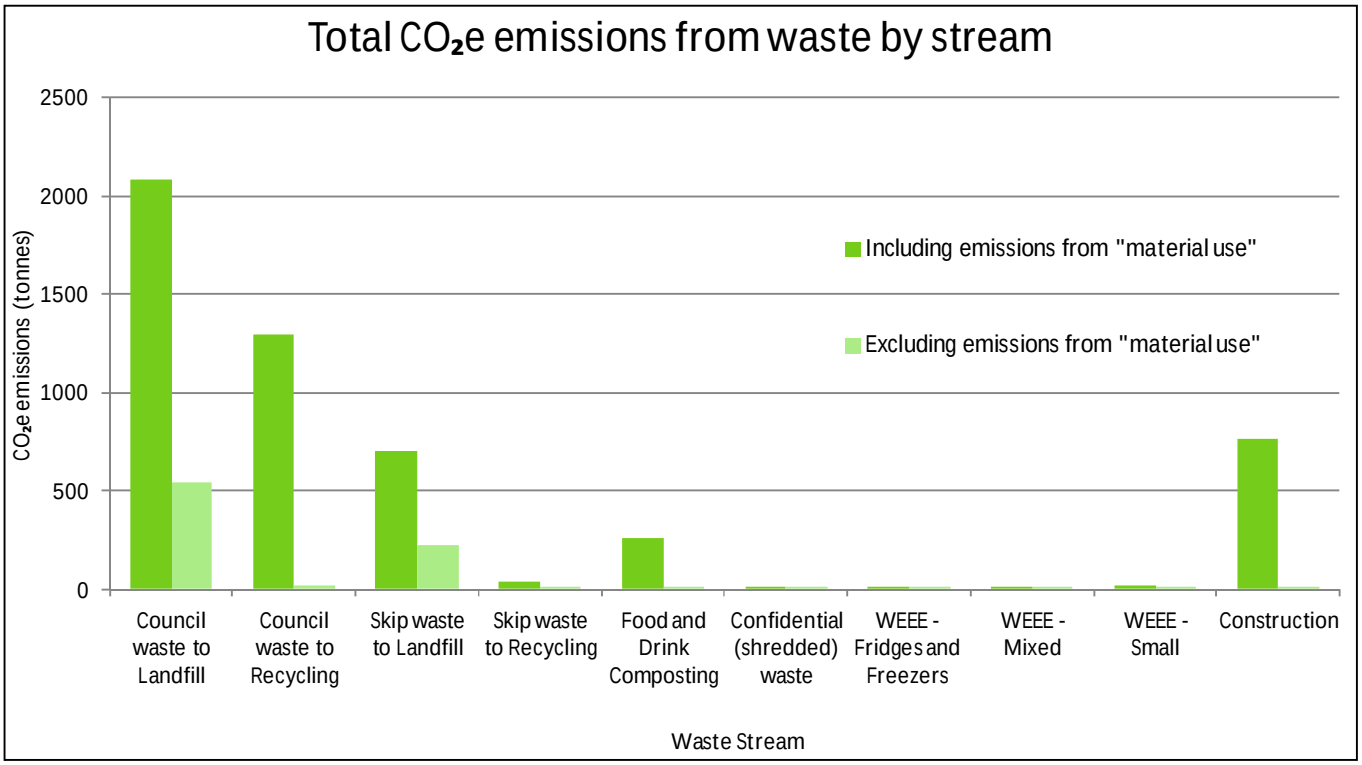

Figure 8: Breakdown of CO_2e emissions (in tonnes) from waste disposal by data source and waste stream, with and without "materials use" emissions included.

The exclusion of "material use" CO_2e emissions from waste results in a much smaller total of 806 tonnes CO_2e, rather than 5180 tonnes CO_2e, as "material use" accounts for about 85% of the total reported emissions from waste,. This smaller total accounts for less than 1% of the total Scope 3 emissions, rather than 3%. In addition to the overall reduction in emissions classified under waste, the proportion of emissions from different waste streams has also changed. Recycling accounts for a much smaller proportion in comparison to landfill once "materials use" emissions are removed. This is expected, as emissions from disposal to landfill include all emissions to end of life, whereas emissions from disposal to recycling only include emissions due to transport to the recycling facility, at which point emissions are associated with production of materials and are therefore outside scope for disposal.

Council collected waste, which accounts for approximately two thirds of the total University emissions from waste, can be separated further, into the different collection sites. The breakdown by site is shown in Figure 9, which includes "materials use" in the calculation of emissions, as stated in the methodology section.

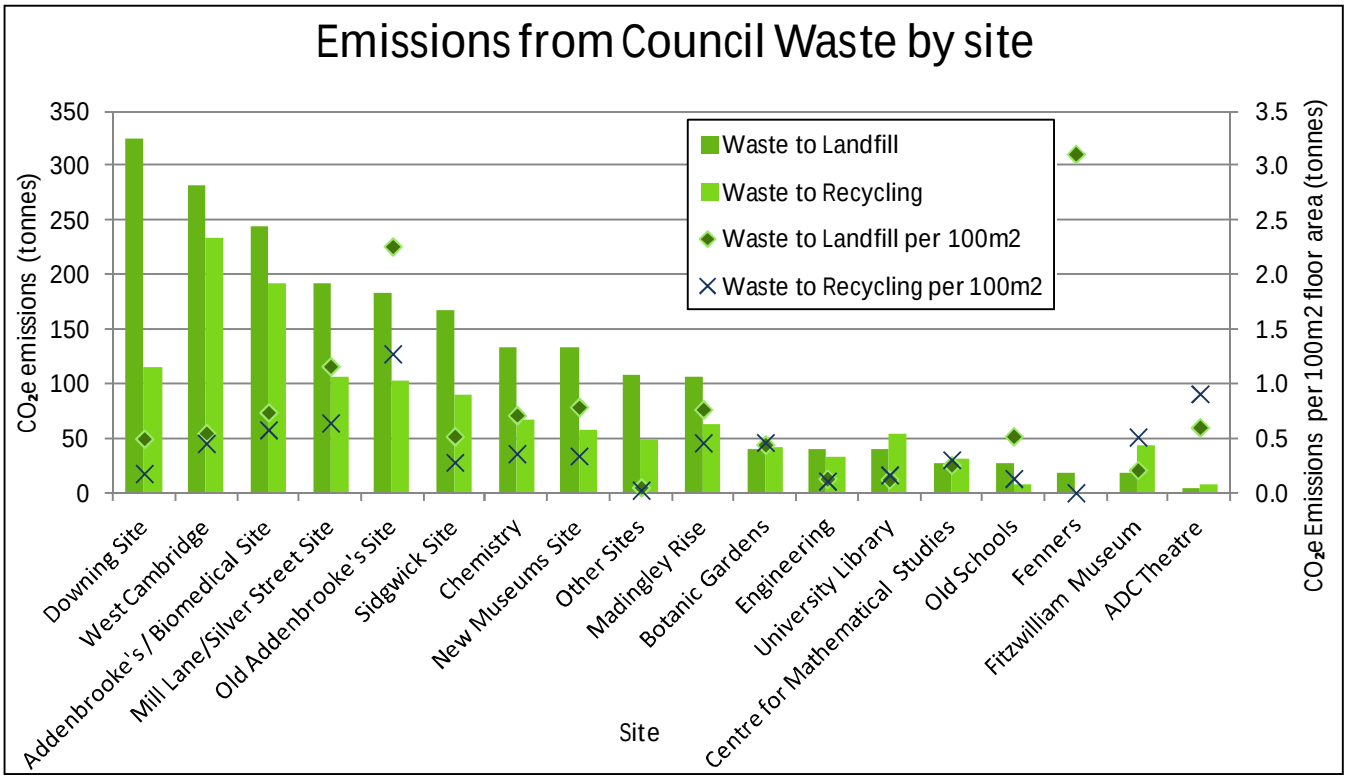

Figure 9: Breakdown of emissions from Council collected waste by site (including emissions from "materials use") and per 100m^2 of total floor area

The sites with the largest emissions from waste are the Downing Site, West Cambridge, and the Addenbrooke's / Biomedical Site. These are also the three largest sites (excluding "other") by floor area. The smaller sites such as the ADC Theatre and Fenners appear to have above average emissions by floor area, this is likely to be due to having larger bins than required and non-optimised collection as the sites are small. The weights used for calculation of emissions are based on bin volumes and number of collections, with the assumption that the bins area always full on collection. The apparent high usage for these smaller sites may be a result of the methodology used rather than the actual waste production. The above average emissions by floor area for the Old Addenbrooke's Site and the Mill Lane area may also be due to suboptimal collection processes.

The Engineering Department has particularly low emissions from waste for council collection. This could to be due to a number of contracts with other waste collection bodies, such as YoYo paper recycling and collection of specialist waste from workshops and labs. There is no central collection of data from these individual contracts and they are expected that the emission would be immaterial, therefore the CO_2e emissions from individual waste contracts have not been calculated.

It is important to note that all of the graphs shown in this results section for waste are for emissions from waste, rather than volumes or masses of waste produced. For several sites the mass of recycling is greater than the mass of waste to landfill, but the figures above generally show that the majority of emissions from waste are due to disposal to landfill. This is expected as emissions associated with waste to landfill are significantly higher than those for waste sent for recycling.

4.5 Procurement

CO_2e emissions from procurement form a large proportion (73%) of the total Scope 3 CO_2e emissions and are estimated at around 1,259,444 t CO_2e. The Scope 3 CO_2e emissions for reporting from procurement are predetermined by the HEFCE tool assessment provided by the University to AECOM. This is the methodology recommended by HEFCE, and by HESA, to achieve consistency across all HEIs. The tool calculates the emissions under 10 categories, represented by the blue bars in Figure 10 below.

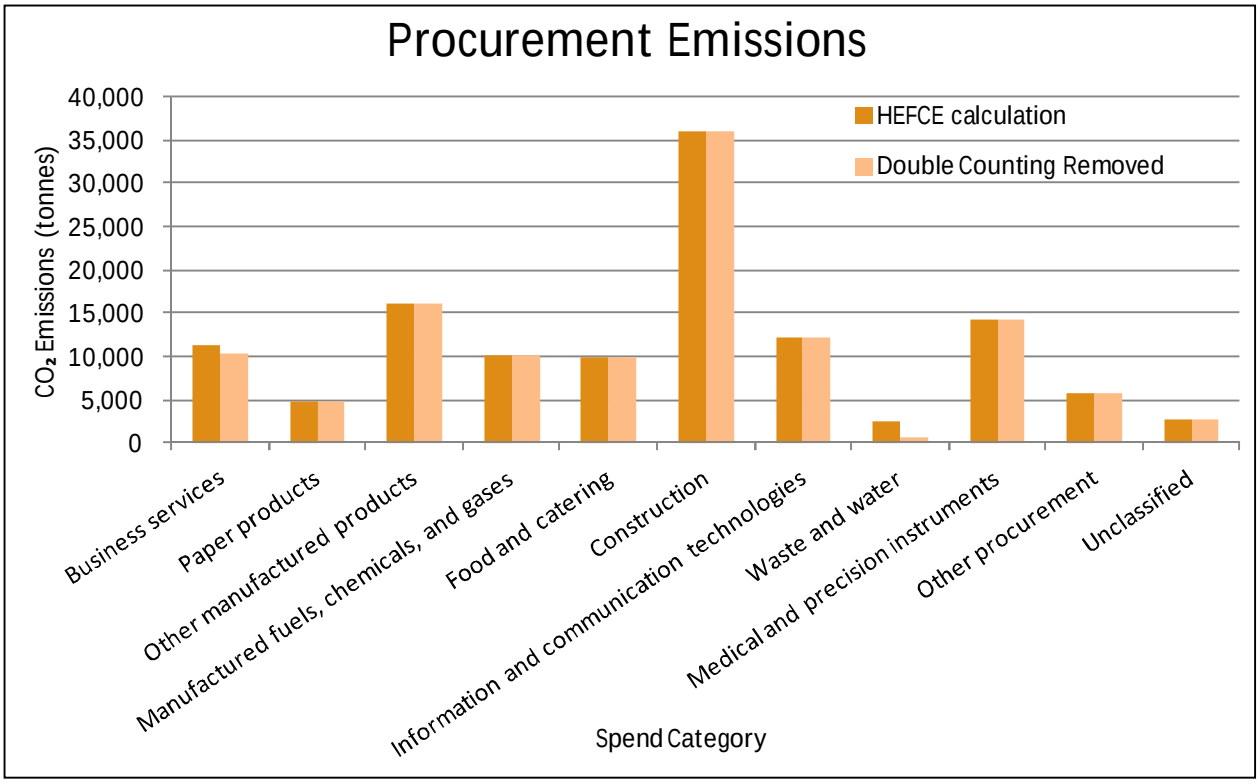

Figure 10: Procurement emission by spend category, as calculated for HESA (blue) and with AECOM adjustment to eliminate double counting (red) – changes occur for two categories only

Procurement emissions from construction are the largest reporting category and account for about 30% of the emissions from procurement. It is not clear from the HEFCE tool if emissions from construction waste are included in this figure, which would result in double counting of emission from waste.

The methodology used for this calculation is unknown as it is built into the HEFCE tool. Unfortunately, whilst procurement is the largest Scope 3 emissions sector, it also has the least detailed information available and the least scope for investigation and analysis. Most importantly, the CO_2e emissions are based on expenditure with conversion factors based on the average goods and services procured. Therefore specific procurement activities by the University aimed at reducing CO_2e emissions may perversely result in higher reported emissions if the lower CO_2e products have a higher cost. This may be balances against a reduction in emission from energy use in Scopes 1 and 2, but is still not an accurate representation of the actual emission associated with specific procurement activities.

All emissions that are excluded from the procurement emissions, represented by the difference between the red and blue bars in Figure 10, are considered to be counted elsewhere in the total University CO_2e emissions reporting. See section 3.3.3 for more information on double counting.

4.6 Travel

Travel has been divided into business and commuter travel to reflect requirements for reporting to HESA.

4.6.1. Business Travel

Business travel accounts for about 9% of the total Scope 3 CO_2e emissions, estimated at around 15,485 t CO_2e.

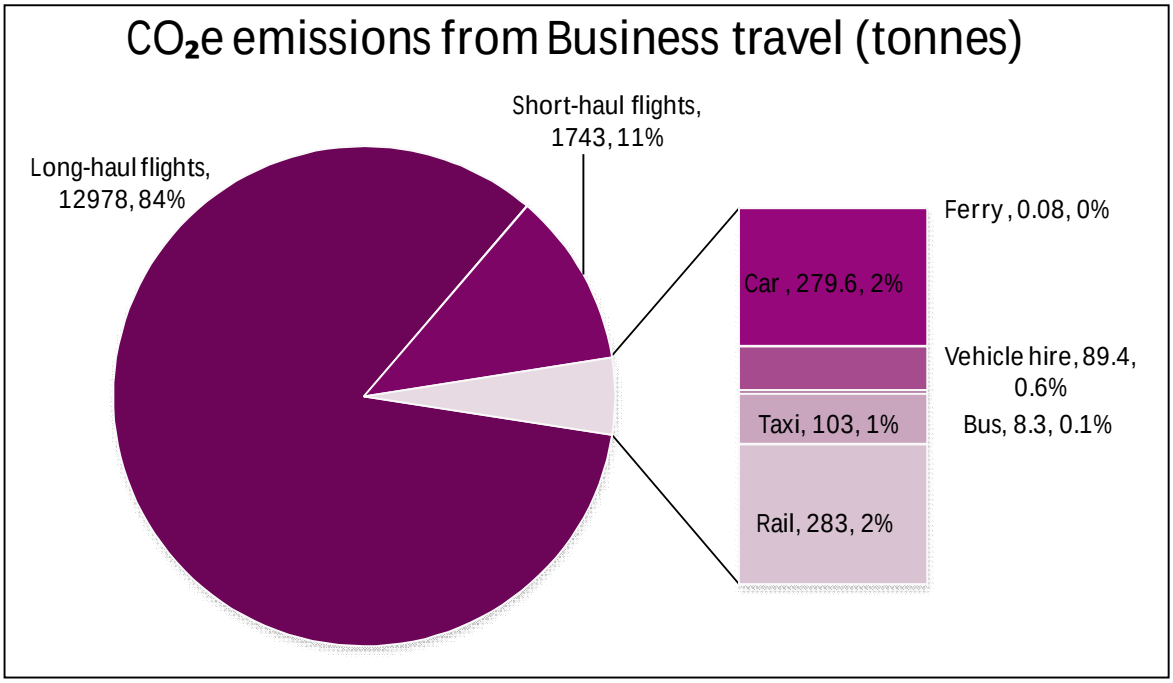

Figure 11: Breakdown of Scope 3 CO_2e emission (tonnes) from business travel by travel mode

The majority (84%) of business travel CO_2e emissions arise from long-haul flights with another 11% from short haul flights. Ground transportation in the form of road, rail, and ferries, accounts for only 5% of business travel emissions.

The dominance of business emissions by air travel is not due to the high CO_2e emissions associated with a passenger km by air travel (the emissions factor does not differ significantly from ground transportation factors), but due to the significant distance covered by air travel. A single long-haul flight may be orders of magnitude larger than ground transport business travel distance covered in the same year by an employee. The dominance of long-haul flights is again due to the increased distance, but it is also a reflection of the global importance of the University and the importance of global collaboration in its activities.

Overall, air travel results in emissions in the region of 14,721 t CO_2e. Average flight distance of a transatlantic flight to Chicago in the US is around 6,362 kms resulting in 1,441 kg of CO_2e. Therefore a return flight would incur emissions of around 2,882 kgs of CO_2e. This would suggest that the overall air travel emissions of 14,721 t CO_2e represent the emissions generated by about 5,108 transatlantic return flights to Chicago. Based on the University having 1,660 academic staff (and presuming that the majority of flights are made by these staff), each member of staff therefore takes on average about 3 of these representative transatlantic return flights. The table below presents this measure for additional representative flight numbers for shorter and longer trips to allow comparison.

Table 9 – Number of representative flights per a member of academic staff.

	Return flight		Avg representative flights	Avg return flights per academic staff
	kms	kg CO2e		
Chicago, USA	12,724	2,882	5,107	3
Rome, Italy	2,894	557	26,430	16
Beijing, China	16,300	3,692	3,987	2

4.6.2. Commuter Travel

HESA requirements for reporting emissions from commuter travel are divided into student and staff commuting, and then by mode of travel. Emissions associated with student commuting are assumed to be zero, as they are not considered to be material (see section 3.3.5). Emissions from staff commuting account for about 5% of the total Scope 3 CO_2e emission totalling 8341 tonnes CO_2e per year. The breakdown of emissions associated with staff commuting is shown, by mode, in Figure 12.

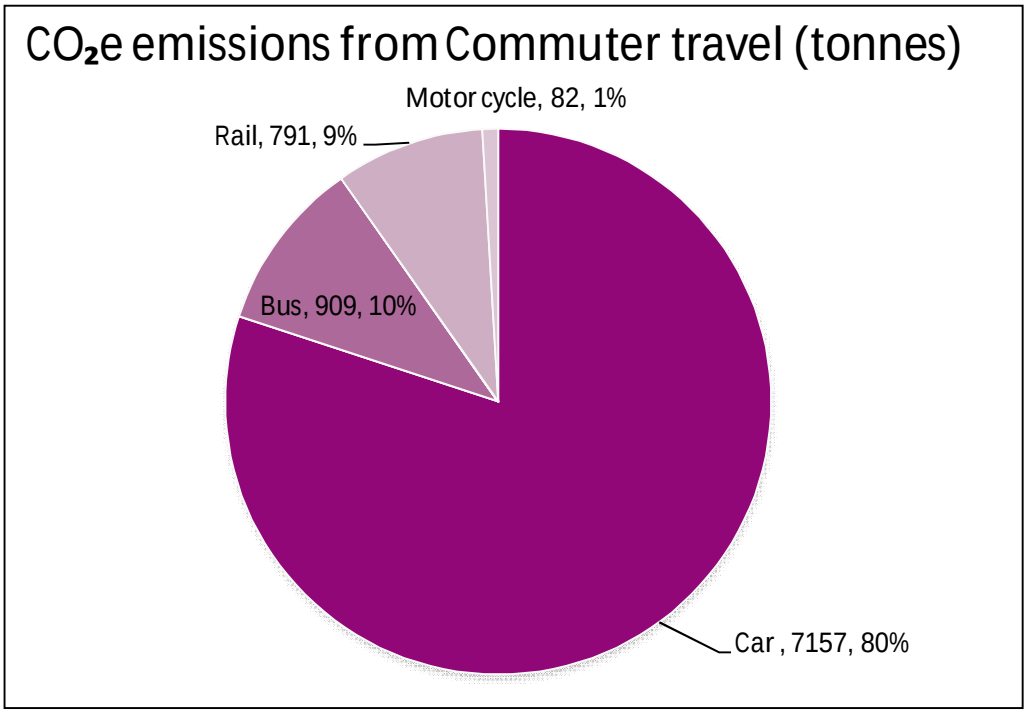

Figure 12: Breakdown of Scope 3 CO_2e emission (tonnes) from staff commuter travel by travel mode

The staff's commuting emissions are dominated by private car use which accounts for 80% of the emissions, or approximately 7,000 tonnes per year. The emissions from bus and rail are both similar at around 10% each.

The emissions calculated for commuting and business travel show significantly different modal splits, as expected. Figure 13 below shows a bar chart of the total CO_2e emissions for each mode of travel from commuting and business.

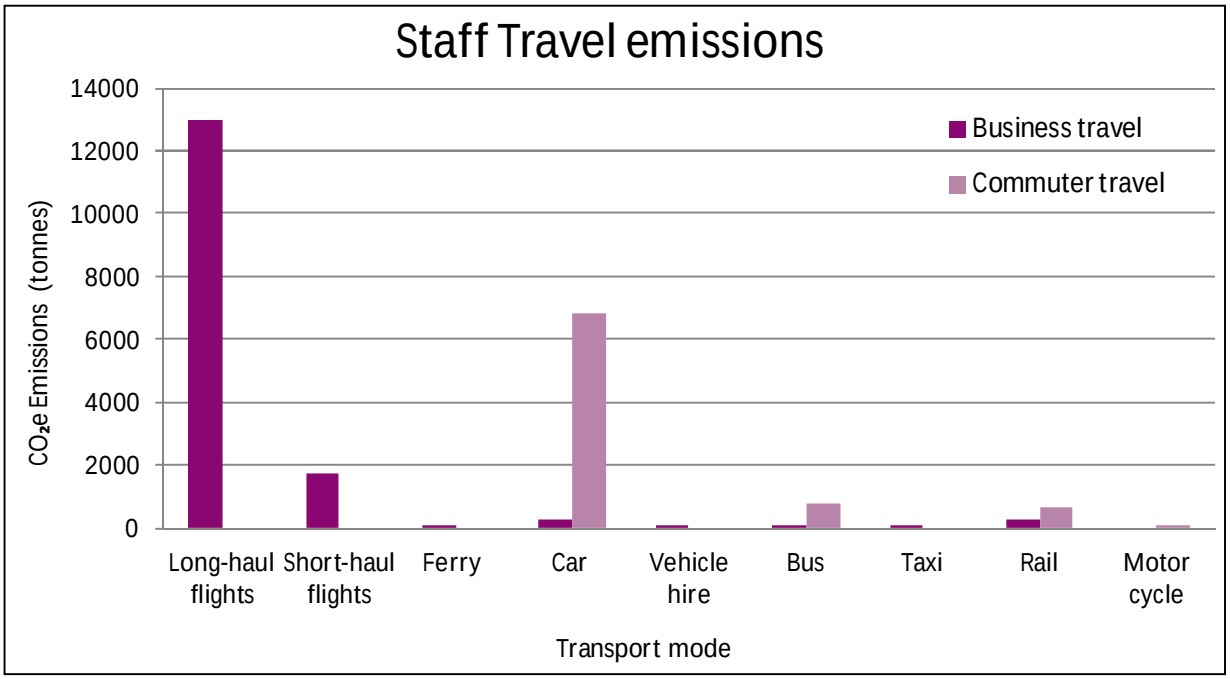

Figure 13: Comparison of business and commuter CO_2e emissions (tonnes) from travel, by mode

4.6.1 Well to tank and transmission and distribution emissions

Well to tank (WTT) and Transmission and Distribution (T&D) emissions account for around 10% of the Scope 3 emissions, or 7% of overall emissions.

These are indirect emissions arising from the consumption of fuels and electricity which are reported separately in Scope 1 and Scope 2 categories. Whilst they make an important contribution to Scope 3, the reduction in their size will depend on two factors outside of Scope 3:

- The size of these emissions is directly proportional to the Scope 1 and Scope 2 fuel and electricity consumption. Therefore reduction in energy consumption will result in a reduction in these emissions.
- The emissions arise out of inefficiencies in energy supply and distribution, which is a national scale issue and outside of the control of the University. Therefore national scale improvements to the energy supply and distribution infrastructure may result in greater efficiency, and therefore reduce these emissions.

Whilst these emissions are included in Scope 3, it is recommended that the University also consider them when reporting in Scope 1 and 2 as they are directly attributable to these reporting sectors.

4.7 Comparative overview with other Universities

Scope 3 emissions represented about 70% of the total CO_2e emissions from the University in the 2012 / 13 financial year. This is similar to other institutions such as Oxford University, which reported 68% Scope 3 emissions in 200910 and UCL (University College London), which estimated in the region of 69% of Scope 3 emissions in 2011/12.

Oxford University reported that in 2009/10[27], 385 t CO_2e (0.5% of total emissions) were from energy used in extraction, treatment and delivery of water, and treatment of effluent. This compares with 0.1% of total reported in 2012/13 by the University of Cambridge for water emissions (278 t CO_2e).

UCL reported 135,517 t CO_2e corresponding to Scope 3 emissions out of 1,96,408 t CO_2e total in 2011/12.

Table 10 shows following shows a comparative breakdown of these with the University of Cambridge:

Table 10 – Comparison of University of Cambridge to other institutions.

t CO2e (2011/12)	UCL		University of Cambridge[28]	
Water	395	0.3%	278	0.2%
Waste	813	0.6%	5,179	3.5%
Procurement	128,647	95%	125,944	85.8%
Travel	5,558	4.1%	15,485	10.5%
Total Scope 3	135,517		146,886	

Table 11 shows the HEFCE estimated figures for t CO_2 for several sectors from their research into a carbon reduction target and strategy for Higher Education in England[29] (as updated in 2010) and how these compare with the t CO_2e (note that these figures exclude Procurement to allow comparison):

Table 11 – Comparison of UoC emissions with HEFCE research.

	HEFCE estimates 2006 (t CO_2)	UoC 2012/13 (t CO_2e) (excluding procurement)
Water	<1%	0.2%
Waste	~1%	4.3%
Business Transport	4%	13%
Air Travel	13%	
Staff Commuting Travel	8%	7%

For Procurement, HEFCE estimated that around 50% of total emissions may fall within this category which closely matches the 51.4% of total emissions calculated for the University of Cambridge.

27 http://www.admin.ox.ac.uk/media/global/wwwadminoxacuk/localsites/estatesdirectorate/documents/environment/Water_Management_Strategy.pdf

28 % figures here exclude calculated emissions by the University of Cambridge of 10% for well to tank processes to allow comparison with UCL breakdown

29 http://www.hefce.ac.uk/data/year/2009/researchintoacarbonreductiontargetandstrategyforhighereducationinengland/

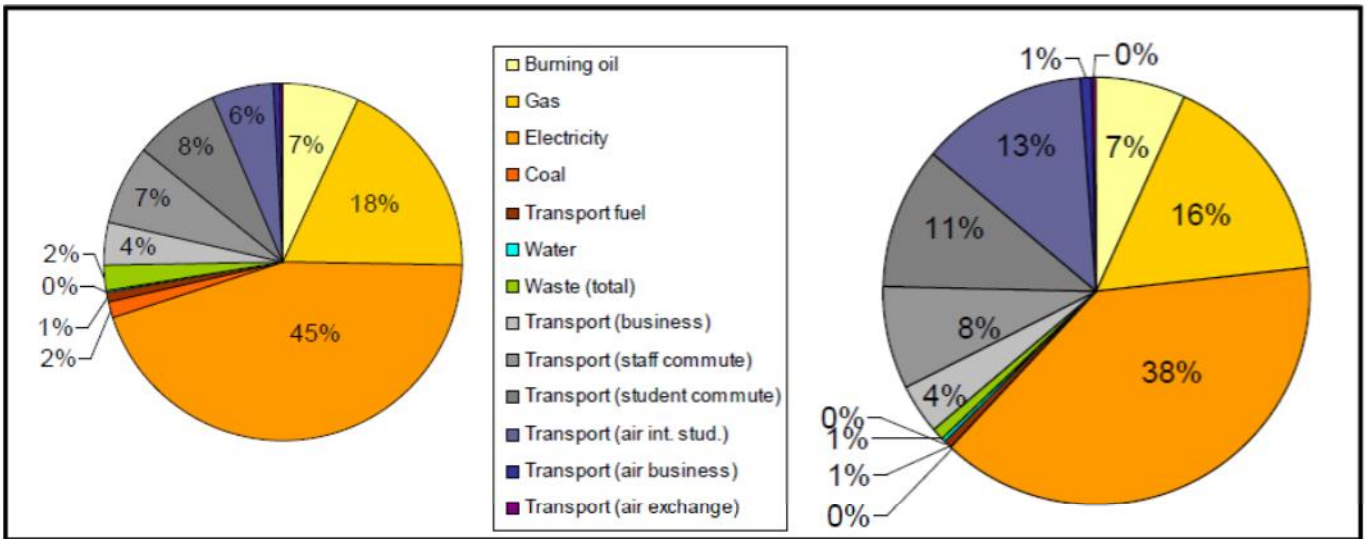

Figure 14: HE sector carbon emissions baseline – breakdown in 1990 (left) and 2006 (right). Source – see footnote 29.

4.8 Estate Management Reporting to HESA

The table below summarises all Scope 3 emissions for reporting to HESA in the format required for completion of the Estate Management Record for FY 2012-2013. All emissions are for CO_2e and reported in tonnes.

Table 12 - Scope 3 CO_2e emissions reporting for HESA.

Scope 3 carbon emissions from business travel		CO_2e emissions (tonnes)	Accurate (A)/ Estimate (E)?
Scope 3 carbon emissions from business travel air	EC3CEBTA	14722	E
Scope 3 carbon emissions from business travel rail	EC3CEBTR	283	E
Scope 3 carbon emissions from business travel grey fleet	EC3CEBTGF	364	E
Scope 3 carbon emissions from business travel leased pool cars	EC3CEBTLC	0	A
Scope 3 carbon emissions from business travel company cars	EC3CEBTCC	0	A
Scope 3 carbon emissions from business travel leased motorcycles or mopeds	EC3CEBTLM	0	A
Scope 3 carbon emissions from business travel leased vans	EC3CEBTLV	0	A
Scope 3 carbon emissions from business travel leased buses	EC3CEBTLB	0	A
Scope 3 carbon emissions from business travel public bus	EC3CEBTPB	8	E
Scope 3 carbon emissions from business travel underground	EC3CEBTU	0	E
Scope 3 carbon emissions from business travel tram	EC3CEBTT	0	E
Scope 3 carbon emissions from business travel taxi	EC3CEBTTX	103	E
Scope 3 carbon emissions from business travel coach	EC3CEBTCC	5	E
Scope 3 carbon emissions from business travel ferry	EC3CEBTF	0	E

Scope 3 carbon emissions from staff commuting

Scope 3 carbon emissions from staff commuting by air	E3CESCA	0	A
Scope 3 carbon emissions from staff commuting by rail	E3CESCR	659	E
Scope 3 carbon emissions from staff commuting by trams	E3CESCT	0	A
Scope 3 carbon emissions from staff commuting by underground	E3CESCU	0	E
Scope 3 carbon emissions from staff commuting by public bus	E3CESCPB	790	E
Scope 3 carbon emissions from staff commuting by coach	E3CESCC	0	A
Scope 3 carbon emissions from staff commuting by car	E3CESCCA	6816	E
Scope 3 carbon emissions from staff commuting by taxi	E3CESCTX	0	E
Scope 3 carbon emissions from staff commuting by motorcycle or moped	E3CESCM	75	E
Scope 3 carbon emissions from staff commuting by ferry	E3CESCF	0	A

Scope 3 carbon emissions from student commuting

Scope 3 carbon emissions from student commuting by air	E3CESTA	0	A
Scope 3 carbon emissions from student commuting by rail	E3CESTR	0	A
Scope 3 carbon emissions from student commuting by trams	E3CESTT	0	A
Scope 3 carbon emissions from student commuting by underground	E3CESTU	0	A
Scope 3 carbon emissions from student commuting by public bus	E3CESTPB	0	E
Scope 3 carbon emissions from student commuting by coach	E3CESTC	0	A
Scope 3 carbon emissions from student commuting by car	E3CESTCA	0	E
Scope 3 carbon emissions from student commuting by taxi	E3CESTTX	0	E
Scope 3 carbon emissions from student commuting by motorcycle or moped	E3CESTM	0	E
Scope 3 carbon emissions from student commuting by ferry	E3CESTF	0	A

Scope 3 carbon emissions from supply chain

Scope 3 carbon emissions from supply chain business	E3SCBS	11271	E
Scope 3 carbon emissions from supply chain paper products	E3SCPP	4900	E
Scope 3 carbon emissions from supply chain other manufactured products	E3SCMP	16114	E
Scope 3 carbon emissions from supply chain manufactured fuels, chemicals, and gases	E3SCMFCG	10190	E
Scope 3 carbon emissions from supply chain food and	E3SCFC	9962	E
Scope 3 carbon emissions from supply chain construction	E3SCCON	35918	E
Scope 3 carbon emissions from supply chain information and communication technologies	E3SCICT	12272	E
Scope 3 carbon emissions from supply chain waste and water	E3SCWW	2532	E
Scope 3 carbon emissions from supply chain medical and precision instruments	E3SCMPI	14269	E
Scope 3 carbon emissions from supply chain other	E3SCOTH	5806	E
Scope 3 carbon emissions from supply chain unclassified	E3SCUNC	2711	E

Scope 3 carbon emissions from waste

Non-residential scope 3 carbon emissions from waste	E3NRCEW	5179	E
Residential scope 3 emissions from waste	E3RCEW	0	E
Total scope 3 emissions from waste	E3CEWT	5179	E
Method of scope 3 carbon emissions from waste	MethodofScope3CarbonEmissionsFromWaste	M - Medium Approach	

Scope 3 carbon emissions from wastewater treatment

Total scope 3 carbon emissions from wastewater treatment	E3CEWWTT	183.9	A

Scope 3 carbon emissions from water supply

Non-residential scope 3 emissions from water supply	E3NRCEWS	94.0	A
Residential scope 3 emissions from water supply	E3RCEWS	0.0	A
Total scope 3 emissions from water supply	E3CEWST	94.0	A

5 Recommendations

5.1 Introduction

AECOM have identified that the University collects a large amount of information and data which can be used for Scope 3 CO_2e emissions calculation and reporting. However the data available is not designed for Scope 3 CO_2e emissions calculations or reporting, and we have therefore made a number of recommendations for improving the process.

It is important that there is a balance between the quality of data available (and the resultant quality of the Scope 3 estimates) and the process required to obtain this data. Virtually all of the data used is derived from other data capture processes (for example, transport analysis, or finance systems), and the collection of data for Scope 3 calculations should not place an undue burden on these other processes.

In this section, a number of recommendations are made for future data collection and calculation of emissions. These recommendations are designed to improve the quality and reliability of the data collection, but also to help simplify the assessment process. There are two main types of recommendation:

- Those which propose increased detail of information, data collection or monitoring to improve the accuracy and completeness;
- Those which propose different methods for collection to make the current monitoring more robust, manageable and consistent with current reporting requirements.

The recommendations therefore aim to achieve the main reporting principles set out in the Greenhouse Gas Protocol reporting guidance:

- Relevance
- Completeness
- Consistency
- Transparency
- Accuracy

Whilst all data could potentially be improved a balance needs to be struck between the effort required to improve data and the outcome from the changes. For example, small changes to data collection for procurement could allow important insight into the procurement emissions, the largest single CO_2e sector of the University. However changes of any magnitude to the water data collection process will have a negligible impact on the Scope 3 emissions. There may of course be benefits of improving data collection for other purposes (such as understanding water efficiency) which could then allow refinement of the Scope 3 calculations.

5.2 Recommendations by sector

The following table lists a number of recommendations for the collection of data for Scope 3 reporting. Alongside the recommendation, the following information is provided:

- Role/responsibility: Who is responsible for this information, who would be affected if the recommendation were put in place.
- Importance: Impact of recommended measure in terms of Scope 3 emissions. (This ignores the potential impact for other reporting requirements).
- Difficulty: How difficult will the improvements be to implement and what is the additional burden on the person responsible?

The recommendations presented here are based on AECOM observations made during the data collection process, and on discussions with a range of University Officers consulted with during the data collection process. The practicality of delivering the recommendations has been discussed at a high level with the University Officers, but further work will be required on how and whether they are fully deliverable given budget and time constraints. The majority of recommendations will require additional Officer time for the collection and collation of suitable data. However some items, for example those involving changes to computer systems, will require additional investment. The response from the Officers was generally supportive of improvements to existing systems which would result in greater consistency and centralisation of reporting processes.

Table 13 - Recommendations for future data collection.

	Recommendation	Role / responsibility	Importance (on Scope 3 emissions)	Difficulty to implement
	Waste			
1	Clarification of Defra guidance with HEFCE and HESA, and whether "materials use" emissions should be included or excluded.	Estates Management Environment and Energy Section (E&E),	Medium – this has a small overall impact, but a large impact on waste emissions.	Low – both options are available, but confirmation is required.
2	Current masses for City Council collected waste are estimated from the number of the bins emptied. These are generally full at the time of emptying so the volumes may be reasonable, but the mass is then estimated from these volumes, which is less accurate. The University should carry out a waste audit to take measurements of the waste masses collected and the overall composition of the waste streams. Ideally each stream is collected separately, but a simpler solution is to determine the typical composition of the waste from an audit and apply these proportions to the total mass of waste as an estimate of the mass per stream.	Estates Management facilities team in collaboration with the City Council	Medium	Medium
3	Improved detail of record keeping of non-council waste streams, by recording the composition, mass and method of disposal (recycling, landfill, reuse etc) of all waste. In particular: • Skip waste • Composted waste – food & drink / garden To achieve good details for calculating Scope 3 emissions, use the tables provided for DEFRA emissions factors; each emissions factor relates to a separate category for which the mass of waste should be measured.	Estates Management facilities team	Low	Low
4	The masses of confidential waste sent to shredding are provided clearly, but the method of ultimate disposal of the shredded material is uncertain. The waste disposal method should be verified so that the correct emissions can be calculated.	Estates Management facilities team	Low	Low

	Recommendation	Role / responsibility	Importance (on Scope 3 emissions)	Difficulty to implement
5	Collect centralised data on alternative departmental waste collection schemes. (eg YoYo paper – CUED). Waste management schemes run by individual departments are not currently monitored, but should be included for future reporting, this could for example include collection of paper, metals, batteries etc.	Estates Management facilities and Environment and Energy Section (E&E),	Unknown	Medium
6	City Council collection data is reported on a quarterly basis but the quarters (July to June) are not aligned with the University reporting year (August to July). For better alignment of reporting, the council data should be reported for quarters between August and July, to coincide with the reporting year.	Estates Management, facilities and Cambridge City Council	Low	Low
	Water			
7	Research to determine if 95% water consumed to waste water treatment fraction is reasonable. This could focus in particular on sites and buildings where water is used for irrigation (farm) and mains to drain cooling (laboratories).	Estates management and input from departments on water use	Low	Low
8	Each water meter is named according to the building that it meters, and the four letter University Building Code (from Capri Data). The site code is currently entered manually for each meter, but could be automated in the future using the Building Code mentioned above. When more than one Building Code is being referenced, these should be listed as one per cell so all relevant buildings can be referenced. This would allow for easier checking of the completeness of the dataset.	Estates management	Low (this would have no impact on the CO_2e emissions, but aid the data collection process).	Low

	Recommendation	Role / responsibility	Importance (on Scope 3 emissions)	Difficulty to implement
	Procurement			
9	Greater understanding and functionality of the procurement tool should be targeted to allow analysis and investigation of procurement emissions. Engagement could be made with the procurement department to understand inputs and with HEFCE for future tool development to enable the required modifications to be made. Request for a detailed methodology of the HEFCE toolkit to be published to allow greater understanding by HEIs.	Estates Management Environment and Energy Section (E&E), and procurement.	High – improvements / clarifications in the Procurement tool would impact all HEIs in the largest Scope 3 sector.	High/medium – this is dependent on the ability to engage with HEFCE to modify the model
10	If greater understanding of procurement emissions is required independent of Scope 3 reporting using the HEFCE tool, we recommend the following: • More granular collection of data – by department and expenditure category • Identify major categories for particular emphasis e.g. construction, business services, energy efficient / long life time equipment etc. • Consider alternative conversion factors for emissions.	Estates Management Environment and Energy Section (E&E),	High – this would allow a detailed understanding of the actual emissions of the University	Medium – All in house data
11	Consideration of how travel, waste and utilities are considered in procurement, to reduce the risk of double counting or gaps in reporting, and consistency with other Scope 1,2 and 3 emissions.	Procurement	Medium	Low
	Travel - business			
12	We recommend that all travel expenses are applied for via an online system where the inputs can be controlled and incorrect entries are not permitted. In general, the system should be designed such that the expenses are specific and categorised. Examples of improvements include: • Remove the option of Other/General Travel & Transport from expenses, and require only specific modes to be selected. • Require that all travel expenses are itemised in the correct transport mode. Do not allow the inclusion of other (e.g. subsistence or travel related expenses) in the travel categories for transport modes. Ensure that individual journeys / modes are entered and not bulk	Finance	Medium	Medium – it is understood that whilst these changes may not be significant in terms of Scope 3 reporting, there are wider benefits to the University of a more controlled on-line expenses

	Recommendation	Role / responsibility	Importance (on Scope 3 emissions)	Difficulty to implement
	expenses. • Allow for additional detail on top of the mode of travel, where more detailed DEFRA factors exist. For example if air travel is specified allow users to pick economy or business class. • For coach/bus travel, include 2 categories: one for individual bus tickets and another for whole coach hire as these will have very different spend to distance ratios			system, and so the additional impact of implementation for Scope 3 reporting is probably low.
13	Assessment of data to allow more robust / University specific benchmarks to be developed for conversion of transport data from spend to distance. The current calculation uses a conversion from expenses spend to distance, and then distance to CO_2e emissions using Defra conversion factors. The spend to distance conversions are based on typical figures and improvements in the accuracy of this through additional analysis would improve the quality of the estimates.	Estates Management Environment and Energy Section (E&E), and procurement	Low	Low
14	Select one preferred supplier and encourage / enforce use of this supplier so that emissions calculations can be carried out centrally by a single organisation. Generally travel agencies are able to report in the emissions reasonably accurately as they already have full access to all of the required travel data. The selection of the supplier could be partially made on the basis of the ability to provide Scope 3 data. This spend will also be reported under procurement emissions.	Procurement	Low – may not change emissions, but will aid reporting	Low
15	Consider how information for air travel distance is collected. This can be either through insurance data or expenses / procurement data. Depending on which is most viable to implement, for each air travel journey (insurance event, or flight expense), the following information should be provided using pre-determined drop down boxes: • Type of flight (business/economy) • Departure Airport • Destination Airport (allow for multi-destination journeys by providing several additional cells for start and end airports)	Insurance, finance, procurement.	Medium	Low

	Recommendation	Role / responsibility	Importance (on Scope 3 emissions)	Difficulty to implement
16	Staff should have access to use of a University or departmental Zipcar account so that ZipCar can report on University use. If this is provided, the University could have a policy of not reimbursing personal expenses for Zipcar to encourage use.	Estates Management Environment and Energy Section (E&E),, and Finance.	Low	Low
17	Uni 4 Bus data: The latest research on Uni 4 bus travel patterns was carried out in 2005. This should be updated to ensure it is representative of the current usage. This research should include division of University users into staff and students.	Estates Management Environment and Energy Section (E&E),	Low	Medium
	General			
18	For all information collection, implement a consistent method of allocating data to the department or site from which it arises. The following should be considered: • Using standardised field names for departments • Use of drop down menus • Removing the ability to enter free-text data as much as possible.	All	Low – no direct impact on total emissions , but may aid comparison between departments and year to year	Medium – this is not technically difficult but may impact a number of different systems.

5.3 Process recommendations

The recommendations in Table 13 relate to data collection improvements which may improve both the quality of the Scope 3 calculations and the ease of calculation.

In addition to the specific recommendations, there are some key process recommendations which need to be considered before the next year of calculation for 2013 /14.

These are:

Methodology

The Defra guidance for calculation of Scope 3 emissions from waste has been updated recently, but HEFCE guidance has not been updated to align with these new Defra emissions conversion factors. There is therefore some confusion over the correct method to use as highlighted in this report. It is recommended that the University engage with HESA and HEFCE to clarify this situation, and if necessary encourage revised methodology guidance to be provided. This will ensure certainty in calculation methodology for next year and allow all HEIs to be reporting consistently.

A particular issue is over the inclusion of the “materials use” waste conversion factor under HEFCE guidance, but not under the latest Defra guidance.

Procurement emissions

The University needs to consider the process for the calculation of procurement emissions and whether further analysis of these is important. There are two primary options:

1. To continue using the HEFCE tool for reporting and analysis. The University will need to engage with HEFCE to improve the current tool to allow a more in-depth interrogation of the methodology. The current assessment process is very crude and does not allow for the representation of specific University activities aimed at reducing CO_2e through procurement. It is clear from the work in this study that there is not much information available on the current HEFCE tool and not a great understanding of the tool within HEFCE or HESA, and so suitable and robust documentation will be important.
2. To continue using the HEFCE tool for reporting, but develop a University specific tool or process for the assessment of procurement emissions. This will allow the University to separately assess low CO_2e procurement measures and the impact that these will have on Scope 3 emissions.

Materiality

In a number of instances data has been discounted based on an argument of materiality, where the emissions resulting from the data collected are so small that they do not make a significant difference to the final result, and are therefore not included in the calculation of Scope 3 CO_2e emissions.

AECOM recommend that the University establish specific levels for materiality for each Scope 3 reporting category, to determine which data inputs should and should not be included. These levels could be based on absolute emissions (any figure less the 2 tonnes is immaterial) or emission as a percentage of the total, or each reporting category (0.5% of the total or 1% of the relevant reporting category). This will lead to a more robust method of reporting and will help to prioritise the level of detail required for collection of input data.

5.4 Recommendations for reducing Scope 3 CO_2e emissions

The aim of this study is to collect data, calculate the Universities Scope 3 CO_2e emissions, and make recommendations for future data collection and reporting. The outputs show clearly the significant of Scope 3 emissions in the Universities total CO_2e emissions, and therefore the importance with which the University should place on making reductions in these emissions.

The results in Figure 4 show that procurement emissions represent the largest Scope 3 CO_2e sector, with construction representing the single largest source of procurement emissions and the single largest source of all Scope 3 emissions. Other significant sectors are WTT and T&D, and business travel (which is dominated by air travel).

Based on the dominance of these sectors, these would appear the key sectors to target if any significant reductions are to be made. The following observations are made:

- Procurement (in general). The data and calculations behind these emissions have been discussed in this report, and a greater understanding of these is required. If the University is to use procurement policies to select lower CO_2e products, then this will need to be reflected in the calculations. There may also be scope for reducing overall procurement levels through a greater understanding of resource efficiency within the University.
- Procurement (construction). Construction is the single largest sector within Scope 3. It is not clear from the procurement data provided exactly what the data includes in relation to construction related activities, but the size of the sector highlights its importance. Clearly there is a possible conflict between the Universities growth and modernisation, and the need to try and reduce emissions, and further work is required to both understand this sector in more detail, and assess the potential for improvement.
- WTT and T&D. These emissions are directly related to the Scope 1 and 2 fuel and electricity use emissions. Therefore reductions in Scope 1 and 2 will help reduce them, alongside improvements to national infrastructure outside of the Universities control.
- Business travel (air travel). International collaboration is an important element to the University's academic work, and therefore air travel will often be essential. However there may be scope for using air travel more deficiently when needed, and making use of other forms of communication, and further work should examine the potential for improvements.

Whilst the size of the Scope 3 CO_2e sector may suggest the potential for reduction, further work is required in all areas to assess the policies and measures which may be employed, and the likely level of reduction which may be achieved. The Element 2 report should be referred to for information on reductions in the commuting transport sector.

6 Conclusions

The Scope 3 CO_2e emissions assessment has been produced using a toolkit developed by AECOM and provided to the University for future use. This model has been designed to:

- Provide an assessment of Scope 3 CO_2e emissions broken down by University site (where data is available at a disaggregated level).
- Provide an assessment of Scope 3 CO_2e emissions which is compliant with HEFCE and HESA methodology and guidelines and which generates data for direct reporting for the EMR.
- Allow updating in future years though the addition of new data for each sector.
- Enable the assessment of policy impacts though simple scenario development, allowing the University to examine potential new policies, by adopting a "what if?" approach.

Alongside the toolkit, a training session will be provided to University officers to provide an understanding of the results obtained and facilitate future use of the tool.

The total Scope 3 CO_2e emissions assessment for the University amounts to 170,000 tonnes per year. These results demonstrate that the Scope 3 emissions represent the largest source of CO_2e emissions for the University, making up around 70% of the total annual emissions, when combined with the figures for Scope 1 and Scope 2.

Within the Scope 3 category, the procurement of goods and services is the largest CO_2e emissions sector, with the procurement categories combined accounting for more than half of the University's total annual emissions. This is significant in that the single largest emissions sector is the one which is the least understood in terms of the way it is calculated by the SUPC, and over which the University has least control. A breakdown of the Scope 3 emissions is provided in Figure 15 below.

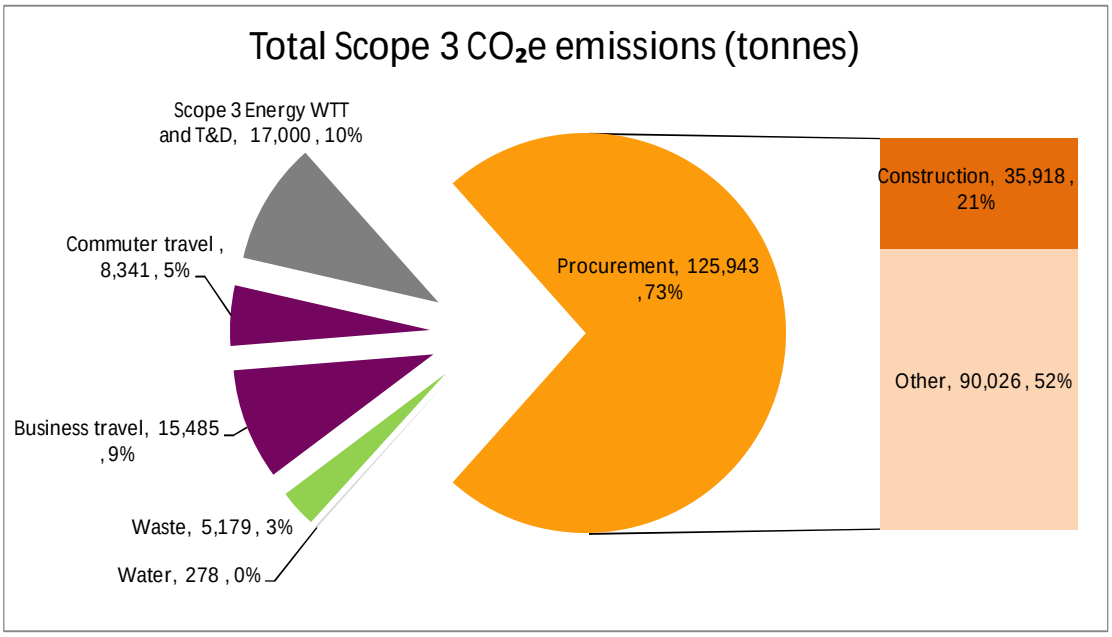

Figure 15: Breakdown in Scope 3 emissions.

Recommendations to improve the data collection and assessment of the Scope 3 emissions have also been provided. These aim to improve the way in which the data is collected in line with the GHGP reporting principles of relevance, completeness, consistency, transparency, and accuracy. Further work is required by the University to assess in detail whether and how these recommendations can be implemented.

In some areas of reporting there is a lack of clarity over the correct methodology to be followed, due to updates in DEFRA guidance since the HESA and HEFCE guidance was written. In each case the options are discussed and the HESA method is followed. However AECOM recommend that there is further clarification with HESA over the reporting methods, as the current error could be up to a 5% over-reporting in Scope 3 CO_2e emissions

The two reports, the Element 1 report and the Element 2 report, together with the development of the data collection and analysis tool and training for University staff in its use successfully deliver the aims of the project.

Appendices

Appendix 1: Overview of Scope 3 emissions toolkit

Introduction

AECOM have developed a calculation toolkit to support the writing of this report, and to be used in future years for reporting of Scope 3 emissions. The toolkit is written in MS Excel 97-2003.

Notes on the methodology and operation are provided within the toolkit. The following sections provide an overview of some of the key functionality and operation modes.

Methodology

The toolkit makes use of the methodology described in this report. Raw or processed input data is imported into the toolkit, and emissions are automatically calculated using in-build Defra conversion factors.

Site analysis

The tool developed by AECOM for the University allows assessment of the emissions across the whole University, and where information is available on a disaggregated basis by site, the results can be viewed for individual sites. For waste, water and commuter travel the emissions are fixed to the geography of the University so it is relatively easy to represent the results on a site by site basis. AECOM has identified 18 separate sites as different geographical areas for the reporting of Scope 3 emissions, where relevant. These are:

- ADC Theatre
- Addenbrooke's / Biomedical Site
- Botanic Gardens
- Centre for Mathematical Studies
- Chemistry
- Downing Site
- Engineering
- Fenners
- Fitzwilliam Museum
- Madingley Rise
- Mill Lane/Silver Street Site
- New Museums Site
- Old Addenbrooke's Site
- Old Schools
- Other Sites
- Sidgwick Site
- University Library
- West Cambridge

For business travel and procurement the emissions are not linked to sites, but to people, so there is little insight to be gained from allocating these emissions to different sites. For these sectors other groupings of emissions are used, such as mode of travel or types of spend for procurement.

The toolkit includes a number of conversion tables which convert the range of dataset site descriptors (site name, department name, school name, building name, building code, etc), into the above sites.

Building use analysis

The toolkit allows the assessment of CO_2e emissions by building use activity type where emissions are associated with buildings. These are:

1. Administrative
2. Catering
3. Farm
4. Laboratory (Academic)

5. Non-Laboratory (Academic)
6. Library
7. Museum
8. Residential
9. Other

The allocation of emissions into the above activity use types makes use of the University's Capri GIS dataset which lists the areas of buildings and rooms in the University estate. For each room or space, the Capri dataset uses a more detailed list of use types, which are then allocated to each of the above 9 activity use types. These are then summed over the sites to allow a pro-rated assessment of emissions.

Whilst the split into functional types does not impact the overall Scope 3 emissions, or even emissions per site, the breakdown may not be perfectly representative per a single use type. For example, the simple area weighted approach will mean that water consumption is the same per m^2 for an administrative building / area as per a laboratory building / area. In reality, the water consumption may be significantly higher per m^2 in the latter.

To overcome this simplification, the toolkit allows the user to introduce a weighting factor for each activity use type, and for each Scope 3 CO_2e emission sector. The factors in the toolkit are all set to "1" and adjustment by the University for future analysis will require some form of analysis to justify any changes.

Commuting transport CO_2e emissions

The calculation of CO_2e emissions for commuting is relatively complex and requires a more in depth assessment of the travel survey, and of travel distances using GIS analysis. Therefore this is conducted in the separate toolkit developed as part of Element 2 which also allows the assessment of a number of policies aimed at improving commuting travel patterns.

The Scope 3 emissions toolkit reads output data from the Element 2 toolkit to include the emissions in the Scope 3 reporting.

Procurement CO_2e emissions

The procurement emissions are calculated in the separate HEFCE procurement calculator tool. The outputs from the HEFCE tool are imported into the Scope 3 toolkit for inclusion in the Scope 3 reporting.

The Scope 3 toolkit also includes a procurement filter which can be used to manipulate the procurement tool input fields, and allow the removal of items which may be double counted. This modified input data is then put in to the procurement tool to produce a modified output.

Policy assessment

The Scope 3 tool includes a "Policy assessment" feature. This allows the user to consider a number of "What If" scenarios where an increase or reduction in emissions category is simulated. The operation of this is based on a simple adjustment of the output data by sector sub-type (eg by waste type), but can be used as a proxy for change in input quantum, CO_2e conversion factor, etc.

Where there is uncertainty over the method of calculation required for Scope 3 reporting, there are also drop down boxes to select the preferred method, for example inclusion of "material use" emissions as part of waste.

Appendix 2: Executive summary from Element 2 report

Introduction

AECOM has been appointed by the University of Cambridge to undertake an assessment of Scope 3 carbon emissions associated with University operations and a more detailed review of emissions related to staff commuting. The scope of this appointment is divided into two parts:

- Element 1 is concerned with the assessment of the overall Scope 3 emissions; and
- Element 2 provides a more detailed review of the emissions related to staff commuting and considers the potential impact the University Travel Plan could have in reducing these emissions.

This report responds to Element 2 of the study, a summary of the Element 1 study is provided in Appendix A and full details of the assessment are available in the separate Element 1 report.

Assessment Approach

The assessment carried out to establish the baseline carbon emissions related to commuting was based on data available at the time of writing and no new surveys were undertaken as part of this study. Data related to existing and past travel habits such as mode of transport and the number of days each week that staff commute to and from the University has been derived from Travel for Work (TfW) survey data.

In order to establish the geographic distribution of staff, home and work postcodes have been obtained from the University. This data has been aggregated into suitable groups for the purpose of analysis and journey distances assessed. Combining this data with the TfW and carbon emission factors per kilometre travelled has allowed the overall commuting related emissions to be calculated.

The emissions factors were obtained from The Department of Energy & Climate Change (DECC)/Department for Environment, Food & Rural Affairs (DEFRA) who provide average conversion factors for the calculation of CO2e emissions for a number of transport modes, which they update each year. In addition to this, for the purposes of Scope 3 emissions assessment, an additional factor is included to cover the emissions related to the transport of the fuel supplies, the Well To Tank (WTT)emissions.

The study also included assessment to ascertain where there may be scope for modal shift and what degree of emission reduction could potentially be brought about by certain levels of shift, particularly away from car travel as the sole occupant of the vehicle. Using Geographic Information System (GIS) software, it was possible to ascertain the extents of the catchment areas for walking, cycling, bus and rail travel and then to subsequently identify the number of home location postcodes within each of these areas.

By comparing the proportions of staff within the potential catchment areas with the current modal shares from the TfW data, the modes where there is greatest and least potential for modal shift can be ascertained.

Results

Based on the assessment contained in this report, the total carbon emissions associated with staff commuting were calculated to be 8,341 tonnes CO2e per annum, equating to an average of 855kg per member of staff each year.

The assessment revealed that car travel as a sole occupant of the vehicle accounted for only 24% of the commuting trips, yet it accounted for 74% of the annual CO2e emissions. This highlights that even a relatively modest modal shift away from car (sole) can result in a significant reduction in carbon emissions.

A review of the potential for modal shift based on historical TfW survey data indicated well-established travel habits with little year-on-year variation in the choice of main mode of travel.

The catchment areas for walking, cycling, bus and rail were identified, allowing the baseline modal shares, to be compared to the maximum potential catchment of each mode (based on accessibility alone). This review concluded that:

a) walking, cycling and bus travel (grouped due to overlapping catchments) are likely to be approaching saturation, especially within the more central City areas, making further modal shift more difficult to achieve; and

b) there is greater potential to encourage modal shift from car to rail, and this could result in significant reductions in commuting-related carbon emissions.

A review of the existing Travel Plan found that it contained a diverse range of initiatives, assigned responsibility and timescales for these initiatives and set overall targets, as would be expected in a successful Travel Plan. However the TfW information related to the Travel Plan revealed that awareness and engagement with the Travel Plan is low. This was also indicated by the relatively low response rate to the TfW survey. Accordingly, the key objectives identified to increase the effectiveness of the Travel Plan are considered to be promotion, raising awareness and increasing staff engagement.

Further Work

The main limitation of the assessment of the carbon emissions is that it is based on the main mode of travel only. In order to refine the study to include all modes of transport that members of staff use between home and work, additional survey data would be required. Such surveys could also collect additional information on car use such as parking locations used and habits amongst car sharers to further refine the assessment.

Ideally this additional information would be collected as part of the TfW survey, however due to the standardised nature of the surveys this may not be possible. In this case, the University would need to undertake/commission its own full travel survey and subsequent analysis, if the assessment is to be refined.

Further study into the effectiveness of existing Travel Plan measures and potential new measures is recommended to ensure targeted funding of Travel Plan initiatives. By engaging with staff through workshop groups or through surveys, the level of interest in existing and potential additional Travel Plan measures could be explored. This study could allow efforts to be focused on Travel Plan measures which are more likely to be adopted by staff and so offer the greatest opportunity to encourage modal shift.

Conclusion

This assessment concludes that staff commuting contributes 8,341 tonnes CO2e per annum to the Scope 3 emissions of the University. Although the University is already achieving high walk and cycle modal shares, there may be scope to further reduce the commuting-related emissions through a reinvigoration of the Travel Plan.