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ARUP

# Breaking New Ground in Higher Education Carbon Footprinting

## Executive Summary

Leicester-based De Montfort University (DMU) has two campuses, 18,000 students, 3,000 staff, and five faculties. Previously DMU measured its carbon footprint based on Scope 1-2 (building energy and travel) emissions - the standard footprint boundary. In 2010 the Higher Education Funding Council for England (HEFCE) published a new national carbon strategy stipulating the measurement of Scope 3 emissions by 2012. Scope 3 comprises indirect emissions resulting from the institution's activities, but which occur from sources not owned or controlled by the institution e.g. emissions from privately-owned halls of residences.

DMU took a pioneering approach by being the first university in England to undertake a full consumption-based footprint and associated interventions study. With experience working on similar studies for the NHS, Arup could offer knowledge and insight for this analytical project that was profoundly unique.

DMU commissioned Arup to calculate baseline greenhouse gas (GHG) emissions for a four year period 2005-09, highlight key carbon hotspots, and identify both quantitative and qualitative interventions. We engaged with eight DMU departments to achieve cross-departmental support.

Arup identified quantitative savings of £350,000 and 800tCO<sub>2</sub>e (tonnes of CO<sub>2</sub> equivalent) per year and also wrote a detailed action plan to enable DMU to meet Level 3 of the Government's procurement Flexible Framework and achieve qualitative organisational benefits.

The five-month project was completed on time and two years ahead of HEFCE's deadline. Scope 3 emissions were found to account for 74% of DMU's total emissions, thereby validating the innovative methodology and approach developed for this study.

## Project and approach

In a recent publication,<sup>1</sup> HEFCE signalled their intent for Higher Education Institutions (HEI) to increase focus on carbon outputs by setting the following HEI sector targets for Scope 1 and 2 emissions<sup>2</sup> reduction (based on 2005 baseline):

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<sup>1</sup> HEFCE (2010). *Carbon reduction target and strategy for higher education in England*, HEFCE.

<sup>2</sup> Based on the WRI/WBCSD GHG Protocol Guidelines refer to [www.ghgprotocol.org](http://www.ghgprotocol.org)

- 12% by 2012
- 29% by 2017
- 43% by 2020

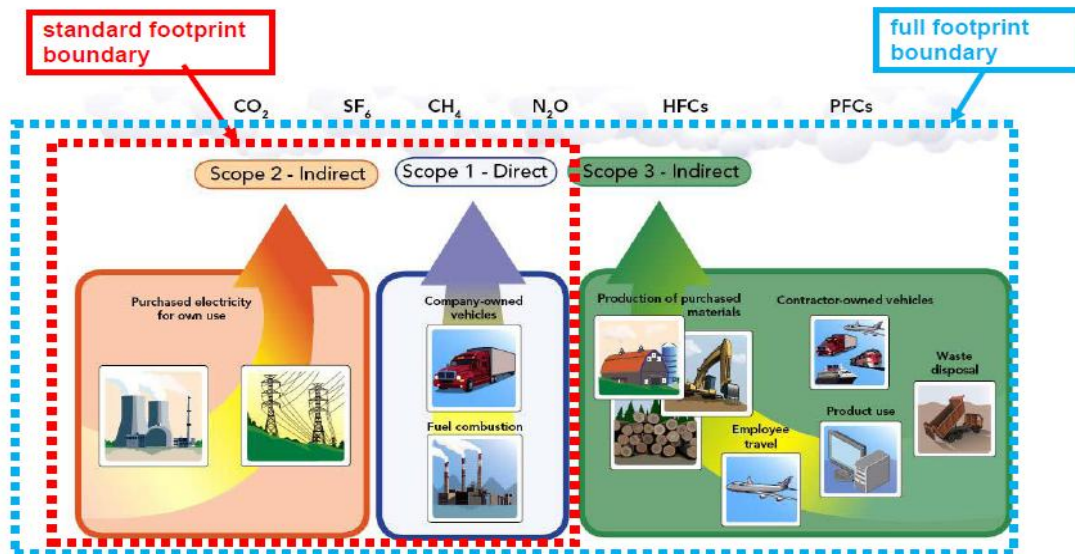
HEFCE expects HEIs to set their own carbon reduction targets, and encourages them to adopt carbon management plans by linking progress of these plans to the Capital Investment Funding (CIF 2),<sup>3,4</sup> introduced from 2011.

HEIs must also commit to monitoring and reporting Scope 3 emissions, including:

- Measuring baseline carbon emissions from procurement by December 2012
- Setting carbon reduction targets by December 2013.

To meet requirements and position themselves as industry leaders, DMU commissioned Arup to undertake a groundbreaking consumption-based carbon footprint study of the University, covering all Scope 1-3 GHG protocol emissions boundaries (see Figure 1).

Figure 1: Scope 1-3 GHG emissions boundaries (adapted from original graphic by Forum for the Future)



<sup>3</sup> HEFCE (2010). Circular letter number 17/2010, *Arrangements for the second Capital Investment Framework*, available at [http://www.hefce.ac.uk/pubs/circllets/2010/cl17\\_10/#annex](http://www.hefce.ac.uk/pubs/circllets/2010/cl17_10/#annex)

<sup>4</sup> HEFCE (2010). *HEFCE Annex A Capital Investment Framework – proposed submission form* available at [http://www.hefce.ac.uk/pubs/circllets/2010/cl17\\_10/cl17\\_10a.doc](http://www.hefce.ac.uk/pubs/circllets/2010/cl17_10/cl17_10a.doc).

Three objectives were developed for Arup:

1. Carbon analysis: Quantify the first total consumption-based carbon footprint for a UK university over the baseline period (2005-8), and identify carbon 'hotspots'
2. Carbon actions: Review possible interventions for carbon hotspots and identify quantitative methods of reducing emissions
3. Case study: Co-author a research paper with DMU using the data and analysis, jointly approach HEFCE with the methodology and lessons learned, and publicise the project to the university sector.

As carbon footprint studies generally result in proposed operational changes, they are often perceived as a threat. To ensure internal support, Arup engaged with key stakeholders to explain the processes and operational benefits, including reducing energy use to release additional funds. This increased understanding ensured enthusiasm and buy-in from DMU, and also facilitated cross-departmental integration.

We arranged weekly telephone meetings to update DMU on project status and held regular face-to-face meetings to maintain consistent communication. The project lasted five months, completing on time and budget in August 2010.

The three distinct project phases are detailed below.

### **Phase 1 (Carbon Analysis)**

Arup estimated a full consumption-based carbon footprint including direct and indirect emissions from three primary emission types: building energy, travel and procurement.

The basic footprint approach remained consistent across all three:

- Step 1: determine consumption (£ spent, km travelled, or kWh used)
- Step 2: derive associated carbon intensities (kgCO<sub>2</sub>e/km travelled, kgCO<sub>2</sub>e/kWh used or kgCO<sub>2</sub>e/£ spent)
- Step 3: multiply consumption by carbon intensity to calculate emissions in kgCO<sub>2</sub>e for each sector and combine to determine the overall total carbon footprint.

### **Building energy emissions**

These relate to 2005-08 consumption of on-site fossil fuels (e.g. for heating) and grid electricity. Emissions were calculated using existing energy consumption data.

### **Travel emissions**

To calculate emissions, we combined travel survey data with modal carbon intensity data (kgCO<sub>2</sub>e/km travelled). We captured data for student and staff commutes, students' annual trips from homes to university accommodation, business travel and visitor travel.

### **Procurement emissions#**

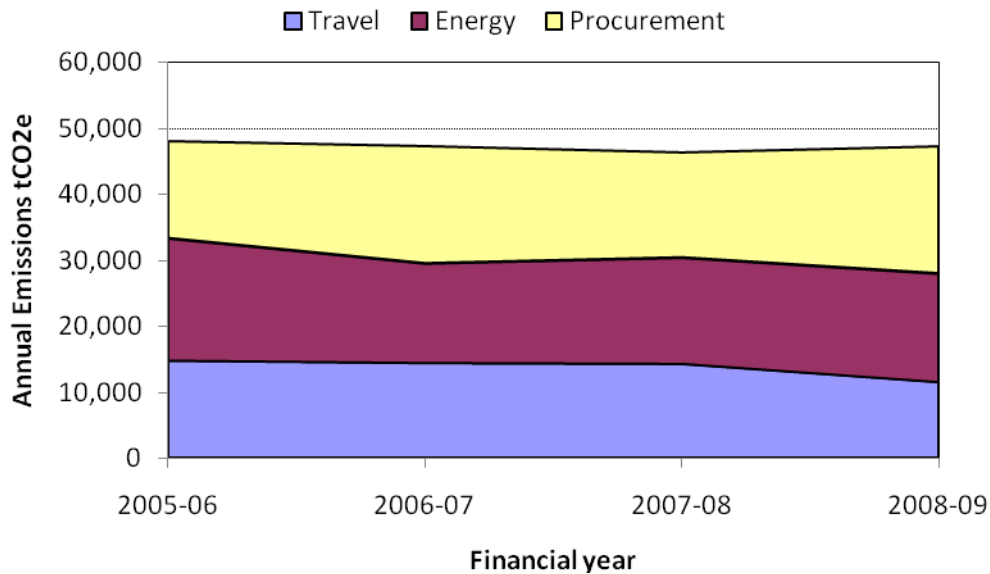
These calculations involved converting DMU goods and services expenditure to equivalent emissions, using the 75 Defra Sector CO<sub>2</sub>e carbon intensities given in the 2009 *Guidelines to Defra / DECC's Greenhouse Gas Conversion Factors for Company Reporting*. Procurement data was gathered from several sources, including DMU's QLX financial management system.

DMU benefitted significantly from Arup’s previous experience in this area, including similar studies for the NHS.

**Phase 1 results**

Overall DMU emissions for 2005-08 remained stable at around 45,000 – 50,000tCO<sub>2</sub>e (see figure 2). However as the estate was reduced following the 2006-7 divestment of their Bedford Campus, this is slightly misleading.

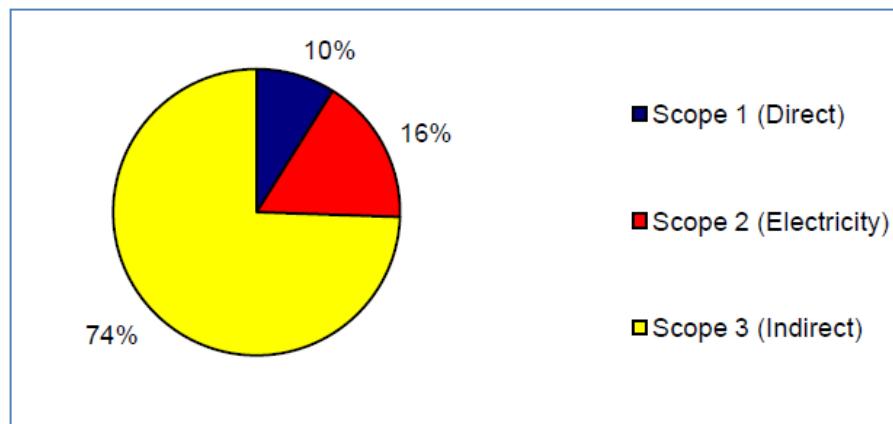
**Figure 2: DMU GHG emissions 2005-08**



Important features of the results included:

- **Building energy:** Electricity emissions were double the gas emissions, indicating that reductions could be achieved through focusing on staff and student behaviour and equipment use, rather than optimisation of gas-fuelled building management systems. Academic buildings were responsible for 25% of all emissions, highlighting the importance of building energy performance in future estates strategies.
- **Procurement:** This was the largest sector, with construction of new buildings contributing to almost half of all procurement emissions and an overall increase of 30% over the 2005-08 time series.
- **Scope 3 emissions:** The importance of Scope 3 emissions (primarily from procurement emissions) is shown in figure 3, demonstrating the validity of the HEFCE’s focus.

**Figure 3: Scope 1-3 GHG emissions showing importance of Scope 3 emissions**



## **Phase 2 (Carbon Actions)**

The assessment indicated the procurement sector had the highest emissions. Building energy and travel emissions had been analysed in previous carbon footprint assessments, and were already included in DMU's future carbon reduction plans, so Phase 2 focused on interventions to reduce procurement emissions.

Working with DMU, Arup developed the procurement study project remit, covering both quantitative and qualitative interventions. Using our ICT resource efficiency specialists to identify potential actions (identified below) in conjunction with DMU was a key differentiator in our service. It allowed us to calculate potential cost and carbon savings by drawing on Phase 1 carbon footprint results. We subsequently issued a questionnaire to key DMU stakeholders and undertook a two-day site visit to enable face-to-face discussions.

Our calculations for quantitative actions indicated that:

- Total annual ICT capital and operational costs could be reduced by 10% by deploying optimised servers, thin client computer equipment, and Multi Functional Device (MFD) printers
- 'Follow-me' printing could save 30% in paper consumption
- Further savings could be made by developing a comprehensive paper and print reduction strategy encouraging re-use of paper and recycled toner cartridges, and discouraging unnecessary printing.

Qualitative actions were those identified in procurement processes as leading to improvements which could be linked to the Flexible Framework - a five-step framework introduced by Central Government to encourage public sector organisations to undertake effective sustainable procurement.

Our action plan involved key points covering five areas:

- **People:** e.g. provide procurement training
- **Policy, strategy and communication:** e.g. develop and introduce a communication programme to staff and key suppliers
- **Procurement processes:** e.g. undertake organisational expenditure analysis
- **Engaging suppliers:** e.g. introduce supplier engagement programme
- **Measurement and results:** e.g. conduct detailed appraisal of sustainability impacts of procurement activities.

### Phase 3 (Case study)

Arup subsequently co-authored several case study papers with DMU, detailing data and analysis from the studies and the methodology for obtaining procurement emissions. It was clear that Arup's pioneering approach, developed with DMU's support, could benefit other universities. It was therefore important to publicise the project within the university sector:

1. Arup co-authored an article with DMU entitled '*Measuring carbon performance in a UK Higher Education Institution through a consumption based carbon footprint: De Montfort University Case Study*'. This has been submitted for inclusion in the Journal of Cleaner Production's special issue on 'Sustainability Management Beyond Corporate Boundaries'.
2. Arup also contributed to papers on carbon and interventions studies submitted to The Sustainable Procurement Centre of Excellence (SPCE), and shortly to be published on SPCE's website. The SPCE is an HEFCE-funded, four year project, initiated in October 2009. SPCE aims to make demonstrable changes to the ways HEIs embed sustainable procurement into standard procedures, practices and policies.
3. Following the project's success, DMU and Arup are currently developing a joint-submission to JISC (Joint Information Systems Committee) for follow-on project funding to develop a procurement emissions analysis tool for HEIs.

## Outcomes

DMU is the first UK university to complete a full consumption-based footprint time-series analysis including a high-level interventions assessment of key procurement carbon hotspots. Whilst these results are important to DMU, the overall aim of the study was to investigate the applicability and benefits to other HEIs of adopting a similar approach. As a result, the following key outcomes can be drawn:

- **A low carbon leader:** Arup has helped DMU to complete the Scope 3 emissions baseline assessment two years ahead of HEFCE's deadline, positioning DMU as an industry leader.

- **Analytical robustness:** The strength of the datasets for procurement and building energy indicates this type of analysis could be developed into a toolkit for wider use, increasing the consistency and comparability of results.
- **Real-time, tangible benefits to DMU:**
  1. The quantitative annual cost savings, estimated at £350,000 and 800tCO<sub>2</sub>e annually, have allowed DMU's ICT department to bring forward implementation of these measures.
  2. The carbon footprint results have been embedded into DMU's carbon management action plan.
  3. The qualitative Flexible Framework level 3 action plan is integrated into DMU's carbon management and procurement.
  4. DMU has used the project to publicise its low carbon agenda via case study submissions and the development of follow-on projects.
- **Cross-departmental DMU engagement:** Arup's consistent communication with the diverse project stakeholders (including the Sustainable Development Task Force; the IESD; DMU Estates; DMU Procurement; Campus Services; Building and Projects; the Print Centre; and Information Services and Systems (ISAS) ensured increased collaboration and integration of departments.
- **Engagement with HEFCE:** This is an important study in the area of university consumption-based footprinting. Further discussions have been held with HEFCE to feed back results, assess benefits and facilitate the wider HEI adoption of the consumption-based approach.

## Client testimonials

"We were delighted with the outcomes of the study, which identified significant carbon savings for the University and highlighted the potential to reduce emissions generated through procurement activities. The Arup team was extremely professional and courteous, and their in depth knowledge of the subject area meant they could offer meaningful insight into a project never previously undertaken by a UK University. Universities are very complex, diverse organizations and Arup helped us to break down the barriers between individual departments and develop cross-departmental coordination. This was crucial not only for obtaining the information for the study but also to ensure that each department understood the resulting operational benefits and could implement the necessary changes to reduce the University's carbon emissions."

Karl Letten, De Montfort University