Carbon Brainprint

- Quantifying the impact of universities on carbon footprint reduction
- Final report on HEFCE project LSDHE43
- Cranfield University
- University of Cambridge
- University of Reading

The need for organisations to reduce their carbon footprint is now well accepted. HEFCE has recently published its policy (2010/01) requiring universities to set targets to reduce their greenhouse gas emissions and targeting reductions of 34% and 80% across the sector by 2020 and 2050 respectively. Universities, however, also help other organisations to reduce their own carbon footprints, both through providing existing or potential employees with the necessary knowledge and skills and, more directly, though research and consultancy projects. These reductions cannot be offset against the university's footprint, but the intellectual contribution to reducing the carbon footprint of others, termed their "carbon brainprint", is immensely valuable in meeting the challenge of global warming.

This project aimed to help quantify the HE sector's Carbon Brainprint. It used a set of case studies from Cranfield, Cambridge and Reading Universities to establish a robust, repeatable method, informed by life cycle analysis methods and PAS2050 for carbon footprinting, for calculating and verifying the contribution of universities to reducing greenhouse gas emissions. This method could be applied across the sector to assess the impact of HE intellectual activities.

Guidelines were drawn up at the start of the project and revised as the case studies progressed. These included general principles, based on carbon footprinting standards, appropriate spatial, temporal and conceptual boundaries for brainprint studies, the scope and limits of applicability, appropriate levels of detail, uncertainty analysis and the possible need to attribute the brainprint among project partners. The guidelines set out the main steps in a brainprint assessment: system description, boundary definition, data gathering, assessment of emissions and changes to evaluate the retrospective and prospective brainprint, and uncertainty analysis.

The case studies covered

- Ceramic thermal barrier coatings for jet engine turbine blades, which help to improve engine efficiency and reduce aircraft fuel consumption.
- Novel offshore vertical axis wind turbines that will be able to generate 'green' electricity using less material for construction than conventional designs.
- Improved delivery vehicle logistics to reduce delivery vehicle fuel use in the food sector.
- Training for landfill gas inspectors to capture emissions of methane from landfill sites.
- Intelligent buildings to reduce fuel consumption by both behavioural change and advanced monitoring and control.
- Optimising defouling schedules for oil-refinery preheat trains, to maintain efficiency and reduce the consumption of oil within the refinery.

These included developments that were already implemented in practice, including some where data on the results were available, and others that have yet to be used. All demonstrated the positive effects of research, consultancy or teaching in reducing greenhouse gas emissions, although the scale of the effect varied considerably. The largest totals came from the jet engine

thermal barrier coatings, due to the large quantities of fuel consumed by aircraft engines, and the training of landfill gas inspectors, due to substantial changes in the emissions of a highly potent greenhouse gas. In other cases the unit reductions were smaller, but the potential total effects are large if they are widely adopted.

On the basis of these studies, it seems likely that a relatively small number of projects focussed on applications with high energy or greenhouse gas flows will represent the majority of the brainprint of most institutions. Those where good monitoring data from full-scale application are available will normally be comparatively simple to assess and provide clear results.

The project has demonstrated that it is possible to begin to quantify the impact that universities have on society's greenhouse gas emissions, and that this impact is large. The current annual brainprint of the four projects assessed at Cranfield University is over 50 times the university's own annual carbon footprint.