January 2010/02
Good practice
Guidance

This report is for information

This document offers guidance for institutions on producing individual carbon reduction strategies, targets and associated carbon management plans.

January 2010/02

Carbon management strategies and plans

A guide to good practice

HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND
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Carbon management strategies and plans: a guide to good practice

To	Heads of HEFCE-funded higher education institutions
Of interest to those responsible for	Senior management, Estates, Finance
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Executive summary

Purpose

1. This document provides good practice guidance for institutions on producing individual carbon reduction strategies, targets and associated carbon management plans.

Key points

2. From 2011, HEFCE capital allocations will be linked to carbon reduction. Higher education institutions (HEIs) in England are required to develop individual carbon reduction strategies, targets and associated carbon management plans.

3. HEIs' carbon management plans are required to include:

a. A carbon management policy or strategy – this could be part of a wider environmental/sustainability policy.

b. A carbon baseline for 2005[1] that covers all scope 1 and 2 emissions.[2] This year is being used as a baseline because it is used for reporting against UK targets, and the SQW report[3] demonstrated that robust data for scopes 1 and 2 is available for that year at institutional level. This will provide consistency across the sector against which progress can be

[1] All baselines mentioned in this report are measured on an academic year. For example, a 1990 baseline measures emissions from August 1990 to July 1991 and a 2005 baseline measures emissions from August 2005 to July 2006.

[2] The World Resource Institute developed a classification of emission sources around three 'scopes': 'scope 1' emissions are direct emissions that occur from sources owned or controlled by the organisation, for example emissions from combustion in owned or controlled boilers/furnaces/vehicles; 'scope 2' accounts for emissions from the generation of purchased electricity consumed by the organisation; 'scope 3' covers all other indirect emissions which are a consequence of the activities of the organisation, but occur from sources not owned or controlled by the organisation – for example, commuting and procurement.

[3] In October 2008 consultants SQW were commissioned to undertake work to develop a carbon reduction target and strategy for HE in England. Key aspects of the report are included in 'Carbon reduction target and strategy for higher education in England' (HEFCE 2010/01), available at www.hefce.ac.uk under Publications. The full report 'Research into a carbon reduction target and strategy for higher education in England: a report to HEFCE' is available at www.hefce.ac.uk under Publications/Research & evaluation.

monitored and reported. Institutions are encouraged to measure a baseline for scope 3 emissions and in the longer term we will expect these to be included.

c. Carbon reduction targets. These must:

- cover scope 1 and 2 emissions, although institutions may choose to set additional targets for wider aspects
- be set against a 2005 baseline. Institutions may choose to set their reductions in context by setting additional targets against an alternative baseline year
- be set to 2020, because this is the timescale for interim government targets. This will provide consistency across the sector against which progress can be monitored and reported. Institutions may also set interim milestones
- be publicly available.

d. An implementation plan to achieve absolute carbon emission reductions across scopes 1, 2 and 3 including timescales and resources. These may cover capital projects and actions to embed carbon management within the institution, for example, through corporate strategy, communication and training.

e. Clear responsibilities for carbon management.

f. A commitment to monitor progress towards targets regularly and to report publicly annually.

g. The carbon management plan and targets must be signed off by the governing body.

Action required

4. As part of the second Capital Investment Framework, HEIs will be asked in June 2010 to confirm that they have carbon management plans which meet the requirements detailed above. Further information on the second Capital Investment Framework is contained in 'Capital Investment Framework: consultation on the assessment process' (HEFCE 2009/48).

1: Introduction

1.1 In the 2008 Climate Change Act (CCA), the UK Government committed to a long-term carbon reduction target of 80% by 2050 against 1990 levels, with an interim target of a 26% reduction by 2020. The 2009 budget increased this to 34% by 2020. A further increase to 42% has been recommended by the Committee on Climate Change (CCC).

1.2 The Department for Innovation, Universities and Skills' grant letter to HEFCE for 2009-10 required the higher education (HE) sector in England to implement a carbon reduction target of at least 80% by 2050 against 1990 levels. HEFCE has announced[4] that, from 2011, capital allocations will be linked to carbon reduction. HEFCE, Universities UK and GuildHE have published their 'Carbon reduction target and strategy for higher education in England' (HEFCE 2010/01).[5] Institutions are required to develop individual carbon management plans and to report on progress and the results achieved.

1.3 This guidance, written by SQW Consulting, aims to help institutions to develop a carbon reduction strategy, targets and associated carbon management plan. Illustrative examples of current practice from individual higher education institutions (HEIs) have been provided at various points throughout this document, drawing on case study material from research by SQW Consulting.

Carbon emissions from the HE sector

1.4 The UK greenhouse gas (GHG) emissions baseline for 1990[6] follows the Intergovernmental Panel on Climate Change (IPCC) methodology and definitions, using the broad categories of: energy; industrial process and product use; land use; and waste. Carbon dioxide (CO_2) is the dominant GHG mainly on the basis of the large volumes emitted into the atmosphere. Therefore, for baselining purposes, all GHGs are converted into carbon dioxide equivalent (CO_2e) on the basis of their greenhouse effect potential.

Table 1-1 **Carbon emission sources from the HE sector**

Source	Description	
Energy – fossil fuel combustion (gas, coal, oil) and electricity use	Building related: • Non-residential buildings – teaching, research, catering, sports, other • Residential buildings – student and staff accommodation Non-building related: • Campus lighting, sports grounds	
Transport	Land transport – car, rail, bus, other Air travel – domestic flights, international flights	Includes: Institutions' own vehicle fleet Business travel – management, research, teaching Commute – staff and students
Other	Water, waste, procurement (assets, goods and services), land use	

Source: SQW Consulting

4 'Sustainable Development in Higher Education: 2008 update to strategic statement and action plan' (HEFCE 2009/03). Available at www.hefce.ac.uk under Publications/2009.

5 Available at www.hefce.ac.uk under Publications/2010.

6 As submitted to the United Nations Framework Convention on Climate Change.

1.5 The HE sector, due to the nature of its operations, predominantly and directly emits carbon and to a much lesser extent other GHGs, often indirectly, such as methane (CH_4). Key sources of carbon emissions from the HE sector are listed in Table 1-1.

1.6 The World Resources Institute (WRI) developed a classification of emission sources into three scopes[7] (descriptions of which sources fall into which 'scope' are in Table 1-2). This approach has been widely adopted, including by the UK Government. Table 1-2 shows total CO_2 emissions attributable to the HE sector for 1990 and 2006.

[7] Source: The Greenhouse Gas Protocol – A corporate accounting and reporting standard (World Resources Institute 2004).

Table 1-2 **HE sector carbon emissions – scopes 1, 2 and 3 (1990, 2006)**

Scope	Description	Examples	HE sector
Scope 1: Direct emissions	Direct emissions occur from sources that are owned or controlled by the HEI	Direct fuel and energy use Transport fuel used in institutions' own vehicle fleets	**1990: total CO_2 equivalent – 1.831 $MtCO_2$** Of which: 1.110 $MtCO_2$ from electricity (61%), 0.498 $MtCO_2$ from gas (27%), 0.173 $MtCO_2$ from burning oil (9%) and 0.037 $MtCO_2$ from coal (2%); and 0.013 $MtCO_2$ from direct transport emissions (1%) **2006: total CO_2 equivalent – 2.124 $MtCO_2$** (16% increase compared with 1990)
Scope 2: Electricity indirect emissions	Emissions from the generation of purchased electricity consumed by the HEI	Purchased electricity	
Scope 3: Other indirect emissions	Scope 3 emissions are a consequence of the activities of the HEI, but occur from sources not owned or controlled by the HEI	Water Waste Land-based business travel Commuting (both staff and students) Air travel (international students; international student exchange; business	**1990: total CO_2 equivalent – 0.717 $MtCO_2$** **2006: total CO_2 equivalent – 1.237 $MtCO_2$** (73% increase compared with 1990)
		Procurement	Not assessed at sector level

Sources: SQW Consulting, WRI 2004

What does this mean for HEIs?

1.7 Rising energy costs, changes in public perception and awareness of climate change, and the policy context provided in our sustainable development strategy (HEFCE 2009/03) all support the case for carbon reduction investment decisions in institutions.

1.8 The HE sector has an important role to play in addressing carbon emissions, both as an educator and as an employer. There is considerable appetite from within the sector to minimise carbon emissions: almost 70% of respondents to the consultation on our 2008 sustainable development strategy[8] supported the development of a carbon strategy for the sector.

1.9 The sector is hugely diverse:

- in terms of physical attributes – size of institution, type (and age) of estate, geographical location (urban or rural; campus-based or dispersed)
- in terms of focus – institutions vary widely in area and degree of specialism, and in the relative balance between research and teaching.

8 'Sustainable development in higher education: Consultation on a 2008 update to strategic statement and action plan' (HEFCE 2008/18). Available at www.hefce.ac.uk under Publications/2008.

1.10 These variations have a significant impact on the scale of institutional carbon emissions and also affect institutions' potential to reduce emissions. Institutions must develop their own carbon reduction targets based on their particular circumstances and ambitions.

1.11 Institutional engagement with the carbon reduction agenda varies. Some institutions already have targets for increasing energy efficiency or reducing CO_2 emissions. A small number have targets for reducing waste, water consumption and/or emissions from road vehicles.

1.12 The diversity of HEIs, along with recognition of their autonomy, makes unilateral recommendations for institutions through a sector-wide strategy inappropriate. This guidance provides advice to institutions across the sector. It is expected that individual institutions will implement carbon reduction initiatives in different ways.

What are HEFCE's requirements?

1.13 From 2011, capital allocations will be linked to carbon reduction. HEIs in England are required to develop carbon management plans that include:

a. A carbon management policy or strategy – this could be part of a wider environmental/ sustainability policy.

b. A carbon baseline for 2005 that covers all scope 1 and 2 emissions. This year is being used as a baseline because it is used for reporting against UK targets, and the SQW report demonstrated that robust data for scope 1 and 2 is available for that year at institutional level. This will provide consistency across the sector against which progress can be monitored and reported. Institutions are encouraged to measure a baseline for scope 3 emissions and in the longer term we will expect these to be included.

c. Carbon reduction targets. These must:
   - cover scope 1 and 2 emissions, although institutions may choose to set additional targets for wider aspects
   - be set against a 2005 baseline. Institutions may choose to set their reductions in context by setting additional targets against an alternative baseline year
   - be set to 2020, because this is the timescale for interim government targets. This will provide consistency across the sector against which progress can be monitored and reported. Institutions may also set interim milestones
   - be publicly available.

d. An implementation plan to achieve absolute carbon emission reductions across scopes 1, 2 and 3 including timescales and resources. These may cover capital projects and actions to embed carbon management within the institution, for example, through corporate strategy, communication and training.

e. Clear responsibilities for carbon management.

f. A commitment to monitor progress towards targets regularly and to report publicly annually.

g. The carbon management plan and targets must be signed off by the governing body.

High-level carbon targets and delivery mechanisms

1.14 A large number of institutions are or will be required to participate in national-level schemes – the EU Emissions Trading Scheme (EU ETS) and the UK Carbon Reduction Commitment Energy Efficiency Scheme (CRCEES).

1.15 The EU ETS[9] is a cap and trade mechanism targeted at large energy intensive sectors and facilities, and covers individual combustion plants of over 20 MW thermal capacity. About 20 English institutions meet this criterion and participate in the scheme, which involves detailed carbon baselining, monitoring and reporting for combustion plants (these typically include large boilers and combined heat and power (CHP)).

9 For more information on the EU ETS, see www.defra.gov.uk under Climate change and energy/Action in the UK/Business/Emissions trading.

10 For more information on the CRCEES, see www.defra.gov.uk under Climate change and energy/Action in the UK/Business.

1.16 The CRCEES[10] is a new scheme that will be launched in 2010, targeting large (but non-energy intensive) organisations in the private and public sectors. The qualifying criterion will be annual electricity consumption in 2008 of 6,000 MWh of half-hourly metered electricity. Over 80 institutions in England are likely to be included in this group. Participants will be required to baseline, monitor and report on direct carbon emissions from electricity, gas and other fuels. Participants will have to purchase allowances equivalent to their carbon emissions each year, with allowances starting to be capped (i.e. a carbon reduction requirement) from April 2013.

1.17 This guidance has taken these national cross-sector initiatives into account, and has also considered the requirements of the Carbon Trust's Higher Education Carbon Management (HECM) Programme. The latter, in particular, has developed a detailed methodology and range of tools for producing and implementing sound carbon management strategies and plans for HEIs. The guidance presented in this document is compatible with the above initiatives. Further information and support on these and other initiatives is signposted in Chapter 4.

1.18 When setting and reporting against carbon reduction targets in the HE sector context and HEFCE's capital funding requirements, HEIs will not be able to use trading to offset[11] their emissions. HEIs may, however, carbon trade to meet their other statutory obligations and minimum requirements, such as under the EU ETS and UK CRCEES and any future legal requirements. Carbon offsetting is discussed further in Appendix C.

Self-assessment questions

1.19 The questions below identify areas which institutions should consider when developing a carbon reduction strategy and management plan.

11 Carbon offsetting is defined as '…compensating for [one's] unavoidable [GHG] emissions by paying someone else to make an equivalent GHG saving'. DECC 2009, UK Government Quality Assurance Scheme for Carbon Offsetting.

Table 1-3 **Self-assessment questions for HEIs**

Theme	Questions
Strategic fit and	Do the carbon reduction strategy and management plan reflect the institution's type, size and estate? Do they take an optimal approach allow for change over time?
	How does the plan support the institution's strategic objectives?
	How has the carbon reduction strategy been incorporated into wider institutional strategy?
Stakeholder involvement	How are governors, staff, students and external stakeholders involved in the process of developing the strategy and plan, and in implementing their recommendations?
	Has the institution identified champions for carbon reduction including at governing body level?
Content and format	Are the strategy and plan clear and easy to understand?
	Do they contain all necessary information?
Resourcing	Is responsibility for carbon management clear?
	Are sufficient resources available (staff time and funding)?
	Are existing resources and data collection methods used appropriately?
Options appraisal	Are the approach and underlying rationale for developing the strategy and plan clearly set out?
	Has the institution critically examined a wide range of options and identified the most appropriate ones?
Monitoring and communications strategy and plan?	Is there a clear process and timetable for monitoring and revising the
Partnership and sharing good practice	Has the institution worked with other HEIs and partners to inform its strategy and plan?
	Does the plan build on existing activities and good practice?

Source: SQW Consulting

2: Process and key elements of a carbon management strategy and plan

2.1 HE institutions in England are required to develop a carbon management strategy. This should include a high-level strategic statement, with objectives and targets, as well as a plan providing more detail on how these will be delivered. Institutions have the autonomy to develop their own individual and unique strategies and plans reflecting their specific circumstances and requirements.

Developing a carbon management strategy

2.2 Institutions should identify a carbon management strategy.[12] A carbon reduction target and management plan will contribute to this strategy. The strategy needs to outline clearly an institution's overall approach and objectives to reducing its carbon footprint.

2.3 There is no one-size-fits-all approach to developing a carbon management strategy. The content and structure will vary by institution as well as reporting structures and responsibility for implementation. In many cases, the institutional carbon management strategy will form part of a wider environmental/sustainability strategy.

2.4 Institutions should consider how a carbon management strategy will fit within and support existing policies and strategies, as well as what its role will be in delivering certain regulatory obligations (including where appropriate the EU ETS and the UK CRCEES). From an internal HEI perspective, the strategy should be in line with the following:

- overall strategic plan
- estates strategy

Case studies: Senior management buy-in

Case study institutions stressed the need for senior management buy-in to reducing emissions. At Manchester Metropolitan University, a section of the annual report is devoted to sustainability, and the Deputy Vice-Chancellor chairs a Sustainability Investment Board (a decision-making panel), which reports directly to the Executive Board and Directorate (which then report to the Board of Governors). The sustainability board has identified key performance indicators (KPIs) (including Carbon Footprint, investment in Carbon Reduction Projects and Display Energy Certificate scores for each building) against which to monitor further progress.

At the University of East Anglia (UEA), the sustainability group reports directly to the senior management team, which is supportive of environmental decision-making as it supports the university's external profile (both nationally and internationally). Becoming an exemplar low carbon campus is now a headline objective in the Corporate Plan.

At Leeds Metropolitan University, carbon reduction is covered by the Corporate Social Responsibility (CSR) Steering Group which is chaired by the finance director. Energy reductions are reported to the finance and general purpose committee, which reports to the Board of Governors.

At King's College London, the Principal is highly supportive of the carbon reduction agenda and, as such, was recently made a 'London Leader' for sustainability by the Sustainable Development Commission, which has helped to raise the profile of King's within the community.

At Imperial College there is an Energy Group, which works with the Director of Facilities and Director of Building Projects in implementing carbon efficient design and operational practices. As a response to the findings of an Environmental Task Force Working group, set up by the Rector, the College has appointed a Director of Sustainability and is establishing a Corporate Social Responsibility Committee led by College Academics and reporting to the Rector. This will define policy, strategy and promote best CSR practice across the College.

Source: SQW Consulting fieldwork

[12] The strategy should be informed by wider environmental and energy policies. It should include a carbon management plan.

- environmental or sustainability policy
- financial strategy
- procurement policy
- travel plan.

2.5 An effective strategy will require serious commitment and support from senior management and the Governing Body. In most cases, it will be appropriate to develop a carbon management strategy which sets out the overall approach and identifies objectives and targets for reducing carbon emissions. The strategy may cover a wider range of areas than those included in the emissions target.

2.6 The carbon management strategy may be set within an existing environmental, energy management or procurement policy.

How to develop a carbon management plan

2.7 There are a number of stages to developing a carbon management plan and ensuring buy-in. The plan should provide detail on how the institution will get from 'A' to 'B' in reducing emissions. Institutions should consult with their internal stakeholders (governors, staff and students) and external stakeholders (sector bodies, peers and local communities) in order to capture and build on existing work.

2.8 In considering their carbon management plans, HEIs should also be aware that they are subject to the public sector duties listed within the Race Relations (Amendment) Act 2000, Disability Discrimination Act 2005 and the Equality Act 2006. These laws impose positive duties on all public bodies to promote race, disability and gender equality in everything that they do.

2.9 Stages in developing a plan include:

- identifying objectives
- establishing a baseline
- setting targets
- identifying options
- costing
- prioritisation
- monitoring and reporting.

These are considered in turn below.

Stage 1: Identifying objectives

2.10 The plan should identify how carbon management will contribute to the institution's strategic aims. For example, one institution may wish to be an early adopter of new technologies to support learning; another may see reducing energy consumption as fundamental to sound financial management. Institutions should consult with staff, students and other stakeholders to identify objectives.

2.11 The plan should clearly set out key objectives. For example:

- to measure carbon emissions from the institution's estate
- to identify ways of reducing carbon emissions.

2.12 It should also identify how these objectives will be achieved, and what further benefits can be generated and how.

Stage 2: Establishing a carbon boundary and baseline

2.13 The establishment of a carbon baseline is key to developing a carbon management plan, identifying potential actions and informing wider estate strategies.

2.14 The first step is to define the boundary – which sources of emission will be covered by the target. Scope 1 and 2 emissions need to be included. The inclusion of scope 3 emissions is optional and since these are diverse institutions need to decide which of these it is appropriate to address through the strategy and plan. Nevertheless, some aspects of scope 3 emissions are expected to feature in the carbon management plan.

2.15 Institutions are encouraged to consider including a wide range of activities and their associated emissions. A justification of the choice of the carbon boundary needs to be provided in the plan.

2.16 Establishing the carbon baseline is the next key step. This involves choosing a baseline year and sourcing relevant data to cover the selected scopes of emissions.

2.17 In line with the UK-wide baseline, the HE sector baseline year has been set as 1990 and progress against the sector level target will be measured against this.

Therefore, progress will be recognised where institutions have reduced carbon emissions since 1990.

2.18 However, relevant energy and carbon data at the HEI level going back to 1990 are patchy. The Estate Management Statistics (EMS)[13] were first introduced in 1996 (although response rates were low for the first couple of years). The 'Hull' statistics (which were produced before the introduction of EMS) only cover a limited subset of all current HEIs, as the statistics were compiled on a voluntary basis and only include those institutions that had university status before 1992.

2.19 Institutions should calculate a carbon baseline for 2005 (taken as the 2005-2006 academic year). This will provide consistency across the sector against which progress can be monitored and reported. 2005 is being used as a baseline as this year is used for reporting against UK targets and the SQW report demonstrated that robust data for scope 1 and 2 is available for this year at the institutional level.

2.20 Additionally, institutions may wish to reference their targets against a 1990 carbon baseline for comparative purposes. It is recognised that estimates will vary in their accuracy. For institutions where relevant 1990 data are available from the 'Hull' statistics, more accurate estimates can be produced. For others, several methods can be employed including back-casting and top-slicing from the sector baseline.

Table 2-1 **Defining the boundary: scopes 1, 2 and 3**

Scope	Includes	Inclusion in baseline and target
Scope 1: Direct emissions from sources that are owned or controlled by the institution. These include emissions from combustion in institution-owned or controlled boilers, furnaces, vehicles, and so on; and emissions from chemical production in institution-owned or controlled process equipment. Direct CO_2 emissions from the combustion of biomass are not included.	Emissions from energy use (within the estate) from fossil fuel (gas, coal, oil) combustion (scope 1) and electricity use (scope 2). This includes energy used for conferences, summer schools and so on. It should include building-related energy use (residential buildings including staff and student accommodation, and non-residential buildings including teaching, research, catering, and sports buildings) and non-building related energy use (for example campus lighting, sports grounds maintenance and lighting). Transport emissions from the institution's own vehicle fleet (scope 1).	Mandatory
Scope 2: Emissions from the generation of purchased electricity consumed.		Mandatory
Scope 3: Other indirect emissions. Scope 3 emissions are a consequence of the activities of the institution, but occur from sources not owned or controlled by the institution.	Emissions from other sources – water use, waste, and procurement (assets, goods and services), land use, business travel (for management, research or teaching) and commuting (both staff and students). Transport can be further categorised by mode into land transport (car, rail, bus, other) and air travel (split between domestic flights and international flights).	Optional

Source: SQW Consulting, WRI (2004)

13 For more information, see www.opdems.ac.uk

For the majority of institutions, institutional baselines for 1990 and 2005 have been prepared by SQW and will be published in spring 2010 at www.hefce.ac.uk under Publications/Research & evaluation.

Calculating the baseline

2.21 There are various toolkits to assist with establishing baseline data and targets. The Carbon Trust provides HE specific guidance through the HE Carbon Management Programme[14] and has an online carbon footprinting tool[15]. Chapter 4 of this guidance identifies additional sources of support and guidance.

2.22 Table 2-2 explains how to calculate the scope 1 and 2 baseline.

2.23 Table 2-3 explains how to calculate scope 3 emissions for the baseline year.

2.24 Institutions may wish to collect additional data, such as proportion of paper recycled, to inform calculations of scope 3 emissions.

Stage 3: Setting targets

2.25 Institutions are required to set a carbon reduction target for 2020 for scope 1 and 2 emissions against a 2005 baseline. Institutions may set their targets in context by referencing them against an earlier baseline year to recognise where they have reduced carbon emissions before 2005. Targets will vary between institution but should be ambitious, and reflect the ability of each institution to deliver carbon savings. Institutions may choose to also set targets for interim years and for aspects of scope 3. Targets will be aggregated and compared to the sector level target.

2.26 Targets should be SMART – specific, measurable, achievable, realistic and time bound. Institutions should consider benchmarking themselves against others in the sector.

2.27 Carbon offsetting cannot contribute towards meeting the 2020 target.

Table 2-2 **Calculation of baseline: scope 1 and 2 emissions**

Step	Task	Data source	If not available
Step 1a	Establish annual energy consumption across estate for each fuel source: gas, electricity, coal (in the appropriate metric) Do not include biomass	EMS returns (refer to the latest definitions and metrics from November 2009) Data must relate to a 12 month period	Obtain information directly from suppliers
Step 1b	Identify fuel use and/or mileage data for all fleet vehicles	Internal records of mileage or fuel consumption Break vehicle use down by fuel type (diesel, petrol, liquefied petroleum gas (LPG)) and by size (large, medium, small)	Assume that direct transport emissions account for 1% of total scope 1 and 2 emissions
Step 2	Apply carbon conversion factors to calculate carbon emissions for Steps 2a and 2b	See Appendix 1 or www.defra.gov.uk/environment/business/reporting/index.htm	
Step 3	**Sum results to provide annual carbon emissions (NB: check these are reported in tonnes CO_2)**		

Source: SQW Consulting

14 For more information, see www.carbontrust.co.uk under Cut carbon & reduce costs/Our services/Public Sector Carbon Management/Higher Education/Carbon Management.

15 Available at www.carbontrust.co.uk under Cut carbon & reduce costs/Measure my carbon footprint/Carbon footprinting.

Table 2-3 **Calculation of baseline: scope 3 emissions**

Step	Task	Data source	If not available
Step 1a	Water (m^3)	EMS – Water consumption figures – water supplied in cubic metres (m^3) – are reported in both the EMS datasets and 'Hull' statistics, which provide the basis for a robust calculation of carbon emissions for those years	Assume water accounts for approximately 1% of scope 1, 2 and 3 carbon emissions
Step 1b	Waste (tonnes)	EMS (available from 2004 only) Use internal record to assess composition of waste	Assume waste accounts for approximately 3% of scope 1, 2 and 3 carbon emissions
Step 1c	Land-based business travel	Travel survey	Emissions from land-based travel for business purposes can be estimated on a top-down basis from the UK National Travel Survey (NTS) (2007), as follows: Step 1: Calculate total business mileage in the UK (multiply mileage per person by the population size) Step 2: Attribute business mileage to individuals in employment only (divide total business mileage by the number of people in employment) Step 3: Estimate business mileage for the institution (multiply individual mileage of people in employment by the number of staff (all staff, FTE)) Step 4: Apply an average carbon emissions factor for a unit of mileage (km) (see Appendix 1)
Step 1d	Commuting (staff and students travelling to and from the institution)	Travel plan or survey If sufficient data for staff and student commutes are available it is possible to break down the use of cars (large, medium, small), bus, motorbike and rail use in miles	Emissions can be calculated from the NTS as follows: Staff commuting Step 1: Calculate UK mileage in this category (multiply mileage per person by the population size) Step 2: Divide total mileage by number of people in employment Step 3: Estimate mileage for the institution (multiplying individual mileage of people in employment by the number of staff (all staff, FTE)) Step 4: Apply an average carbon emissions factor for a unit of mileage (km) based on split between car, bus and train (see Appendix A)

Step	Task	Data source	If not available
			Student commuting is reported as trips for 'Education' purposes Step 1: Calculate UK mileage in this category (multiply mileage per person by the population size) Step 2: Divide total mileage by number of people in education Step 3: Estimate mileage for the institution (multiply individual mileage of people travelling for education purposes by the number of students) Step 4: Apply an average carbon emissions factor for a unit of mileage (km) based on split between car, bus and train (see Appendix A)
Step 1e	Business air travel	Staff survey; internal travel records or expenses claims	Emissions from business air travel (staff flights associated with academic and professional activities) can be estimated from the Civil Aviation Authority's 'Passenger Survey Report' (2006). Institutions should calculate a pro rata share (based on staff numbers) of those travelling for 'Conference/Congress'. It should be assumed that the average domestic flight (one way) is 300 km and the average international flight (one way) is 5,000 km
Step 1f	Air travel – international students	Emissions arising from international students flying to the UK (and back to their home countries) Two round trips per calendar year should be attributed to EU-25 nationals, and one round trip per calendar year for non-EU-25 nationals. Where the country of domicile is known, institutions should calculate the distance between London and the capital city of the country of domicile. For the remaining students, an average flight distance should be applied	If specific mileage data is not available for air travel, assumptions can be made that a long haul flight is 4,000 miles and a short haul flight is 400 miles (one way)
Step 1g	Air travel – student exchange	Emissions from air travel of students in English institutions travelling overseas in relation to student exchange programmes. Assume one return flight per student, based on a London to capital city route	If specific mileage data is not available for air, assumptions can be made that a long haul flight is 4,000 miles and a short haul flight is 400 miles (one way)

Step	Task	Data source	If not available
Step 2	Multiply each category of emissions by the relevant carbon conversion factors	See Appendix A or www.defra.gov.uk/environment/business/reporting/index.htm	
Step 3	**Sum results of Step 2 (NB: check these are reported in tonnes CO_2)**		

Source: SQW Consulting

2.28 Initial discussions should be held within Estates Management to discuss reduction opportunities and the key focus areas within the estate where the majority of scope 1 and 2 emissions arise.

2.29 A comprehensive list of interventions needs to be produced, covering all known solutions that can be implemented – including technical and non-technical (e.g. behavioural change) solutions. Individual interventions need to be quantified in terms of their carbon reduction potential (impact). The cumulative impact by 2020 in absolute terms (tonnes of carbon) will help institutions to identify a realistic reduction target.

2.30 Each intervention then needs to be quantified in terms of its cost. Some interventions are no or low-cost; others could require a considerable investment. One approach to comparing the carbon benefit of intervention is to identify the cost of abating a tonne of carbon (£/tCO_2). Interventions with negative costs (i.e. financial gain, for example, through savings against energy bills) should be implemented as a priority. Their cumulative carbon savings will inform the financially viable carbon target.

2.31 The two activities above (quantifying the carbon impact and cost) are typically combined to produce what is known as the Marginal Abatement Cost Curve (MACC). The MACC is a tool that informs investment decisions in terms of what carbon savings can be achieved at what cost. The Carbon Trust's HECM Toolkit contains a Carbon Management Projects Register tool with facilities for MACC, project costing and carbon saving quantification (CD available from Carbon Trust or the HE Network; see Chapter 4).

Stage 4: Identify options

2.32 Identifying and appraising options for carbon reduction is important. The range of options will depend on several factors, including age of estate, type of estate (campus-based/dispersed) and location (urban/rural). Institutions may wish to implement larger-scale estates solutions (CHP or new boilers); to start with smaller-scale changes (e.g. lagging of pipes); or to implement a mix of both. Institutions should take existing activity into account: institutions already using a number of energy-saving measures will have less scope for quick wins.

2.33 The Carbon Trust offer a range of services to assist in identifying carbon saving opportunities, including free carbon surveys (energy audits) to organisations with annual energy bills of more than £50,000.[16]

16 For more information, see www.carbontrust.co.uk under Carbon Survey/Start Here/Apply for a Carbon Survey.

Case studies: Identifying interventions

The University of Bristol divides potential interventions into two categories: 'vertical' and 'horizontal'. 'Vertical' initiatives include large-scale investment in three CHP heat-led units, providing around 2,000 tonnes of CO_2 savings annually. Alongside this, the university is running an ongoing programme investing in 'horizontal' energy-saving projects (across departments). The programme has an annual budget specifically for capital investment, which is spent on smaller projects such as updated lighting controls. The programme engages existing staff in a number of ways; it tends to use in-house engineers to implement the solutions, and projects are identified in three ways:

- the energy team carry out an audit of energy usage, and identify projects
- estates design team find issues, and ask the energy team to investigate
- building users and managers make recommendations.

Source: SQW Consulting fieldwork

Stage 5: Costing

2.34 Each option should be costed in terms of the total capital outlay required (CAPEX), as well as the ongoing operating cost (OPEX) involved. It is important to bear in mind that carbon reduction is closely linked to reducing energy consumption so there will be tangible financial savings that will offset some or all of the costs. Some opportunities are low or no-cost, including behavioural change and space management, where net financial gains are to be expected early on. Even the costlier opportunities need to be looked at from a life-cycle perspective where the upfront investment is set against the energy and cost saving over the life of the intervention.

2.35 Where appropriate, established investment appraisal protocols and procedures should be applied to carbon-saving opportunities, thus maintaining consistency and reducing the administrative burden. In any case, opportunities need to be explored from a simple pay-back angle – i.e. the number of years during which savings on the energy bill cover all additional CAPEX and OPEX. Further assessment, particularly for larger capital projects, may be required where inflation and equipment amortisations are taken into account – i.e. looking at the net present value of a project in future years by applying discount rates[17].

2.36 When appraising opportunities, it is also important to consider the cost of inaction. This involves looking at likely future energy prices, the price of carbon and other aspects that can be valued, such as institutional reputation. If an opportunity or a package of opportunities is not progressed because of high capital cost, this may result in the institution paying more over time in energy bills and other costs.

2.37 When immediate or short-term paybacks are not possible, it may be appropriate to identify sources of external funding for the initial investment. Some examples are provided in Chapter 4.

Stage 6: Prioritisation

2.38 Institutions need to prioritise the identified and costed opportunities. This should be done on the basis of internally agreed criteria, in particular cost (and affordability) and impact (energy and carbon savings). The result will be a prioritised list of interventions that clearly demonstrates the cost and impact of each intervention. Institutions should also consider how the opportunities fit in with their estates strategies, for example taking into account planned new build and major refurbishments.

2.39 A MACC is a pictorial representation of the relative costs (and reduction potential) of different interventions. Appendix B provides some examples of generic MACCs for buildings. The 'Opportunities Database', a tool used in the HECM programme (see Chapter 4), contains a facility for HEIs to generate a MACC.

17 Choosing a discount rate varies on the basis of level of risk attributed, expected inflation rate and required project profitability. For public sector projects, the Government's Green Book sets the discount rate at 3.5% per annum. Private sector projects often use discount rates of 10%-15%.

Case studies: Quick wins, big wins

Quick wins are a useful way of maintaining staff and student enthusiasm for reducing carbon emissions. At Leeds Metropolitan University, quick wins included the introduction of air-handling fans with direct variable speed drive; sub-metering; and movement and light sensors – especially in gyms, toilets and lecture theatres. There are also a number of easily implementable IT solutions – including automatic overnight switch-off of equipment in IT labs.

Identifying big wins is also critical. At the University of East Anglia (UEA), the campus is dominated by a large listed 'teaching wall', constructed in the 1960s, which limits the range of potential cost-effective investments to reduce carbon emissions. The University decided to invest in a whole-site approach as it would be more efficient in the long run, and has installed three 1 MW CHP boilers to cover the whole site (e.g. providing heat for the new sports facilities). One runs permanently, with two running for most of the summer, and three in the winter – around two-thirds of electrical energy is now generated on-site. There is now also a District Cooling system – an absorption chiller in the basement, to provide cooling more efficiently for the whole block in the summer, and the University has made the decision to invest in a large-scale biomass boiler.

Source: SQW Consulting fieldwork

Case studies: Behaviour change

Behaviour change can contribute up to a 10% reduction in energy use. However, it is not necessarily easy and the message needs to be reinforced (particularly to new cohorts of students). King's College London provides a 10-point booklet (now in its second year) to all first year students, and is looking at integrating this practice to staff induction.

Harper Adams University College held an energy competition between halls of residence entitled 'Carbon Challenge'. Halls were provided with varying levels of feedback on energy use during the week. The institution was able to identify motivating factors and the types of message which were most effective in encouraging behaviour change.

Leeds Metropolitan University reports on savings through departmental environmental coordinators, energy champions, Health and Safety Advisory Committees and the Corporate Social Responsibility Steering Group, and works with the City Council's Climate Change Officer as well as the Students' Union ethical and environmental officer. The 'Big Switch Off', a pan-university project, monitored energy use over consecutive weekends during the national Big Switch Off campaign.

The University of Bristol is introducing 'Green Impact Awards', modelled on the Sound Impact Awards programme run by the National Union of Students Services Ltd (NUSSL). The scheme has 130 criteria, all of which are practical to implement. There are four levels ('working towards' level; bronze and silver (both with fixed standards) and gold). Fifty departments are involved, and it now involves around 2,500 staff as well as students, in projects such as carbon auditing.

At UEA there is a current drive to change behaviour; a pilot scheme presented a department with a breakdown of a business-as-usual case (of its energy baseload), and offered to let the department keep the financial equivalent of additional savings (after energy price changes have been taken into account). The pilot saw savings of 13% on electricity use. UEA also coordinates regular 'tours' of its estate for university staff to raise awareness of the interventions which have been put in place, and is preparing staff training modules on energy and climate change.

Source: SQW Consulting fieldwork

Stage 7: Monitoring and reporting

2.40 Monitoring is a key and mandatory element of carbon management. Progress against targets and in relation to the carbon baseline will be monitored in line with HEFCE's requirements. These requirements will focus on scope 1 and 2 emissions, with optional, but recommended, monitoring of scope 3 emissions (in particular where the institution has implemented interventions for reducing scope 3 emissions).

2.41 Monitoring procedures will be compatible with other national policy and regulatory requirements, including the EU ETS and the CRCEES.[18]

2.42 All data should be converted into tonnes of carbon dioxide (tCO_2) and additional metrics can also be used – for example, the original energy or fuel metric (kWh, therm, litres, miles). Other greenhouse gases will be reported as carbon dioxide equivalent (tCO_2e).

2.43 Monitoring and reporting should be carried out on an annual basis (by HE sector academic year in common with EMS). A good carbon reduction programme will be embedded into the wider estates strategy including sustainability, environmental and facilities management policies. This will minimise the administrative burden and maximise synergies.

2.44 Appropriate monitoring requires key roles and responsibilities to be established internally – both at operational and strategic levels. Institutions may wish to establish a carbon reduction team with responsibility for implementing actions. Members can include staff, student representatives and estate and facilities management. There should be a link to the senior management team and reporting to the Governing Body.

2.45 Regular meetings between the carbon reduction team are important to raise any issues that could hinder the effective delivery of reduction targets. Any decisions undertaken by the carbon reduction team should take existing relevant strategies into account.

2.46 Institutions need to consider whether there is scope for a designated carbon manager within the institution who will also be responsible for monitoring and reporting (smaller institutions may consider sharing such a post). Each carbon reduction opportunity needs to have a nominated champion (project manager or key contact point) to determine the course of action and to monitor progress.

Case studies: Staffing requirements

Staffing requirements will vary depending on institution size, complexity and existing resources. Leeds Metropolitan University has a sustainability team with three members. Within this team, there is a sustainability manager, a trainee environmental manager (with a specific energy efficiency remit) and a transport coordinator. The institution is engaging staff in departments through a network of environmental and energy champions, including staff from Campus and Residential Services (CARES) with a specific remit for waste and recycling. It aims to make carbon reduction 'part of everybody's role' – which requires staff buy-in from a number of areas including Estate Services, CARES, purchasing, finance and faculties. The institution focuses on developing staff competencies and training, and enabling staff to swap experience.

Institutions may also consider how to involve existing staff in the carbon reduction agenda. At the University of Reading, involvement of the full range of staff employed in the institution is seen as vital; everyone from cleaners to security staff can be involved in monitoring and reporting energy wastage in buildings outside 'normal' opening hours, which can help staff feel valued. Furthermore, staff members from the construction engineering department have been involved to identify new opportunities for energy generation on the university's estate.

Source: SQW Consulting fieldwork

[18] Monitoring progress against the sector level target will rely on data from Estates Management Statistics and carbon emissions data will be mandatory with effect from 2009-10.

Case studies: automated meter reader

An automated meter reader (AMR) uses advanced metering to measure, store and communicate reading to a remote server. Generally readings are taken every half hour and the stored data are collected by the server daily. AMR has the capability to eliminate estimated billing and this means less staff time is taken up with reconciling inaccurate bills.

A recent field trial by the Carbon Trust found that organisations that switched to using AMR identified 12% carbon savings and 5% through reduced utility consumption.

The high quality data available through AMR will allow HEIs to see more precisely where, when and how much energy they are using. When AMR is combined with automatic Monitoring and Targeting (aM&T), energy cost savings of up to 15% can be achieved.

AMR has a central role to play in reducing carbon emissions and, together with the Carbon Trust Standard, it forms the CRCEES early action metric. To qualify as an early action metric, AMR needs to be in place by the end of March 2011.

The Office of Government Commerce Buying Solutions has developed a comprehensive AMR services framework available to all in the public sector. The framework commenced in October 2009 and will operate for four years offering five-year industry standard call-off contracts. The framework covers electricity, gas, water, sub-metering, other meters such as heat, fuel oil and LPG, and aM&T software.

Source: Office of Government Commerce 2009

Case studies: Partnerships

The Universities of Bristol and Reading have both worked with Partnership for Renewables (Carbon Trust) to see if they can install various renewables options across their estate (e.g. photovoltaic (PV) technology on roofs; anaerobic digestion; wind turbines on university-owned land). Institutions with significant land resources (including farmland) may consider alternative uses for their resource which involve carbon reduction measures or energy generation. Both institutions are also exploring potential partnerships (e.g. a shared CHP plant) with other large institutions nearby, including hospitals and local authorities.

Small institutions can benefit greatly from developing partnerships around the carbon reduction agenda in terms of sharing resources, particularly if they do not have the immediate budget to employ a specific carbon reduction manager. The Arts University College at Bournemouth has a number of informal environment-focused links to other HE and further education (FE) institutions in the South West, and has set up an Environment Committee which reports to the executive.

Source: SQW Consulting fieldwork

2.47 The plan should be agreed and signed off by the governing body. Monitoring should take place at least annually, and progress should be reported publicly.

Joint working and partnership

2.48 HEIs should make use of the wide variety of funding, financial and reduction opportunity information available. Chapter 4 identifies some key sources of information, and the Carbon Trust can provide advice specifically tailored to the HE sector.[19]

2.49 Institutions should also identify partners (other HEIs, or local bodies) with whom they can share good practice and/or (for local institutions) joint capital investments and sharing of facilities and space. Partners might be institutions with a similar carbon profile, similar age estate and/or similar research profile, or nearby institutions.

19 For more information, see www.carbontrust.co.uk under Cut carbon & reduce costs/Our services/Public Sector Carbon Management/Higher Education.

2.50 There is a wide range of expert organisations and representative bodies within the sector, which play helpful roles in developing and disseminating good practice as well as informing policy. These include:

- the National Union of Students (NUS): the role of students in minimising carbon emissions has been, and will continue to be, significant
- the HE representative bodies (Universities UK and GuildHE) and the Higher Education Regional Associations: these facilitate partnership working both across HEIs and with other regional stakeholders
- the Committee of University Chairs (CUC): supporting effective governance across the HE sector
- the Higher Education Environmental Performance Improvement initiative (HEEPI): provides environmental benchmarking tools, and runs networks and events on sharing best practice
- the Association of University Directors of Estates: currently carrying out research on how the HEI estate may evolve over the next 20-30 years, which will help estates teams to visualise what the university of the future could look like
- the Environmental Association of Universities and Colleges: its website and email groups are useful sources of information and facilitate sharing of good practice, experience and skills
- the Association of University Purchasing Officers (AUPO) and the regional and national purchasing consortia: a sustainable procurement centre of excellence, led by the North Eastern Universities Purchasing Consortium in partnership with AUPO and funded by HEFCE, aims to make demonstrable changes to the way HEIs embed sustainable procurement into their standard procedures, practices and policies. This will help develop measurement and monitoring tools for carbon emissions related to procurement.

Carbon reduction strategy format

2.51 An example format for a carbon management strategy could be as follows:

- executive summary
- introduction
- overview of strategy
- approach to carbon reduction and fit with strategic objectives
- carbon emissions data
- assessment against baseline and target
- financial and carbon options evaluation
- implementation plan
- governance and progress monitoring.

3: Measuring carbon performance

3.1 This chapter provides guidance on how to measure performance in reducing emissions. There are three main elements:

- data collection
- monitoring
- strategy development.

Collecting data

3.2 Section 2 identifies ways in which carbon emissions for a baseline year can be calculated. For future years, institutions will need to collect sufficient information to measure progress.

3.3 Institutions already collect data which can be used to calculate carbon emissions. Using such data will minimise the administrative burden on institutions and ensure greater compatibility and consistency of data and information. In some cases, additional data collection and monitoring systems will need to be established.

Scope 1 and 2 emissions

Estate Management Statistics

3.4 Much of the data collected through EMS is of importance in determining CO_2 emissions. Current (November 2009) indicators which are likely to be of use include:

Table 3-1 **Relevant EMS indicators**

Reference	Indicator	Short description
D38a	Energy consumption	Energy consumption, defined in kWh, including gas, LPG, oil and electricity. Total and split by oil, gas, electricity, coal, steam/hot water and other
D38c	Energy emissions	The energy consumption figures returned under D38a, converted into CO_2 equivalents
D72a	Use of renewable energy sources	Renewable energy is constituted by those sources having a zero-carbon loading such as sunshine, wind, flowing water, biological processes, and geothermal heat flows
D72c	Energy generated on-site by CHP	The annual energy (kWh equivalent) generated on-site from CHP. Includes both heat and electricity
D72d	Renewable on-site energy generation	The annual energy (kWh equivalent) generated on-site through 'renewable' sources
D72e	% of total energy from renewable sources subject to Renewables Obligation Certificates (ROCs)	Percentage contribution to annual energy consumption from renewable sources

Source: www.opdems.ac.uk – adapted from 'EMS data definitions & amendments', November 2009

Case studies: Estates investment

Harper Adams University College pursues a two-fold strategy to improving energy efficiency on its estate. It views the estate as a potential demonstrator for sustainable technologies. The campus has examples of PV tiles, solar thermal, biomass heating and an anaerobic digester is planned which would make the site largely self-sufficient in electricity. For new build, the institution aims for Building Research Establishment Environmental Assessment Method (BREEAM) excellent rating where possible. Thermal modelling is routinely commissioned early in building design to optimise the design and make informed capital investment decisions.

Reducing energy use can, in some cases, conflict with other objectives: for example, external lighting needs to be sufficient for personal safety and building security, but is also a major factor in high energy use, particularly in an open campus. Integrated lighting and air-conditioning controls on timers have been introduced across the estate. Unused student PCs are switched off overnight automatically by the remote network (this led to a big drop in energy consumption). Other work has included water leak detection and balanced electrical phase loading across three phases for energy use.

At the University of East Anglia, whilst student numbers have increased by 240% since 1990, and building area by 50%, carbon emissions have gone up by just 10%. This is largely because of investment in major capital projects, including energy generation (see 'Quick wins, big wins' case study box), and the installation of six low energy buildings since 1995, with up to 50% reduced heating energy demand.

Source: SQW Consulting fieldwork

Case studies: Efficient use of space

Leeds Metropolitan University has focused on reducing the size of the estate and improved space management – with individual closed or locked buildings to be used as needed. This results in cost savings on maintenance, heating and lighting, and provides associated carbon savings.

The University of Birmingham has adopted the concept of the 'smaller, better estate', which has been endorsed by its Executive and Council (governing body). As a result, it is planning to reduce the current scale of the operational estate. Buildings are being refurbished to provide greater density of occupation.

Source: SQW Consulting fieldwork

Transport fuel emissions

3.5 Transport fuel used in institutions' own vehicle fleets[20] releases carbon emissions which fall within scope 1. These direct transport emissions are not currently monitored and reported under EMS. Institutions should implement a system for collecting information on volume of fuel used or purchased and, where this is not available, on mileage by vehicle size and type.

Electricity

3.6 Indirect emissions through the use of electricity fall under scope 2. Total electricity consumption should be monitored and reported on. In addition, grid electricity should be reported separately from non-grid (on-site generation) electricity. For grid electricity, the national carbon factor should be applied (see further below). Electricity sourced from renewable sources, often referred to as 'green electricity' (green tariffs) should also be converted into carbon using the same national carbon factor and included in the baseline. This is because most renewable electricity supplied under green tariffs in the UK is generated and supplied through a statutory requirement, the Renewables Obligation (RO). Only where institutions can demonstrate that

20 This includes vehicles that are owned and leased by the institution.

the green electricity they purchase is additional to the RO (i.e. where the Renewables Obligation Certificates (ROCs) have been retained) can this be counted as zero-carbon and either not included in the baseline or counted towards meeting the carbon reduction target. The updated EMS reporting definitions (November 2009) provide the following clarification:

> 'Electricity supplied through "green tariffs" should not be considered zero-carbon, but the average grid electricity carbon factor should be applied. In exceptional circumstances, where an institution can demonstrate that the renewable electricity is additional to a utility's statutory requirement for renewable energy generation (i.e. where the Renewables Obligation Certificates (ROCs) have been retained), this amount of electricity can be zero-carbon rated.'

3.7 Electricity from on-site renewables may only be counted as zero-carbon or as contributing to meeting the HEI's target if no ROCs have been sold. Where an HEI generates on-site renewable electricity and it sells any of the ROCs associated with it, this electricity should be counted as grid electricity with the respective carbon content. This is consistent with the EMS.

3.8 Electricity from on-site CHP should be monitored but not included in the HEI's carbon baseline – only gas (as kWh, therm or m^3) should be counted. This avoids double-counting of gas and electricity use. This is consistent with the EMS.

3.9 Further information on fiscal incentives is available at Appendix D.

Scope 3 emissions

Water

3.10 Water consumption figures – water supplied in m^3 – are reported as part of EMS. Where possible, water consumption should be broken down by building or use type (residential/non-residential) which could help to identify and prioritise interventions. This will facilitate institutions in identifying appropriate solutions for reductions in use. Institutions should be able to secure data on water consumption from suppliers and/or meter readings.

3.11 Only mains water consumption should be included in the carbon baseline calculation using the appropriate carbon conversion factor. Rainwater and grey water are considered zero-carbon. Carbon from borehole water (on-site) is accounted for through the energy (electricity) used for extraction and supply.

Table 3-2 **Relevant EMS indicators on water consumption and supply**

Reference	Indicator	Short description
D38b	Water consumption	The annual volume (m^3) of mains, metered fresh water consumed
D77a	Water supply 'grey water' and rain water	The annual volume (m^3) of non-mains water supply for potable and non-potable use from rainwater and 'grey water'
D77b	Water supply borehole extraction	The annual volume (m^3) of non-mains water supply for potable and non-potable use from borehole extraction

Source: www.opdems.ac.uk – adapted from 'EMS data definitions & amendments', November 2009

Waste

3.12 Institutions report waste-related information through the EMS and should use this source.

3.13 It is important to monitor and report on all categories of waste as they have different carbon contents and some, such as recycling and incineration, can be used to demonstrate reductions in the institution's carbon baseline.

Business travel and commuting

3.14 Emissions from travel for business purposes and commuting can be monitored at the HEI level by way of a survey of staff and students. This will provide up-to-date information and can be done as part of an institutional travel plan. Where this is not practical, a top-down approach, as outlined in Chapter 2, can be adopted, using national-level statistics and estimating the institutional share. This approach, however, is far less accurate, as it is less sensitive to the specific circumstances of HEIs and behavioural change at the HEI level.

3.15 The EMS has recently started to record travel-related data. Indicators reported include total transport costs (residential and non-residential) (D63) and percentage of single occupancy car journeys (D75). The former may help in establishing carbon emissions through the use of conversion factors, whilst the latter may inform behaviour change strategies.

3.16 However, ultimately additional monitoring procedures should be established at institutional level to capture this area of emissions. For all types of business travel and commuting, three key parameters need to be captured – length of trip, frequency and mode of transport.

Table 3-3 **Relevant EMS indicators for waste**

Reference	Indicator	Short description
D73	Waste – Total	The approximate annual mass of waste generated by the institution
D73	Waste – Recycled	The approximate annual mass of waste recycled by the institution
D73	Waste – Incineration	The approximate annual mass of waste incinerated by the institution
D73	Waste – Other methods	The approximate annual mass of waste to landfill from the institution

Source: www.opdems.ac.uk – adapted from 'EMS data definitions & amendments', November 2009

Case studies: Travel plans

Leeds Metropolitan University has a 10-year transport strategy. Reducing single occupancy of vehicles is one of the key areas. The university has partnered with the University of Leeds, Sustrans and the City Council on a project to hire bikes to students (for a charge of £35 per year). New Halls of Residence, based on campus, will not allow student parking. The university is also working with local bus companies to provide bus services on campus.

The University of Gloucestershire, with campuses in two smaller towns, provides institutional support for local bus routes as part of the green transport strategy (staff and students travel free on buses in the county).

The University of Reading has worked in partnership with the Local Authority to open a new bus route running through the campus connecting it with the town centre; usage of public transport has grown, and the bus route is now a permanent fixture. It has a car-share scheme, and a variety of vehicles for shared usage, including farm vehicles, minibuses and battery-operated vehicles. The system also calculates the financial and CO_2 saving each user is making compared to making that journey by car (as a single occupant).

The Arts University College at Bournemouth has a travel plan which includes subsidised bus passes for students to travel to and from campus. The Institute sends monitoring data on its vehicle usage to the Travel and Transport Steering group, and the governors and planners take an active interest. The travel plan compares private and public transport usage, including single-occupancy car usage, against a baseline and benchmarks.

Source: SQW Consulting fieldwork

Procurement

3.17 Procurement is one of the most difficult areas of carbon emissions to measure. HEIs are advised to work closely with their procurement teams and with any relevant procurement consortia to establish a consistent and comparable method of measurement. It is important to understand the full scope of procurement, and to break it down further into broad categories such as building procurement and procurement of goods and services. The former relates to the design specification of buildings and material use, whilst examples of the latter include food and drink, information and communications technology (ICT) equipment, stationery and supplies. Procurement of energy will not be included as it is effectively covered in scope 1 and 2 emissions.

Case studies: Procurement

Reducing carbon emissions from procurement can be difficult for individual institutions. Procurement consortia can help to put pressure on suppliers. A number of institutions are beginning to specify environmental issues in procurement.

At Leeds Metropolitan University, sustainability criteria are included in all tenders for capital projects (weighted at 20%), and they aim for BREEAM excellent for all buildings costing over £0.5M (both refurbishment and new build). Buildings must include recycled content (specified in tender process), and the institution makes use of WRAP[21] toolkits on net waste in construction and demolition (two large demolition projects on-site achieved over 95% reuse and reprocessing on-site). They also take an investment appraisal approach to buildings, which resulted in the retention of CHP and rain water harvesting during a value engineering exercise for the Rose Bowl building.

At the University of Gloucestershire, the IT department has changed its procurement strategy to maximise energy efficiency. Multi-functional devices (machines that will photocopy, print and scan) have replaced all photocopiers and these are AAA energy rated.

The University of Reading has moved to an e-procurement system, reducing the need for hundreds of large paper-based tenders being delivered each year. Tenderers are asked to complete a section on environmental policy, and score extra points for having an ISO14001 system in place.

Source: SQW Consulting fieldwork

21 For more information see www.wrap.org.uk

Calculating carbon emissions

3.18 The table below explains how to calculate scope 1 and 2 emissions for monitoring purposes.

Table 3-4 **Calculating carbon emissions: scopes 1 and 2**

Step	Task	Data source	If not available
Step 1a	Establish annual energy consumption across estate for each fuel source: gas, electricity, coal (in kWh) Do not include biomass	EMS returns Data must relate to a 12-month period	Energy bills for the same period and unit price of energy
Step 1b	Identify transport fuel use or mileage data for all fleet vehicles	Internal records of fuel consumption or mileage Break vehicle use down by fuel type (diesel, petrol, LPG) and by size (large, medium, small)	Fleet annual cost and unit cost (fuel or mileage). NB: detailed analysis is required to account for non-fuel costs, such as insurance, tax, service, breakdown, amortisation and profit (leased cars)
Step 2	Apply appropriate carbon conversion factors for each energy/fuel category to calculate carbon emissions	See Appendix A or www.defra.gov.uk/environment/business/reporting/conversion-factors.htm. These conversion factors are used within EMS	
Step 3	**Sum results for all scope 1 and 2 emissions to provide annual carbon emissions (NB: check these are reported in tonnes CO_2)**		

Source: SQW Consulting

3.19 The table below explains how to calculate scope 3 emissions.

Table 3-5 **Calculating carbon emissions: scope 3**

Step	Task	Data source	If not available
Step 1	Water (m^3)	EMS – Water consumption figures	-
Step 1a	Apply carbon conversion factors to calculate carbon emissions	See Appendix A or www.defra.gov.uk/environment/business/reporting/conversion-factors.htm	
Step 2	Waste (tonnes)	EMS (from 2004 only) Use internal record to assess composition of waste	-
Step 2a	Apply carbon conversion factors to calculate carbon emissions	See Appendix A or www.defra.gov.uk/environment/business/reporting/conversion-factors.htm	
Step 3a	Business air travel	Travel survey Internal travel records or expenses claims	Calculate top-down from national statistics (see as per baseline)
Step 3b	Air travel – international students	Travel survey	Calculate top-down from national statistics (see as per baseline)
Step 3c	Air travel – student exchange	Travel survey	Calculate top-down from national statistics (see as per baseline)
Step 3d	Sum all air travel mileage		
Step 3e	Multiply air travel mileage by carbon conversion factors to calculate carbon emissions	See Appendix A or www.defra.gov.uk/environment/business/reporting/conversion-factors.htm	
Step 4a	Land-based business travel	Travel survey	Calculate as for baseline
Step 4b	Commuting (staff and students travelling to and from the institution)	Travel survey	Calculate as for baseline
Step 4c	Sum mileage of land-based travel (business and commuting)		
Step 4d	Multiply land-based mileage by carbon conversion factors to calculate carbon emissions	See Appendix A or www.defra.gov.uk/environment/business/reporting/conversion-factors.htm	
Step 5	**Sum results of Steps 1a, 2a, 3e and 4d to provide annual carbon emissions (NB: check these are reported in tonnes CO_2)**		

Source: SQW Consulting

Monitoring and reporting

3.20 Collecting data on carbon emissions is the first step in identifying progress against the baseline. Where appropriate, institutions may wish to collect data at campus or building level to provide a more detailed picture of energy use and water consumption. An independent qualified professional audit of the university's carbon accounts could assist in ensuring consistency and correctness.

3.21 Interim carbon targets should be used to map and monitor progress towards targets. Strategies can then be designed to meet budgets and the results can be evaluated on a yearly basis.

3.22 The more important element is to interpret the data to inform carbon management strategy. Generally carbon emissions are identified for the institution as a whole, however, institutions might identify particular areas where emissions are not falling as fast as others, and may decide to prioritise interventions in these areas.

Case studies: Internal data use

The University of Bristol highlighted the importance of identifying and designing appropriate KPIs, which allow comparison year on year, and provide the information the institution needed to know. For example, 40% of their energy use is in 'highly serviced areas' (e.g. intensive labs), so they can identify where intervention may have the greatest impact.

Harper Adams University College and UEA have both installed building management control systems in every building and metering across the whole estate. This is vital in understanding energy use in order to inform the Estates Department on what steps to take. Typically this provides too much data to interpret however, particularly with limited resources in estates departments; at UEA a PhD student has been employed to focus on analysis of energy usage in the university's buildings. This has been highly valuable, although it is recognised that there is a limit to how much student resource can be drawn on in monitoring and data collection, and this also requires a certain amount of planning and training.

The Estates Department at King's College London has developed strong links with the Facilities Department in terms of collecting and sharing information. Through regular engagement with other departments across the whole College, and sharing monitoring data and analysis, the department has built up credibility across the institution.

The Arts University College at Bournemouth found that small institutions can be disproportionately affected by requirements to collect monitoring data. The Institute is currently installing a new software-based finance system, which will help to rationalise and simplify the collection of data as well as analyse the results. Whilst it will take around a year to 'bed in' (training etc.), the investment is expected to pay off many times over in future years.

Source: SQW Consulting fieldwork

Case studies: Using a carbon reduction target

Institutions with carbon reduction targets, such as the University of Birmingham, have noted the importance of publicising the target and progress towards it in motivating staff and students.

In addition, allocating responsibility for certain elements of energy management to members of staff or groups of students has been useful. At the University of Gloucestershire, the overarching organisational target is drilled down to functional units (campuses) and monthly figures on energy use provided to each campus. This approach shows how campus managers can play a pivotal role in reducing energy consumption. Using this approach effectively would require providing detailed information on energy use and consumption on a monthly basis, and providing tools to managers to implement savings.

Source: SQW Consulting fieldwork

3.23 Institutions should monitor progress against targets and report this publicly on at least an annual basis. Progress against the plan should be regularly communicated internally to the governing body; senior management team; estates and facilities staff; other staff and students.

Case studies: Approach to scope 3 emissions

De Montfort University (DMU) has conducted substantial work on data collection and emissions calculation for monitoring scope 3 emissions, covering the following sources:

- Staff and student commuting. Data from a staff/student travel questionnaire is used to estimate the total annual distance travelled by staff and students, the type of transport used, and the associated CO_2 emissions.
- Business travel. Activity data (number of kilometres travelled) have been calculated using records of bookings and expenses claims associated with business travel for the different modes of transport (air, rail, coach, car, van, ferry and taxi).
- Water consumption and waste. Activity data originate from the EMS already reported to the Higher Education Statistics Agency (HESA). For water consumption, the emission factor considers the clean water supply, as well as the wastewater treatment. Waste-related emissions are calculated based on the 2006 IPCC methodology for National GHG inventories, considering recycled waste as well as waste sent to landfill.

Furthermore, DMU has constructed a comprehensive calculation tool based on DEFRA's spreadsheets for local authorities and businesses, which includes the above-mentioned categories for scope 3 emissions as well as for scopes 1 and 2.

DMU's approach is also to measure and report emissions in disaggregated figures (according to their scope) so the main contributors to energy consumption and GHG emissions (halls of residence, refurbishments, travel, physical infrastructure, building applications, etc.) can be identified and provide an indication on the direction of resources and investment, once the milestones have been determined.

Source: De Montfort University

4: Other sources of guidance and support

4.1 There are a number of existing sources of guidance for institutions wishing to reduce carbon emissions. There is also a very wide range of ongoing activity across the HE sector, including both sector-wide programmes and institutional initiatives.

4.2 The table below identifies sources of support and guidance, and provides a brief overview of some key, sector-wide activities and initiatives.

Table 4-1 **Selected sources of support and guidance for HEIs**

Resource	Description	Source	Resource type
UK Government			
Department of Energy and Climate Change (DECC)	DECC was established in October 2008, and has responsibility for energy and climate change mitigation policy. The website provides up to date information on Government policies to tackle climate change, including the setting and monitoring of nationwide carbon reduction targets. It is also a useful source on information on policies that might affect individual HEIs as employers and consumers.	www.decc.gov.uk	Organisation
Department for the Environment, Food and Rural Affairs (DEFRA)	DEFRA produces guidance on organisational carbon footprinting – 'Guidance on how to measure and report your greenhouse gas emissions'. The latest update was published in September 2009.	www.defra.gov.uk under Environment/Business and the Environment/Reporting environmental impacts	Guidance
Carbon Reduction Commitment Energy Efficiency Scheme (CRCEES)	The CRCEES section of the DECC website provides up-to-date information on the Government's Carbon Reduction Commitment, including a CRCEES user guide and quarterly updates to stakeholders. The Energy Consortium provides a free CRCEES Toolkit for HEIs.	www.decc.gov.uk under What we do/A low-carbon UK/CRC Energy Efficiency Scheme www.energyconsortium.org.uk/top1t3t/news_details.asp?top=1&sid=411&tid=310&mid=0&news_id=15	Legislation Tool kit
Climate Change Committee (CCC)	This organisation advises the Government on necessary measures to monitor and mitigate climate change. It identifies means for achieving a low carbon economy (including carbon budgets and carbon markets), some of which may be of interest to HEIs.	www.theccc.org.uk	Organisation

Resource	Description	Source	Resource type
Strategy development			
Carbon Trust – Generic document Vision Statements for HEIs	The Carbon Trust has collated a list of vision statements, drawn from institutions participating in Phase 1 of the HECM programme. Although not intended to be a definitive guide to developing strategic objectives, the list may assist HEIs in framing their carbon management strategies.	Carbon Trust, The Higher Education Carbon Management Programme v1.2, available on CD from the Carbon Trust	Guidance
Low Carbon Economy	This website is run by Low Carbon Economy Ltd, and provides a useful compilation of information related to low carbon strategies, products and services. It may assist HEIs in determining options available to implement their carbon reduction strategy.	www.lowcarboneconomy.co.uk	Organisation
Consultancy			
Design Advice (Carbon Trust)	Design Advice offers professional, independent and objective advice on energy efficient and environmentally sound building design. Clients are offered free initial design consultancy on a building project – further consultancy, with partial funding, may be available. The consultancy recommendations cover energy efficiency, environmental improvements and the potential commercial benefits of 'green design'.	www.carbontrust.co.uk under Cut carbon & reduce costs/ Our services/Building Design Advice	Consultancy
Energy Surveys (Carbon Trust)	A range of different survey types are available depending upon the size of the organisation and experience in managing energy.	www.carbontrust.co.uk under Carbon Survey/Start Here/Apply for a Carbon Survey	Consultancy
Fleet Health Check (Energy Saving Trust)	If you are a fleet operator, you may qualify for three days of free advice from an independent fleet management expert to help you reduce your fleet costs, cut vehicle emissions, improve your social and environmental reputation and minimise traffic and parking problems where you work.	www.energysavingtrust.org.uk under Business & Public Sector/ Transport in business/Advice for organisations/Fleets over 50 vehicles	Consultancy

Resource	Description	Source	Resource type
Developing a carbon management plan			
Higher Education Carbon Management Programme (Carbon Trust)	This programme assists HEIs to develop a carbon management strategy and business case, and to get it signed off by the senior management team. Running since 2005, now in its fifth phase and 85 HEIs across the UK have participated.	www.carbontrust.co.uk under Cut carbon & reduce costs/ Our services/Public Sector Carbon Management/Higher Education/Carbon Management	Programme
Quick wins			
Carbon Trust – 'Further and Higher Education sector overview' guide	This guide provides examples of initiatives which could help institutions reduce carbon emissions. It focuses on low and no-cost measures with quick payback times.	www.carbontrust.co.uk under Publications	Guidance document
Target setting and management			
EcoCampus	EcoCampus is an Environmental Management System and award scheme for the HE sector. There are four phases to the scheme, and institutions are encouraged to progress towards implementing a full environmental management system (ISO14001 standard).	www.ecocampus.co.uk	Environmental Management System
Carbon Trust – embedding carbon management progress check	The Carbon Management Health Check allows institutions to identify progress in embedding carbon management approaches. The focus is on change management, defined as 'non-technical activities and issues that make the HECM Programme work well'.	Carbon Trust, The Higher Education Carbon Management Programme v1.2, available on CD from the Carbon Trust	Programme
Carbon Trust HE Network	This network encourages communication between HEIs to share knowledge and experience of carbon management in HEIs. Members can post information or links, share experience and arrange knowledge sharing events.	henetwork.carbontrust.co.uk	Network

Resource	Description	Source	Resource type
Baselining and benchmarking			
Carbon Trust – carbon footprint calculator	An online calculator to help organisations calculate their carbon footprint. It includes benchmark information.	www.carbontrust.co.uk under Cut carbon & reduce costs/ Measure my carbon footprint/ Carbon footprinting	Toolkit
NUS Carbon Academy	The Carbon Academy aims to 'reduce the carbon footprint of NUS services'. It offers staff and student training and has developed a toolkit for sharing best practice (requires online registration). The project is funded by the Carbon Trust.	www.nussl.co.uk under Ethical & Environmental	Programme
HEEPI Energy Benchmarking Tool	CEBenchbuild is an Excel tool that allows HEIs and FE colleges to assess the energy performance of their buildings against national benchmarks.	www.heepi.org.uk under other benchmarking	Toolkit
Universities that Count (Business in the Community)	Universities that Count is a benchmarking and reporting programme based on the Business in the Community Corporate Responsibility Index, and adapted for the HE sector.	www.eauc.org.uk under Projects/Universities that Count	Programme
Green Gown Awards	The Green Gown Awards are now in their sixth year. The awards cover a range of categories including energy and water efficiency and sustainable construction.	www.eauc.org.uk under Green Gown Awards	Award
People and Planet 'Green League'	The Green League ranks universities on the basis of a number of environmental indicators. The majority of the indicators relate to institutions' carbon emission (water use, waste recycling and energy sources as well as carbon emissions per head). Other categories cover environmental management, (environmental policy, staff roles, and environmental audit).	www.peopleandplanet.org under Campaigns/Go Green /Green League	League table

Resource	Description	Source	Resource type
ICT			
Sustainable ICT in Further and Higher Education: SusteIT Final Report	This report considers the environmental impact of ICT use in the FE and HE sectors, and identifies approaches to improve the sustainability of ICT use.	www.jisc.ac.uk under Green ICT	Guidance document
Destination Green IT	This website provides up to date information and advice on low carbon information technology systems. Resources include reports, case studies and technological developments.	www.destinationgreenit.com	Guidance document
Energy consumption			
Energy Consumption Guide – Energy efficiency in further and higher education	This Guide, produced by the Carbon Trust, is intended to assist estates and energy staff in HEIs to assess energy use across a range of building types. It provides information on how to assess energy performance as well as quantifying the potential for making energy use savings.	Carbon Trust, The Higher Education Carbon Management Programme v1.2, available on CD from the Carbon Trust	Guidance document
Energy Consortium	The Energy Consortium is a not-for-profit organisation, with 160 members from the FE and HE sectors. The consortium procures energy supplies on behalf of its members.	www.energyconsortium.org.uk	Organisation
Energy Saving Trust	The Energy Saving Trust provides advice and information to help organisations, including those in the public sector, reduce carbon dioxide emissions.	www.energysavingtrust.org.uk	Organisation
Carbon Trust	The Carbon Trust website includes a wide range of publications on carbon related policies, actions and case studies.	www.carbontrust.co.uk under Publications	Guidance document

Resource	Description	Source	Resource type
Procurement			
Office of Government Commerce	The Office of Government Commerce looks to encourage sustainable practices across Government, supporting environmental, social and economic sustainability.	www.ogc.gov.uk under Sustainability	Organisation
PAS 2050 – Assessing the life-cycle greenhouse gas emissions of goods and services	A Publicly Available Standard (PAS) for a method for measuring the embodied greenhouse gas emissions from goods and services.	http://shop.bsigroup.com under PAS 2050	Guidance document
Energy Technology List	The Energy Technology List provides information on products which meet Government-approved low carbon and efficient technology criteria.	www.theccc.org.uk	Guidance document
Waste			
Waste conversion factors	The EMS website provides a list of over 1,300 waste conversion factors to assist in calculating carbon emissions from waste.	www.opdems.ac.uk	Guidance document
Space use and management			
UK Higher Education Space Management Group	The UK Higher Education Space Management Group 'has been set up to assist higher education institutions to identify and implement best practice in the management of space'. The link is to a list of reports and tools, including practice, performance and guidelines as well as case studies.	www.smg.ac.uk	Organisation / Guidance documents
The SMG Model of the Affordable Estate	The SMG model is based on EMS data, and allows HEIs to calculate and benchmark sustainable and total estate provision.	www.smg.ac.uk under Reports/tools/The Model	Toolkit
GreenBuild initiative (Building Research Establishment): BREEAM for Higher Education	The GreenBuild initiative 'BREEAM Higher Education' has developed a template approach for higher education buildings.	www.breeam.org under Schemes/BREEAM Higher Education	Programme

Resource	Description	Source	Resource type
Behavioural change			
Forum for the Future – Higher Education Partnership for Sustainability (HEPS) project (now ended)	The HEPS project, which involved 18 universities and colleges, focused on integrating sustainability considerations into HEIs.	www.forumforthefuture.org	Programme
Student involvement			
NUSSL	Sound Impact is a NUSSL accreditation scheme, whereby Student Unions sign up to implement practical activities linked to reducing their environmental impact.	www.nussl.co.uk under Ethical & Environmental	Programme
Student Switch Off	The Student Switch Off is an energy-saving competition. Students living in different halls of residence compete to reduce energy usage.	www.studentswitchoff.org	Programme
Transport			
Carbon Trust – Organisational Sustainable Transport – Options and Opportunities	Implementing travel plans and changing travel habits of staff and students can be difficult. This briefing note identifies travel plans options for institutions and provides information and advice on implementation.	Carbon Trust, The Higher Education Carbon Management Programme v1.2, available on CD from the Carbon Trust	Guidance document
Carbon Trust – External Funding For Carbon Management Programmes	This briefing note provides information on how to secure external funding for carbon management projects, including sources of European funding and low- or zero-cost support services.	Carbon Trust, The Higher Education Carbon Management Programme v1.2, available on CD from the Carbon Trust	Guidance document
Energy Savings Trust – Transport	This website provides a range of documents and case studies which can help institutions to manage travel fleets effectively.	www.energysavingtrust.org.uk under Business & public sector/Transport in business	Guidance document

Resource	Description	Source	Resource type
Curriculum			
The Sustainability Curriculum	This document provides information and advice on integrating sustainability and environmental issues into the curriculum.	Blewitt, J and Cullingford, C (2004), 'The sustainability curriculum: the challenge for higher education' (Earthscan, 2004)	Guidance document
Funding			
Intelligent Energy Europe (European Commission)	This programme funds initiatives in the following areas: SAVE – improvements in energy efficiency and demand management ALTENER – new and renewable energy sources for centralised and decentralised production STEER – energy aspects of transport, the diversification of fuels and the promotion of renewable fuels and energy efficiency in transport COOPENER – promotion of renewable energy sources and energy efficiency in developing countries.	www.ec.europa.eu under Funding/Grants/Energy/ "Intelligent Energy Europe" Programme	Funding
7th Framework Programme (European Commission)	This programme funds initiatives in the following areas: SUSTAINABLE ENERGY SYSTEMS – research and development projects into cleaner energy technologies plus research into the impact of new energy technologies on society, the economy and employment CIVITAS II –sustainable surface transport CONCERTO – supports local communities in developing initiatives that are sustainable and highly energy efficient.	www.cordis.europa.eu under 7th Framework Programme	Funding
Bio-energy Capital Grants (AEA)	Open to industrial, commercial and community sectors; provides grants for the installation of biomass fuelled heat and CHP projects.	www.bioenergycapitalgrants.org.uk	Funding
Revolving Green Fund (Salix/HEFCE)	The Revolving Green Fund provides ring-fenced, recoverable grants to HEIs for energy/carbon saving projects.	www.salixfinance.co.uk under Higher Education	Funding
Low Carbon Building Programme – Phase 2 (BERR)	This programme provides research funding linked to the development and commercialisation of carbon reduction technologies.	www.lowcarbonbuildings phase2.org.uk	Funding

Resource	Description	Source	Resource type
Carbon offsetting			
DECC – Guidance on carbon offsetting	The UK Government's Quality Assurance Scheme for Carbon Offsetting – Approval requirements and procedures for offset providers, September 2009.	offsetting.decc.gov.uk under Information for offset providers /Guidelines/Scheme's requirements and procedure documents	Guidance document
DECC – Guidance on carbon neutrality	Guidance on carbon neutrality, September 2009.	www.decc.gov.uk under What we do/A low-carbon UK/ Carbon Neutrality	Guidance document

Appendix A
Conversion factors

1. The Department for the Environment, Food and Rural Affairs (DEFRA) has developed conversion factors which can be used to calculate carbon emissions for a given fuel. The figures below are for the year 2008, institutions should check for updates on the DEFRA website (www.defra.gov.uk). These conversion factors are used for the Estates Management Statistics (www.opdems.ac.uk).

2. Different energy fuel mixes result in different levels of CO_2 emissions. The following CO_2 conversion factors should be used to calculate the CO_2 emission per unit of energy.

3. Renewable transport fuels such as biodiesel and bioethanol are not listed as there is a wide diversity of products on the market with different carbon content. For generic conversion factors for these, please refer to Annex 9 of the Defra guidance, or for specific products to the supplier or the Renewable Transport Fuel Obligation (RTFO).

4. Conversion figures for grid electricity reflect the fuel mix for each year.

Table A-1 **Conversion factors by fuel type**

Type	Units	Kg CO_2 per unit (Net CV Basis, Total GHG)
Fuels		
Natural gas	kWh	0.20417
	Cubic metre	2.0133
	Therms	5.9837
Fuel oil	Tonnes	3,229.5
	kWh	0.28045
Diesel	Tonnes	3,200.6
	kWh	0.26630
	Litres	2.6694
Petrol	Tonnes	3,172.1
	kWh	0.25537
	Litres	2.3307
Liquid Petroleum Gas (LPG)	kWh	0.22572
	Therms	6.6153
	Litres	1.4968
Wood pellets	Tonnes	121.5

Source: Defra, 2009 Guidelines to Defra/DECC's GHG conversion factors for company reporting (September 2009). Available at www.defra.gov.uk under The Environment/Business and the Environment/Reporting environmental impacts.

5. All of the above carbon conversion factors are expressed as CO_2-equivalent as they cover all six regulated GHGs and therefore the conversion factor is for GHG Total. The current EMS definitions use conversion factors based on carbon dioxide only, but will move to a GHG Total basis at the next revision.

Table A-2 **Electricity conversion factors by year**

Year	**Kg CO_2e per unit**
(Grid rolling average Total GHG)	
1990	0.77651
1991	0.76641
1992	0.74624
1993	0.71590
1994	0.69567
1995	0.65726
1996	0.62050
1997	0.58491
1998	0.56582
1999	0.54217
2000	0.53069
2001	0.52513
2002	0.52482
2003	0.52737
2004	0.53665
2005	0.53729
2006	0.54013
2007	0.54418

Source: Defra, 2009 Guidelines to Defra/DECC's GHG conversion factors for company reporting (September 2009)

Appendix B

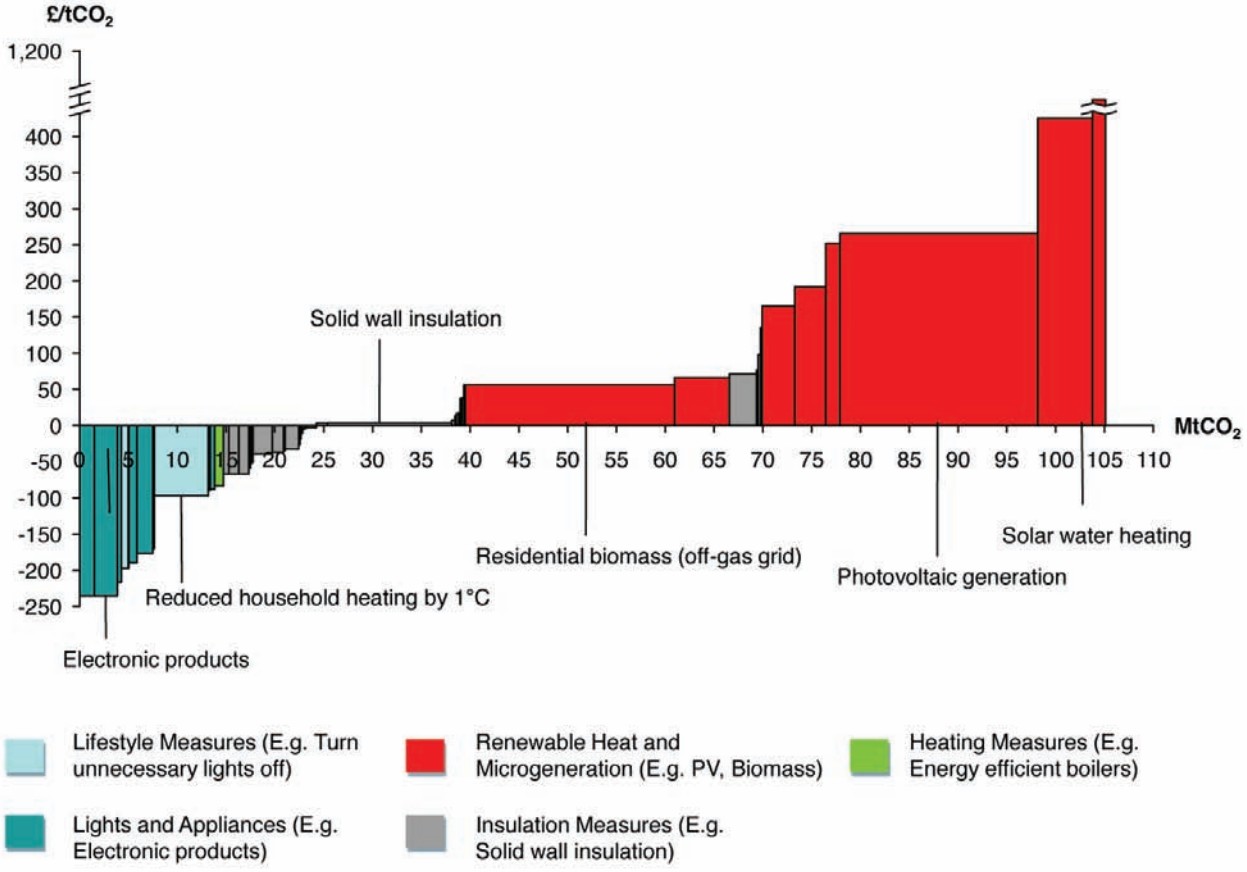
Examples of Marginal Abatement Cost Curves

1. The Marginal Abatement Cost Curve (MACC) is a commonly used assessment and decision-making tool regarding carbon-reduction interventions that captures several key parameters. Firstly, on the vertical axis, it shows the absolute cost-effectiveness of each intervention as cost (£) of saving a unit of carbon (tCO_2). This is calculated on a life-cycle basis, i.e. capturing all costs (capital and operational) and revenues (income and/or cost savings) and also factoring in inflation and amortisation (discount rate, as %). These are then set against the total carbon saved over an intervention's entire life. Interventions that appear below the line will generate net cost savings/revenues over their life and those above the line will not pay off for themselves. Interventions are plotted in order of their cost-effectiveness, from low to high cost.

2. Secondly, on the horizontal axis, the MACC shows how much carbon each intervention will save over its life (the width of each bar) and the cumulative impact of interventions if they are all implemented.

3. The first report of the Committee on Climate Change (December 2008) introduces some generic MACCs for the UK as a whole, which provide a good indication of some of the typical costs and abatement potential of different types of intervention. Two of the most useful MACCs, for residential and non-residential buildings, are reproduced here.

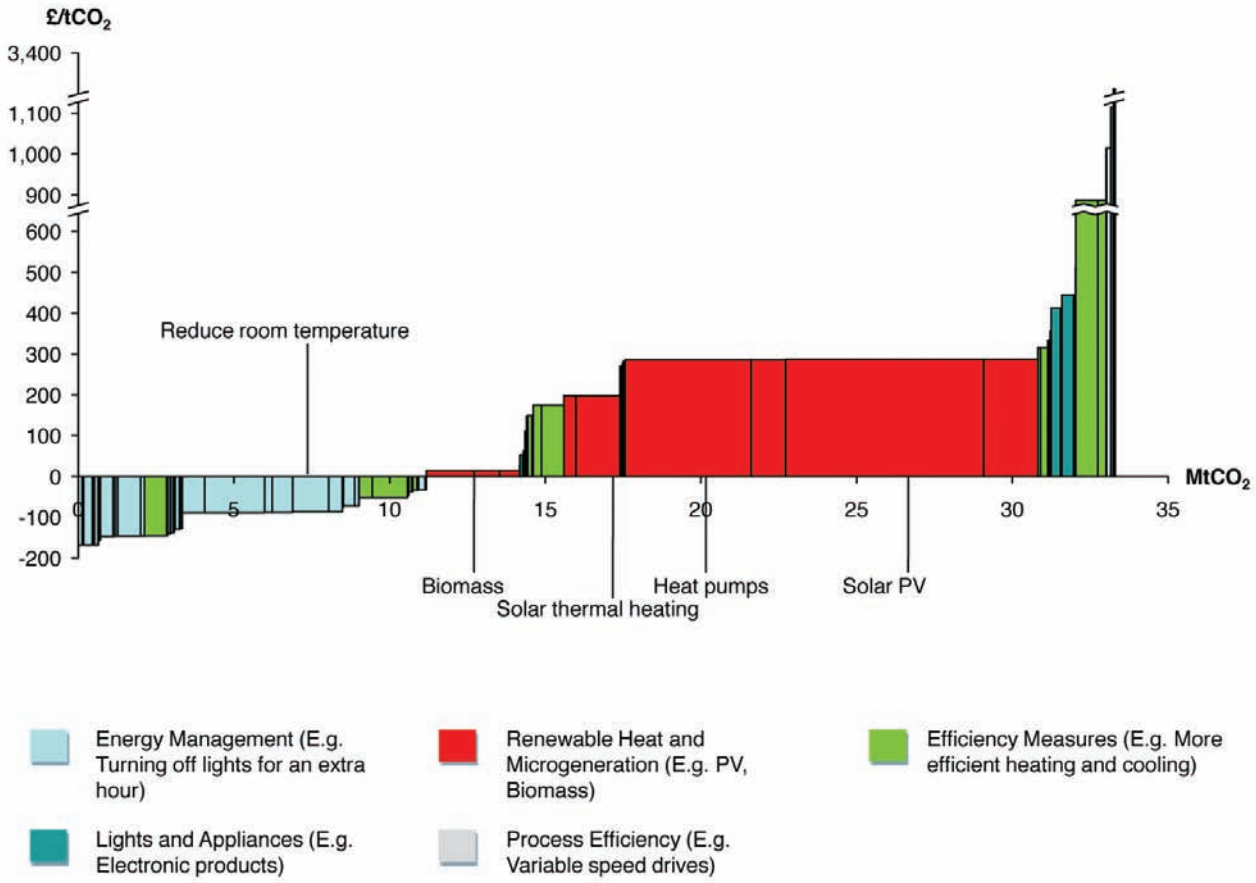
Figure B-1 **Marginal Abatement Cost Curve in 2020 for residential buildings at the UK level, 2008**



Source: Committee on Climate Change, 2008.

This graph is taken from the Committee on Climate Change report, 'Building a low-carbon economy – the UK's contribution to tackling climate change' (Figure 6.10, Residential Sector MACC – technical potential in 2020, Chapter 6, page 221). Available at www.theccc.org.uk under Reports.

Figure B-2 **Marginal Abatement Cost Curve in 2020 for non-residential buildings at the UK level, 2008**



Source: Committee on Climate Change, 2008

This graph is taken from the Committee on Climate Change report, 'Building a low-carbon economy - the UK's contribution to tackling climate change' (Figure 6.19, Non-domestic buildings MACC - technical potential in 2020, Chapter 6, page 241). Available at www.theccc.org.uk under Reports.

Appendix C
Carbon offsetting

1. Carbon offsetting should be seen as complementary to efforts to reduce emissions internally. When conducted correctly, carbon offsetting can reduce the impact of activities that cause greenhouse gas emissions. Carbon offsetting can also help raise awareness of climate change issues. Carbon offsetting involves the funding of projects that reduce or avoid emissions, with the carbon credits thus generated used to offset the equivalent amount of emissions emitted elsewhere. These carbon credits represent savings against a business-as-usual assessment. The carbon savings made must be in addition to the savings that would have happened anyway without the funding from the sale/purchase of carbon credits. Examples of projects reducing or avoiding emissions include the development of hydro-electric power stations, biomass-fuelled CHP plant and wind farms where more carbon-intensive power generation would otherwise have taken place.

Types of carbon credit

2. There are currently two recognised carbon markets: the compliance market (involving the trade of credits that are compliant with the mechanisms set out in the UN's Kyoto Protocol); and the non-compliance market (involving the trade of credits that are non-Kyoto compliant). Kyoto-compliant credits are generally issued through one of two mechanisms – the Clean Development Mechanism (CDM) or Joint Implementation (JI).

3. Non-compliant credits are issued by unregulated bodies and cannot be exchanged for compliant credits. These types of credits are usually known as

Table C-1 **Good quality criteria for carbon offsetting**

Criteria
Additionality – Projects must demonstrate that they have produced a saving in carbon that would not have happened otherwise i.e. the project could not take place without the carbon finance from selling credits. The project must not be required by legislation or to demonstrate compliance against legally binding targets. This should be demonstrated via a project methodology developed by a recognised body.
Avoiding leakage – The project must demonstrate that it has not caused an increase in carbon emissions elsewhere. Leakage is when the carbon saving made at a project/location/time increases emissions elsewhere. An assessment must be made of any effects from the project, whether upstream or downstream. This must be taken into account in determining the total emissions that can be sold from that project.
Permanence – If the project could be impermanent (e.g. forestry projects are at risk of disease or fire) then this must be addressed by the project developer or offset provider. To achieve this, impermanent projects must periodically be independently reviewed and, if necessary, credits must be replaced when they expire or cease to be valid.
Timing – Carbon credits should be ex-post, that is they must only have been issued from the project after the emissions reduction has taken place.
Validation and verification – The project must receive independent verification. The verifier must be an accredited and recognised independent third party. Purchasers of credits should also ensure that robust, independent validation and verification procedures were in place to check projects were implemented according to the methodology and subsequently monitored to ensure that emission reductions were properly measured.
Avoiding double counting – A registry must be used to register, track and permanently cancel credits to avoid double counting or double selling. Project must not be double counted against another policy or mandatory targets.
Transparency – Credits should be supported by publically available project documentation on a registry to set out the underlying projects (when they were considered approved and implemented), the quantification methodology applied and independent validation and verification procedures and reports for project and credits.

Source: DECC, September 2009

Voluntary Emissions Reductions (VERs) and purchasing one VER should equate to 1 tonne of CO_2 equivalent saved.

4. In recent years a number of voluntary standards have emerged to help 'regulate' this market, such as the Voluntary Carbon Standard and the Gold Standard for VERs.

The Government's Quality Assurance Scheme for carbon offsetting

5. The Government's Quality Assurance Scheme for carbon offsetting provides consumers with confidence that the offset credits they purchase genuinely mitigate the effect of their emissions. The Quality Assurance Scheme currently only allows approval of Kyoto-compliant international credits (Certified Emissions Reductions (CERs), European Union Allowances and European Reduction Units) and not VERs. When purchasing credits through an offset provider, it is recommended that you look for offsets carrying the quality mark.

6. If purchasing carbon credits directly from a broker, the Government recommends the purchase of Kyoto-compliant credits, such as CERs, because these offer the highest level of assurance that the above criteria have been met. More information about carbon offsetting is available in the DECC's 'A guide to carbon offsetting for the public sector'.[22]

Domestic offsets

7. There is often an interest in funding UK-based projects to help tackle climate change. Such projects, for example the installation of small-scale renewable energy generators and energy efficiency measures in households (e.g. insulation, boiler upgrades), do exist and some of them purport to provide 'offsets'. However, despite the obvious attraction of purchasing credits from UK-based projects, there is a real challenge in ensuring that domestic projects used for offsetting do actually create emissions reductions compared to the business-as-usual scenario.

8. Because there is no mechanism in place for UK-based projects to generate Kyoto-compliant carbon credits, any credits that emanate from such projects are, by definition, VERs. However, the internationally available standards for VERs do not tend to recognise carbon credits from domestic projects because of the inherent difficulties in proving the additionality of the carbon savings achieved.

9. This is because the UK has national and international emission reduction targets and has introduced a number of policies and measures to achieve them. There are also financial incentives available (such as woodland grants, subsidies for insulation and the creation of a market for renewables) that might cover some or all of the costs of projects. As a result of this, UK-based projects may result in emissions savings that would have happened anyway, rather than delivering additional savings that lead to a genuinely lower concentration of GHGs in the global atmosphere.

10. This means that carbon credits from such projects cannot normally meet the criteria of a good quality offset. In such cases, domestic carbon credits cannot be used as part of an effort to become carbon neutral. It is clear, however, that providing funding for domestic projects could bring a number of other benefits, including helping the UK to meet its emission reduction targets at a lower cost and easing the UK transition to a low carbon economy.

11. If supporting UK projects is a priority, it is recommended that carbon neutral status is not sought and an alternative means found of communicating a commitment to tackling climate change. For companies funding UK projects, the Government's guidance on how to measure and report GHG emissions includes some suggestions for recording this.

22 See www.decc.gov.uk under What we do/A low-carbon uk/Carbon offsetting/Public Sector Offsetting.

Appendix D
Fiscal incentives

Renewable energy feed-in tariffs

1. The Energy Act 2008 provides broad enabling powers for the introduction of feed-in tariffs (FITs) for small-scale low carbon electricity generation, up to a maximum limit of 5 MW capacity (50 kW in the case of fossil-fuelled CHP). The FITs will be introduced through changes to electricity distribution and supply licences.

2. These provisions are intended to encourage the uptake of small-scale low carbon energy technologies while the RO continues to be the main support mechanism for large-scale renewables deployment.

3. FITs will guarantee a price for a fixed period for electricity generated using small-scale low carbon technologies. The Government believes that the increased certainty that this will provide will encourage individual households, communities, businesses, schools, hospitals, universities and a host of other organisations to consider installing small-scale low carbon electricity generation technologies.

4. The Renewable Electricity Financial Incentives Consultation, launched on 15 July 2009, sets out how the Government intends the FITs scheme to work, including the proposed tariff levels. Government is committed to having FITs in place in April 2010.

5. The framework proposed by Government suggests that if HEIs take advantage of FITs this will not affect their ability to claim credit for the carbon reduction achieved by any scheme. However, the final design of the scheme, to be launched in April 2010, should provide definitive guidance on this issue.

6. For more information see www.decc.gov.uk under What we do/UK energy supply/The energy mix/Renewable energy/Renewable energy policy/Feed-in tariffs.

Scheme framework and eligibility

7. Any individual or organisation (including HEIs) will be eligible for FITs and the following framework is proposed in the above-mentioned consultation:

- the following technologies will qualify for FITs: wind, solar PV, hydro, anaerobic digestion, biomass and biomass CHP, and non-renewable micro CHP
- all installations under 5 MW capacity (50 kW for fossil-fuelled CHP) will be eligible
- both grid-connected and off-grid installations will be eligible.

8. Tariffs will be differentiated by technology and where more than one technology is installed at the same site, the respective tariffs will apply to each technology. Installations will receive the following financial incentives:

- generation tariff – per unit of electricity generated (regardless of whether the electricity is used on-site or exported)
- export tariff – per unit of electricity exported to the grid.

9. Incentives under the FITs and the RO cannot be combined – generators eligible for FITs will have to choose which of the two schemes to join. However, eligible installations of under 50 kW completed after 1 April 2010 will only be able to join the FITs scheme.

Renewable heat incentives

10. Powers in the Energy Act 2008 allow the setting up of a Renewable Heat Incentive (RHI). The Government's aim is to make the RHI as accessible, flexible and user-friendly as possible to potential investors in renewable heat at all scales.

11. The Act allows the RHI to provide financial assistance to generators of renewable heat, and producers of renewable biogas and biomethane.

12. Details of the scheme have not yet been finalised and the Government will be consulting on these shortly. The following are key issues for consultation:

- It is expected that the RHI will apply to generation of renewable heat at all scales, whether it is in households, communities or at industrial scale.
- The RHI should also cover a wide range of technologies including biomass, solar hot water, air- and ground-source heat pumps, biomass CHP, biogas produced from anaerobic digestion, and biomethane injected into the gas grid.

- The RHI will apply across England, Scotland and Wales (Northern Ireland will be required to develop its own legislation).
- The RHI will be banded, for example by size or technology (e.g. larger scale biomass heat may require less support per MWh than others).

13. The incentive payments will be funded by a levy on suppliers of fossil fuels for heat. These are mainly licensed gas suppliers but also include suppliers of coal, heating oil and LPG.

14. The Government aims to have the RHI in place by April 2011.

15. For more information see www.decc.gov.uk under What we do/UK energy supply/The energy mix/Renewable energy/Renewable energy policy/Renewable heat/Renewable Heat Incentive.

List of abbreviations

AMR	Automated meter reader
aM&T	Automatic monitoring and targeting
AUPO	Association of University Procurement Officers
BiTC	Business in the Community
BREEAM	Building Research Establishment Environmental Assessment Method
CAPEX	Total capital outlay required
CARES	Campus and Residential Services (Leeds Metropolitan University)
CCA	Climate Change Act 2008
CERs	Certified Emissions Reductions
CCC	Committee on Climate Change
CHP	Combined heat and power
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CRCEES	Carbon Reduction Commitment Energy Efficiency Scheme
CSR	Corporate social responsibility
CUC	Committee of University Chairs
DEFRA	Department for the Environment, Food and Rural Affairs
DECC	Department of Energy and Climate Change
EMS	Estates Management Statistics
EU ETS	European Union Emissions Trading Scheme
FE	Further education
FITs	Feed-in tariffs
GHG	Greenhouse gas
HE	Higher education
HECM	Higher Education Carbon Management programme
HEEPI	Higher Education Environmental Performance Improvement project
HEFCE	Higher Education Funding Council for England
HEI	Higher education institution
HESA	Higher Education Statistics Agency
ICT	Information and communications technology
IPCC	Intergovernmental Panel on Climate Change
KPI	Key performance indicator
kW	Kilowatts
kWh	Kilowatt-hours

LPG	Liquefied petroleum gas
MACC	Marginal Abatement Cost Curve
$MtCO_2$	Million tonnes of CO_2
MW	Megawatts
MWh	Megawatt-hours
NUS	National Union of Students
NUSSL	NUS Services Ltd
OPEX	Ongoing operating cost
PV	Photovoltaic
RHI	Renewable Heat Incentive
RO	Renewables Obligation
ROC	Renewables Obligation Certificate
SMG	Space Management Group
tCO_2	Tonnes of CO_2
tCO_2e	Tonnes of CO_2 equivalent
UEA	University of East Anglia
VERs	Voluntary Emissions Reductions
WRI	World Resources Institute

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