UNIVERSITY OF CAMBRIDGE

Carbon Management Plan

2010-2020

Version 1.2

Summary

This Carbon Management Plan was produced by a 2020 Working Group established by the Environmental Strategy Committee in response to the Higher Education Funding Council proposal for a Carbon Reduction Target and Strategy for Higher Education in England (HEFCE 2010/01, January 2010).

This Plan sets out policies, strategies and targets to achieve absolute reductions across scope 1, 2 & 3 emissions, and is primarily concerned with activities up to 2020.

In order to set the new Plan in context, Sections 2 - 4 of this document explain: (i) the manner in which University emissions should be monitored, (ii) recent trends in the scale of emissions, and (iii) recent initiatives that have proven successful in reducing emissions. These highlight the impact of research growth on carbon emissions from the University in recent years, the diversity of the scale of emissions across the University, and the importance of research activity to carbon emissions.

The core of the Plan is set out in Section 5, and proposes future governance and management structures. A framework of activities is proposed, involving policy development and infrastructure management, to ensure that the reduction of emissions can be achieved in the most effective manner possible.

A series of new proposals is made to ensure that the management of carbon emissions formally becomes part of the University planning process, and that methods be developed to allow the passing of costs associated with carbon emissions to funders. It is proposed that a framework scheme be developed to allow the strategic piloting of carbon reduction activities in selected departments, for later future roll-out across the University. Here, funding would be linked to resulting savings in utility and carbon allowance costs. To ensure that such approaches are successful, greater coordination is proposed across the University, along with the development of techniques to improve the monitoring of emissions and the consideration of greater use of benchmarks. It is also proposed that the University studies the option for building partnerships with other institutions to maximise the effectiveness of carbon reduction schemes.

Finally the plan outlines target levels of emissions for the University and proposes that future targets should take account of growth in research activity.

CONTENTS

1.0   INTRODUCTION

The University of Cambridge was founded in 1209 and is one of the world's oldest universities and leading academic centres, celebrating its 800th anniversary in 2009. The mission of the University of Cambridge is to contribute to society through the pursuit of education, learning, and research at the highest international levels of excellence. It is a self-governed community of scholars, comprising 31 independent Colleges and over 150 departments, faculties, schools and other institutions, with around 9,000 staff, 12,000 undergraduate students and 5,500 post-graduate students in 2010. The University's Estate comprises a wide variety of buildings, ranging from those built in the 13th Century to modern biomedical facilities, and now comprises 551,000m^2 of floor area spread across over 300 buildings, of which 77 are listed, including 4 at Grade 1. The current annual cost of energy and water for these buildings is around £15 million.

The University has a decentralised management structure and most of the larger departments employ their own technical and maintenance staff. However, many of the administrative functions (finance, personnel, etc.) have been brought together under the umbrella of Unified Administration Service (UAS), at the head of which is the Registrary. The largest division within the UAS is Estate Management (EM), which manages both the procurement of new buildings for the University as well as the maintenance of the existing stock. The Energy Manager and Environmental Officer are based in Estate Management.

The University of Cambridge is the recipient of the largest amount of academic research income in the UK – some £260 million. In the 2008 Research Assessment Exercise (RAE), 31.7 per cent of submissions were in the 4* category (world-leading) while 39.2 per cent were in the 3* (internationally excellent).

The University of Cambridge has a reputation for excellence in the field of sustainability, energy and environmental science, having a large number of departments engaged in its study. For example, the Cambridge Programme for Sustainability Leadership (CPSL) has over the last twenty years become renowned for its ground-breaking international leadership seminars on sustainability and strategy, such as The Prince of Wales' Business & Sustainability Programme (BSP) and the Climate Leadership Programme.

In recent years, considerable attention has also been placed on the importance of minimising carbon emissions associated with the operational aspects of the University Estate, leading to a range of initiatives to reduce emissions. For example, in 2005 Cambridge was one of 18 universities involved in the first phase of the HEFCE-backed Higher Education Carbon Management (HECM) Programme in partnership with Carbon Trust. Participation in the HECM programme has enabled £300,000 to be spent on energy conservation initiatives through the Salix fund. In addition, an Electricity Incentivisation scheme has been implemented to make departments more accountable for energy costs. This has resulted in a saving of 3,606 tonnes of carbon dioxide emissions in the first year of operation, compared with Business as Usual.

This Carbon Management Plan will therefore build on those existing initiatives to develop new targets and strategies that look towards 2020 and beyond. It is concerned only with emissions associated with the teaching, research and administrative functions of the University and does not extend to the 31 Cambridge

Colleges, which are independent institutions with their own property and income. Neither does it include activities associated with Cambridge University Press or Cambridge Assessment.

2.   CARBON MANAGEMENT STRATEGY

The context in which the Carbon Management has been developed is outlined in the following sections.

2.1   Context & Drivers for Carbon Management

2.1.1   Vision

The University of Cambridge has adopted a series of core values for carbon management. These include a statement of concern for sustainability and the relationship with the environment. On that basis a University Environmental Policy has been developed that is reviewed regularly by the Environmental Strategy Committee. The Policy states that:

> In achieving excellence in teaching and research, the University of Cambridge aims to manage its activities, buildings and estates to promote environmental sustainability, to conserve and enhance natural resources and to prevent environmental pollution, to bring about a continual improvement in its environmental performance.

The University will comply fully with environmental legislation and officially approved codes of practice, and will make continued efforts:

- to promote sound environmental management policies and practices in the work of all Faculties, Departments, and other institutions;
- to increase awareness of environmental responsibilities amongst staff and students;
- to work with other agencies locally, nationally, and internationally to promote appropriate environmental policies;
- to implement policies and procedures that contribute to a reduction in the University's carbon footprint;
- to minimise waste and pollution, and to operate effective waste management procedures;
- to reduce the consumption of fossil fuels;
- to reduce water consumption;
- to promote a purchasing policy which will give preference, as far as practicable, to those products and services which cause the least harm to the environment;
- to avoid use, wherever possible, of environmentally damaging substances, materials, and processes;
- to maintain the grounds and buildings of the University Estate in an environmentally sensitive way;

- to have regard to environmental factors as far as practicable in respect of the growth of the University and the integration of new developments into the local environment;
- to encourage modes of transport by staff and students which minimise the environmental impact;
- to communicate with interested parties on issues relating to the Environmental Policy including contacts in the immediate neighbourhood, and the regional, national and global community.

2.1.2 Management of Environment Issues

The management of operational environmental issues within the University has been overseen by the Committee for Environmental Management since 1995. However, in recognition of the growing importance of sustainability issues and the management of carbon emissions, it was agreed in 2010 that the Committee for Environmental Management should be restructured as the Environmental Strategy Committee, with strengthened membership and reporting lines. The Environmental Strategy Committee is chaired by the Pro-Vice-Chancellor for Institutional Affairs and reports directly to the Planning & Resources Committee, with an indirect reporting link to the Buildings Committee on issues relating to buildings.

The management of environmental issues is assisted by an Environmental Management System (EMS) based on ISO 14001. As part of the EMS, the University has developed a range of environmental objectives and targets in a 3-year Environmental Plan which is overseen by the Environmental Strategy Committee.

The University recognises that the Higher Education Funding Council (HEFCE) also regards the reduction of emissions to be of great importance, and indeed that future capital funding for HEIs (for example through the Capital Infrastructure Framework, CIF) should be linked to institutional performance in carbon emissions. It has also welcomed the proposal by HEFCE for a Carbon Reduction Target and Strategy for Higher Education in England (HEFCE 2010/01).[1]

The HEFCE proposals require that individual institutions:

- Must establish a carbon baseline for 2005 for scope 1 & 2 emissions (i.e. purchased electricity, gas and oil + transport fuel).

- Encouraged to measure a carbon baseline for scope 3 emissions (i.e. water, waste, business travel, commuting and procurement).

- Publish carbon reduction targets for scope 1 & 2 emissions for 2020 which must be less than those in 2005. Individual institutions are free to set their own targets based on individual circumstances, but should contribute to the sector target of 34% reduction on 1990 emissions by 2020.

- Produce a carbon management policy or strategy, and an implementation plan, approved by the governing body of the University, to achieve targets for scope 1, 2 & 3 emissions, including timescales and resources.

- Establish clear responsibilities for carbon management.

- Commit to monitor targets and report publicly annually.

In response to the HEFCE proposals it was recognised that the University's existing Carbon Management Plan, covering the period 2005 to 2010, was nearing completion and required revision. The Environmental Strategy Committee therefore agreed to establish a 2020 Working Group comprising of a number of senior academics and administrative staff with specific expertise and responsibilities in carbon management (Annex 1) to develop a Carbon Management Plan to achieve reductions in carbon emissions by 2020 and also to look beyond to longer-term initiatives that would result in further reductions by 2050.

This Plan has therefore been developed with the support and engagement of senior management and academics from across the University with oversight by the appropriate University Committees throughout its development, including the Environmental Strategy Committee, Planning & Resources Committee and University Council.

3.0   EMISSIONS BASELINE & PROJECTIONS

3.1   Measurement

The University of Cambridge contributes to climate change directly, through emissions from University facilities, and indirectly, through both emissions associated with its demand for goods and services and through the disposal of wastes. These emissions are categorised as 'scopes' in the Greenhouse Gas Protocol (GHG Protocol)[2], which are defined as follows:

Scope 1:   Direct emissions that occur from sources that are owned or controlled by the organisation, for example emissions from combustion in owned or controlled boilers, furnaces, vehicles

Scope 2:   Emissions from the generation of purchased electricity consumed by the organisation

Scope 3:   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, water, waste, business travel, commuting and procurement.

Throughout this Plan, carbon is expressed in terms of Carbon Dioxide Equivalent ($CO_{2(e)}$). This is calculated from metered energy consumption using conversion factors published by DECC (or using other recognised conversion factors where there are no appropriate factors provided by DECC)[3].

Tables 1 and 2 show the scope 1 & 2 emissions for buildings and vehicle fuel for the whole University Estate based on figures used to compile the annual HEFCE Estate Management Statistics (which include an allowance for embedded accommodation at Addenbrooke's Hospital).[4]

Table 1: Scope 1 & 2 Baseline for 2005/2006

	Consumption	Unit	Conversion Factor	$CO_{2(e)}$ (tonnes/y)
Grid electricity	100,516	MWh	0.53744	54,021
Natural gas	79,797	MWh	0.18523	14,781
Heating oil	1,846	MWh	0.24683	456
Steam	7,443	MWh	0.23154*	1,723
Vehicle fuel	95	m^3	0.26720	254
Total				**71,235**

Table 2: Scope 1 & 2 Baseline for 2008/2009

	Consumption	Unit	Conversion Factor	$CO_{2(e)}$ (tonnes/y)
Grid electricity	109,942	MWh	0.54522	59,943
Natural gas	84,814	MWh	0.18523	15,710
Heating oil	1,322	MWh	0.24683	326
Steam	6,163	MWh	0.23154*	1,427
Vehicle fuel	95	m^3	0.26720	254
Total				**77,660**

* The conversion factor used for steam is based on the conversation factor for natural gas with an efficiency factor of 0.8 to account for boiler efficiency.

It should be noted that the carbon intensity of the grid has been improving through the 1990s as coal-fired power stations have been replaced by gas ones, causing lower carbon emissions per unit of energy generation. This improvement may however reverse in coming years as nuclear and other low carbon-generating sources come to the end of their working lives.

3.2 Recent trends in scope 1 & 2 emissions

Scope 1 & 2 emissions comprise direct emissions from processes, emissions associated with energy use in buildings and transport fuel.

There are no direct qualifying process emissions from the University so, for the purposes of the HEFCE proposals, emissions are limited to those associated with energy use in buildings and transport fuel.

3.2.1 Carbon emissions from energy use in buildings

Accurate historical energy consumption for buildings comprising the main University Estate (not including Colleges, Cambridge Assessment, Cambridge University Press and Embedded Accommodation at Addenbrooke's Hospital) is shown in Figure 1. In considering this figure it should be noted that in recent years the University of Cambridge has been particularly successful in the fields of research and teaching, and there has been a substantial growth in activity across the University. Research income, for example, has grown as an average rate in real terms of 8% p.a. in real terms. Energy consumption has grown steadily as a consequence of this growth, which has also led to a growth in the Estate.
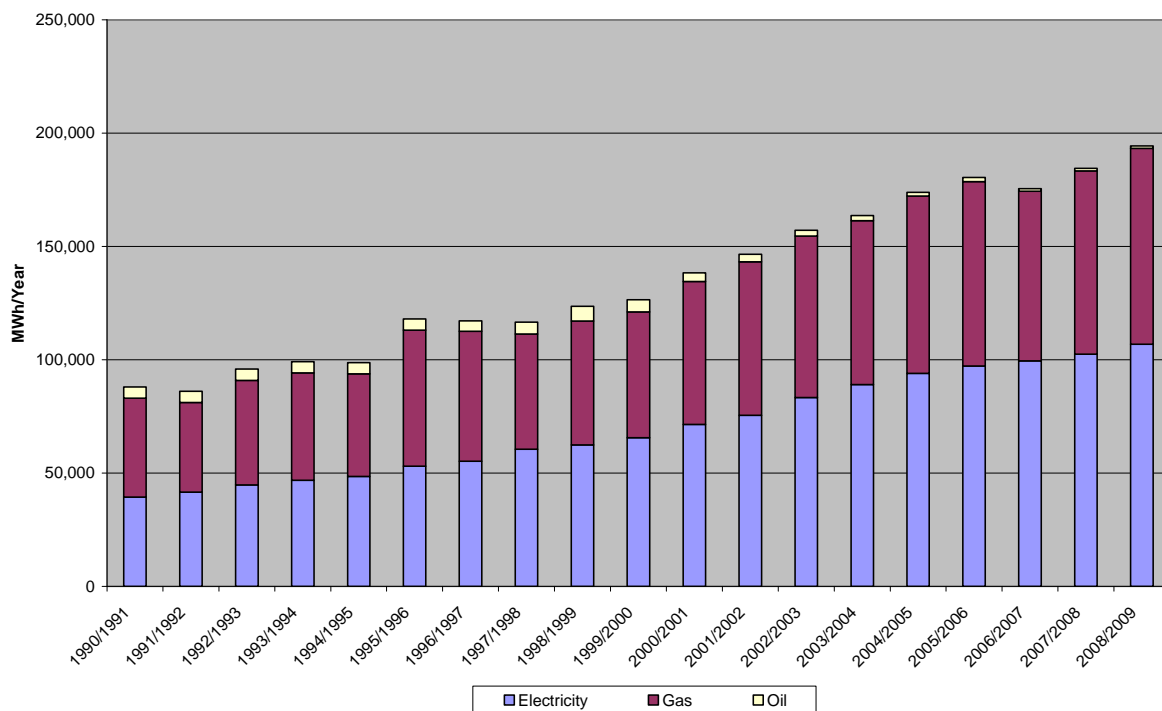

Figure 1:   Energy consumption in buildings (main Estate only)

Electricity consumption has risen faster than heating energy consumption (which is dominated by oil and gas). This is primarily because electricity consumption has been driven by demands from electrical equipment such as research equipment, IT, and ventilation and other equipment to satisfy H&S and other regulatory requirements associated with scientific research. Additionally, building envelopes have become more efficient, resulting in a proportionately greater impact from 'plug loads' from academic research. Preliminary investigations indicate that plug loads associated with academic scientific research (including ventilation etc. to satisfy H&S requirements) could account for around 60% of University carbon emissions. Further investigations are planned to improve our understanding of this aspect.

Carbon emissions calculated using annual historical DECC conversion factors show a similar upward trend, as shown in Figure 2.
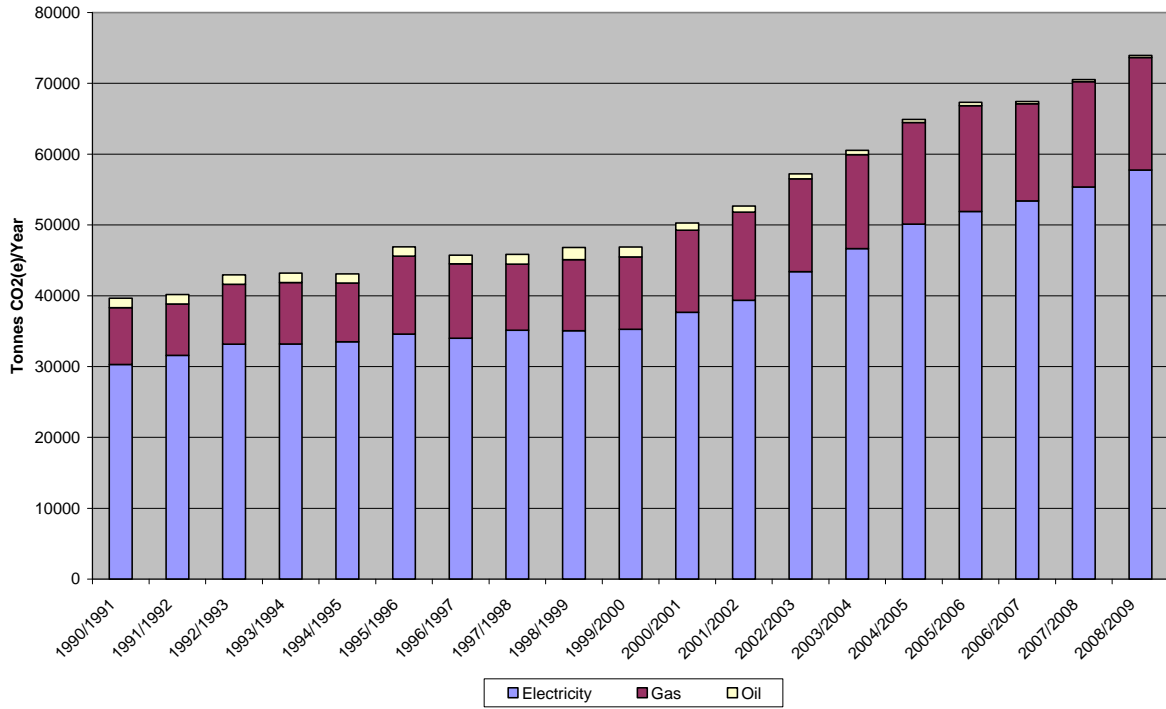
Figure 2:   Carbon Dioxide emissions associated with energy use in buildings (main Estate only)

It should be noted however that while the overall level of emissions has grown (Figure 2), the management of emissions has resulted in reduction in emissions normalised to income – as shown in Figure 3.
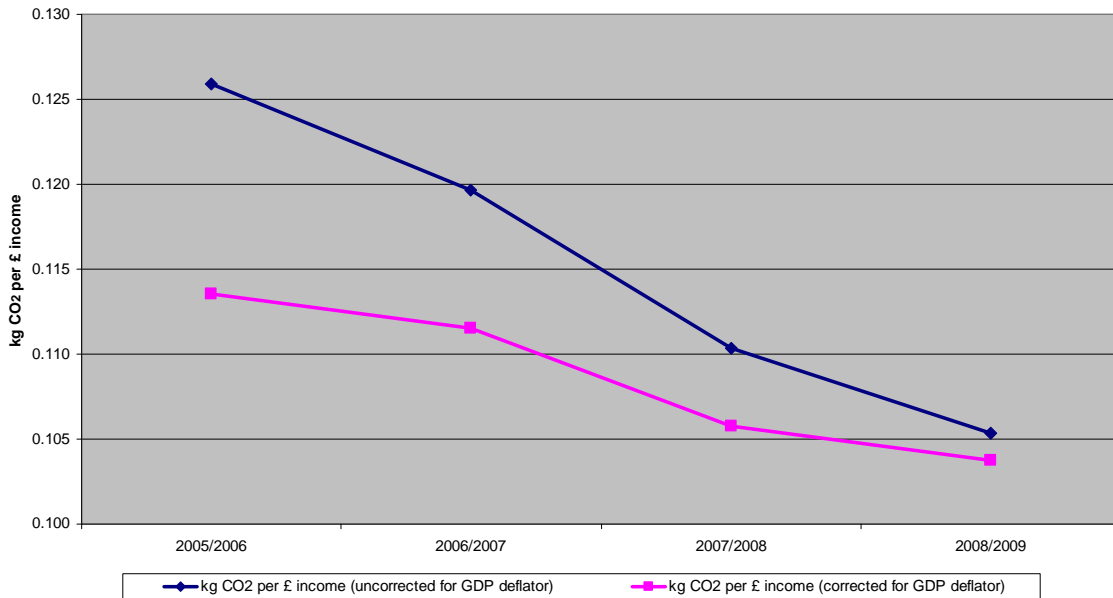
Figure 3:   Carbon Dioxide emissions related to Total Income (Corrected and Uncorrected for inflation using the HM Treasury GDP Deflator)

As a result, emissions per unit of total income have reduced by 16.34% in absolute terms and 3.60% corrected for inflation using the HM Treasury GDP Deflator between 2005/2006 and 2008/2009.

It is important therefore that the setting of targets for future emissions should take account of any further potential growth in activity, and that concerted efforts be made to ensure that emissions due to research activity itself are minimised.

Evidence of the relative importance of research emissions within the University of Cambridge when compared with other Universities is shown in Figure 4. Here the breakdown of the University's 2005 baseline for scope 1 & 2 emissions is compared with 2005 Sector baseline calculated for HEFCE by consultants SQW:

Cambridge University Scope 1 and 2 Emissions 2005/2006 (%)

Electricity ■ Gas □ Oil □ Coal ■ Transport Fuel
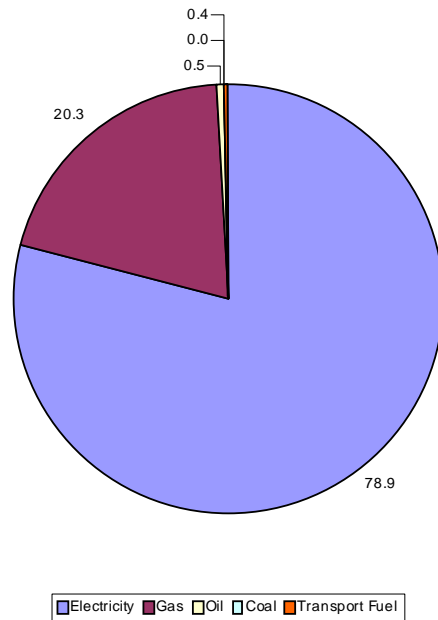
Sector Scope 1 and 2 Emissions 2005/2006 (%)

Electricity ■ Gas □ Oil □ Coal ■ Transport Fuel

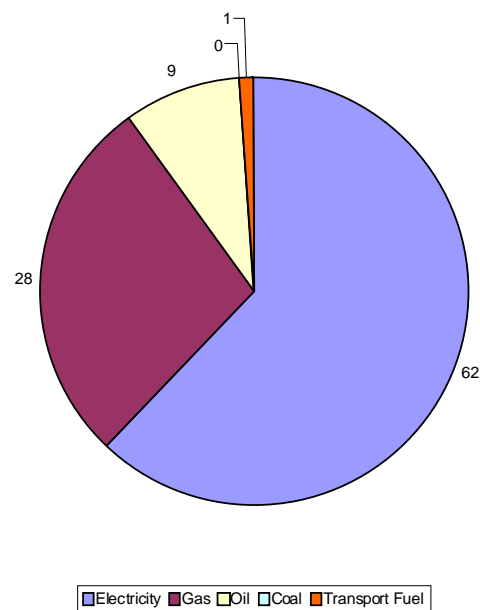*Figure 4:   Comparison of Cambridge and HE Sector Scope 1 & 2 Emissions*

Unsurprisingly, the University emissions profile shows a much greater contribution from electricity usage (79%) compared with the sector average (62%) as a consequence of the high energy demands of scientific and technical research compared with institutions with higher proportions of teaching in arts and humanities subjects.

It is clear that, given the major importance of growing research-related emissions, their control and management should become a distinctive part of the future plan of the University.

3.2.2 Comparison of carbon emissions with other English HEIs

Analysis of data relating to 2005 carbon emissions from English HEIs contained in SQW's baseline report for HEFCE[5] shows that relative scale of emissions by the University of Cambridge is similar to other research-intensive universities, as demonstrated in Figure 5, which shows that the Russell Group Institutions represent 15 of the highest 18 emissions of all HEIs in England.

The highest 48 of these institutions in terms of carbon emissions is shown again in Figure 5(a) for the sake of clarity. It can be seen that many of the institutions in this group that are not (at the time of writing) in the Russell Group are still likely to have a high proportion of science & technical based teaching & research (e.g. Exeter, Durham, Brunel, Reading, Leicester, Cranfield and York).
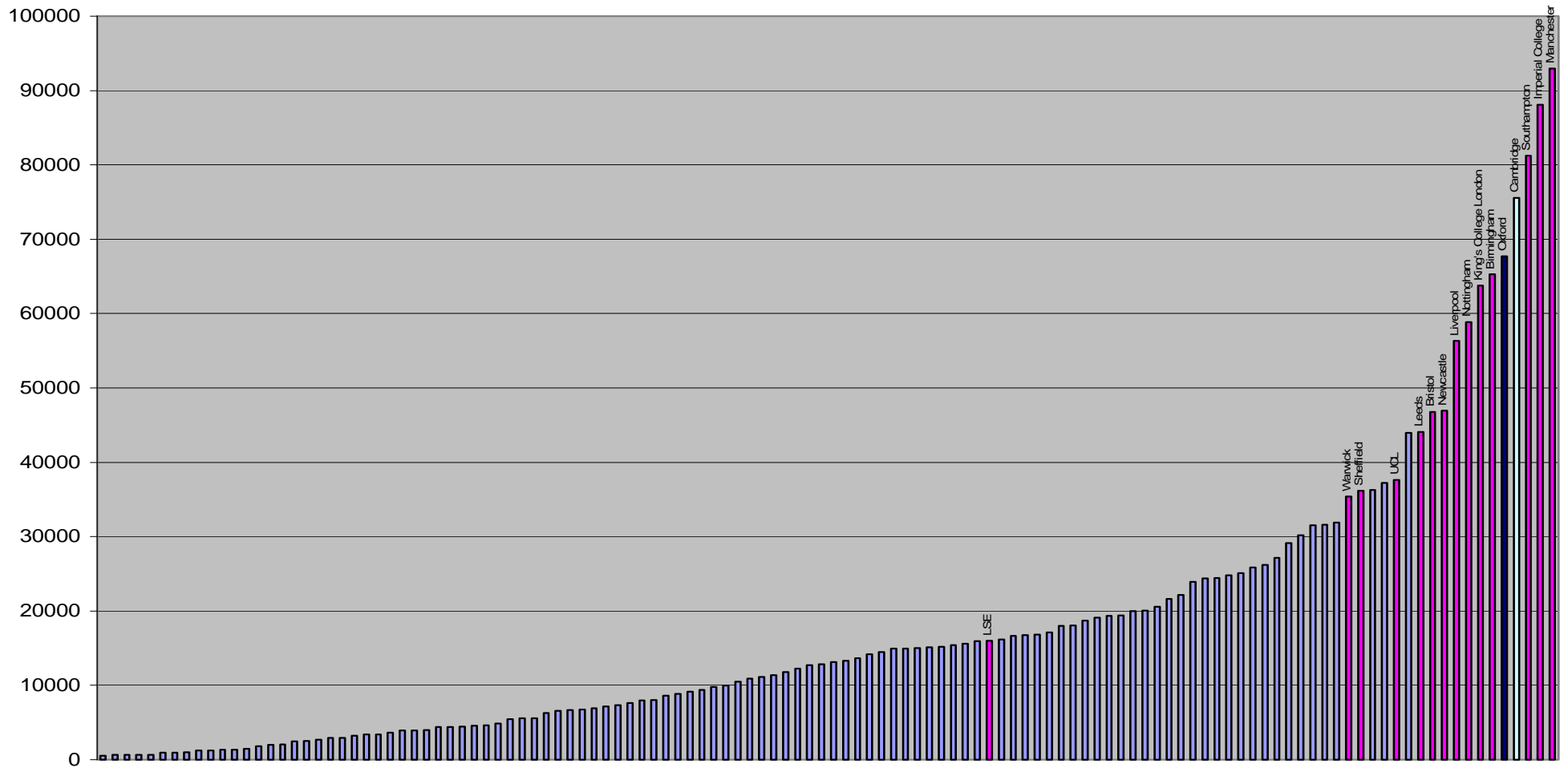
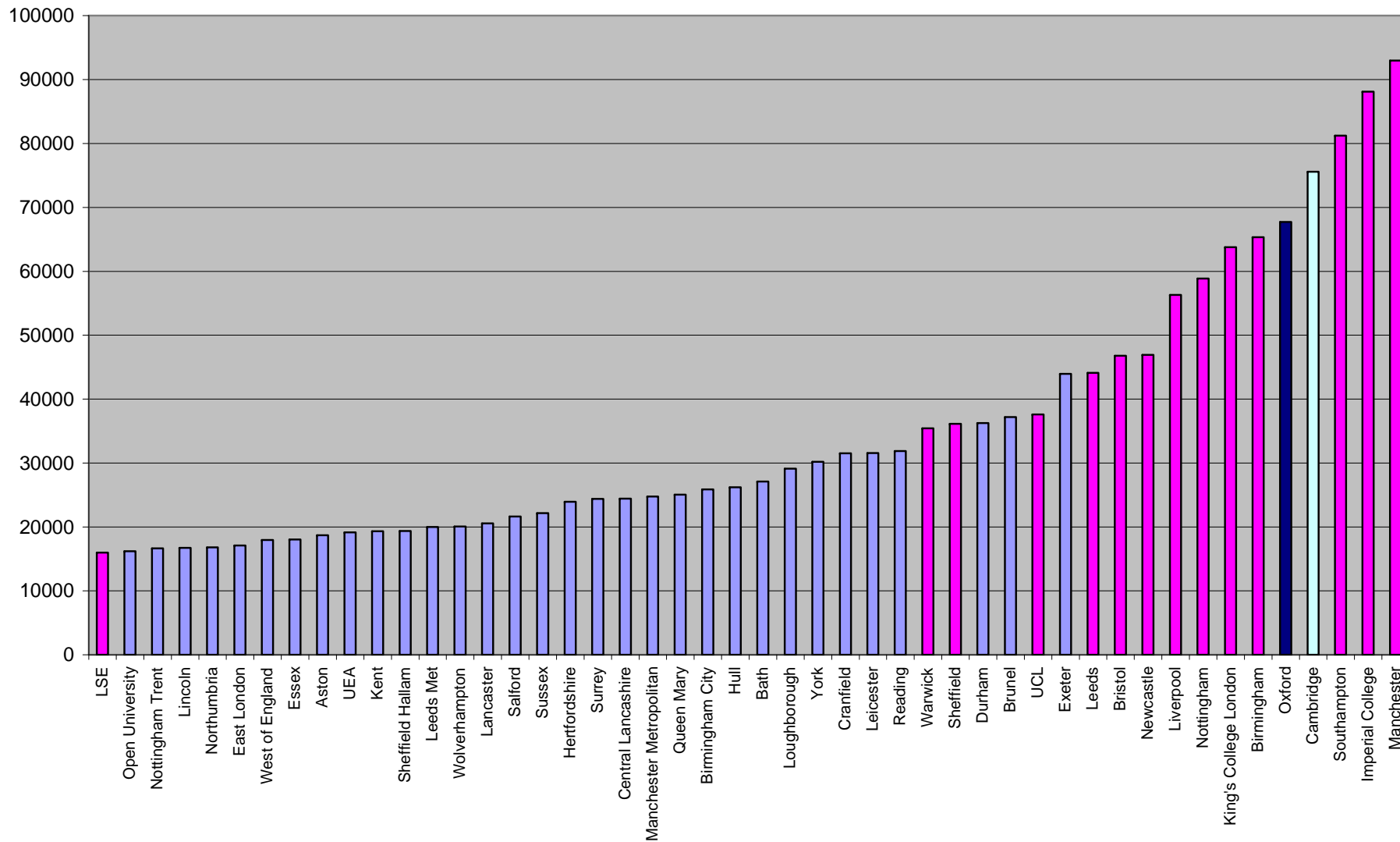*Figure 5:   Comparison of 2005 CO$_2$ Emissions (t/y) from English HEIs (Russell Group Institutions highlighted).*

Figure 5(a): Comparison of 2005 CO$_2$ Emissions (t/y) from Highest 48 English HEIs (Russell Group Institutions highlighted)

3.2.3 Carbon emissions associated with transport fuel

The other contributor to scope 1 & 2 emissions is from vehicle fuel used in vehicles owned by the University.

Responsibility for management of individual vehicles rests with their respective departments, making it difficult to obtain accurate estimates of fuel usage. However, initial estimates of transport fuel usage have been made as part of the 2009 HEFCE Estate Management Statistics data collection exercise. This information has been used to calculate carbon emissions using appropriate DECC factors, which found that from a vehicle fleet of around 240 vehicles, the estimated emissions were 251 tonnes of CO_2.

Similar information is not available for 2005. However there have been no significant changes to the size and nature of the vehicle fleet since that time so emissions associated with transport fuel for 2005 is not expected to differ significantly from those estimated for 2009.

3.3 Variation of carbon emissions across the University Estate

Although the University is rightly regarded as a single entity, the origin and scale of its carbon emissions vary greatly across its Estate and need to be considered individually.

As a result, in developing the plan for management of carbon emissions, much emphasis has been placed on the precise measurement of emissions. Accurate historical energy consumption is being measured for buildings across the main University Estate. Information on carbon emissions can therefore be obtained on a building-by-building basis, as shown for the 30 major users in Figure 6.
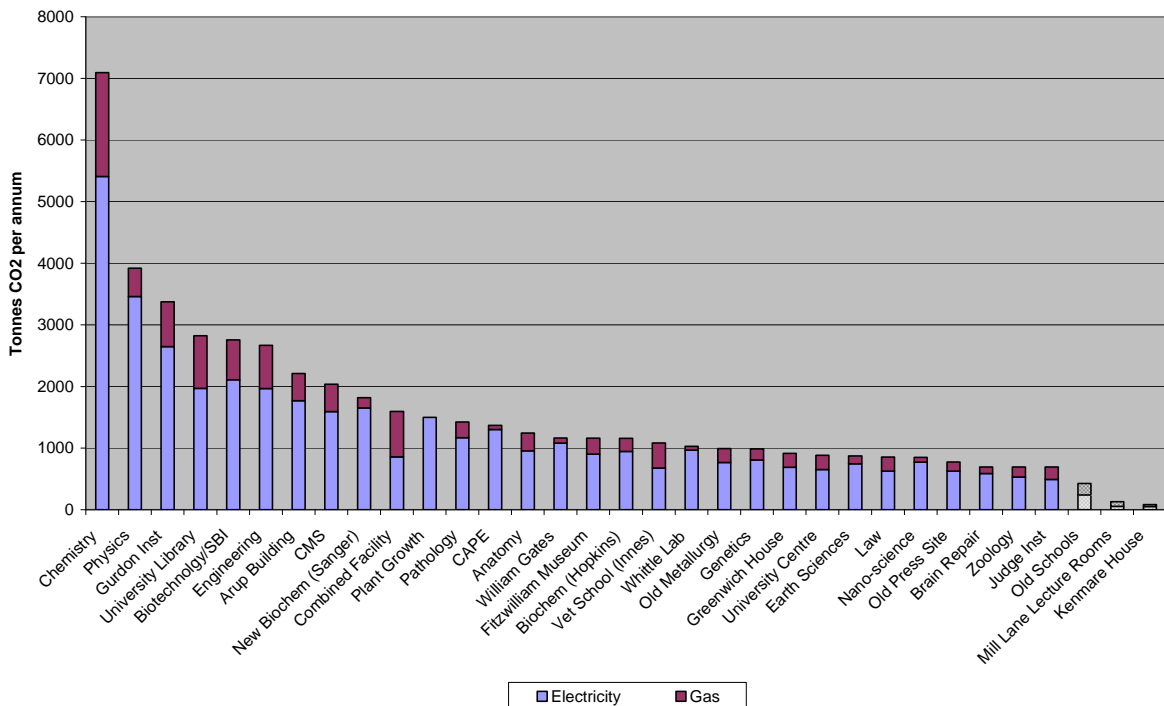
Figure 6: Highest 30 buildings ranked by magnitude of carbon emissions

Emissions from administration facilities at the Old Schools and Estate Management, as well as the Mill Lane Lecture Rooms, are also shown for context in Figure 6.

As expected, these measurements have noted that by far the largest contribution to emissions is from departments engaged in scientific and technical research. For example, emissions associated with the Department of Chemistry represent around 10% of the University's total emissions. The only non-scientific buildings in the top 20 are the University Library and Fitzwilliam Museum, which are both very large buildings with high energy demands relating to the provision of satisfactory internal climatic conditions.

The dominating impact of academic plug loads associated with scientific research is further reinforced by considering the carbon intensity as tonnes CO_2 emitted per m^2 from these buildings, as shown in Figure 7.
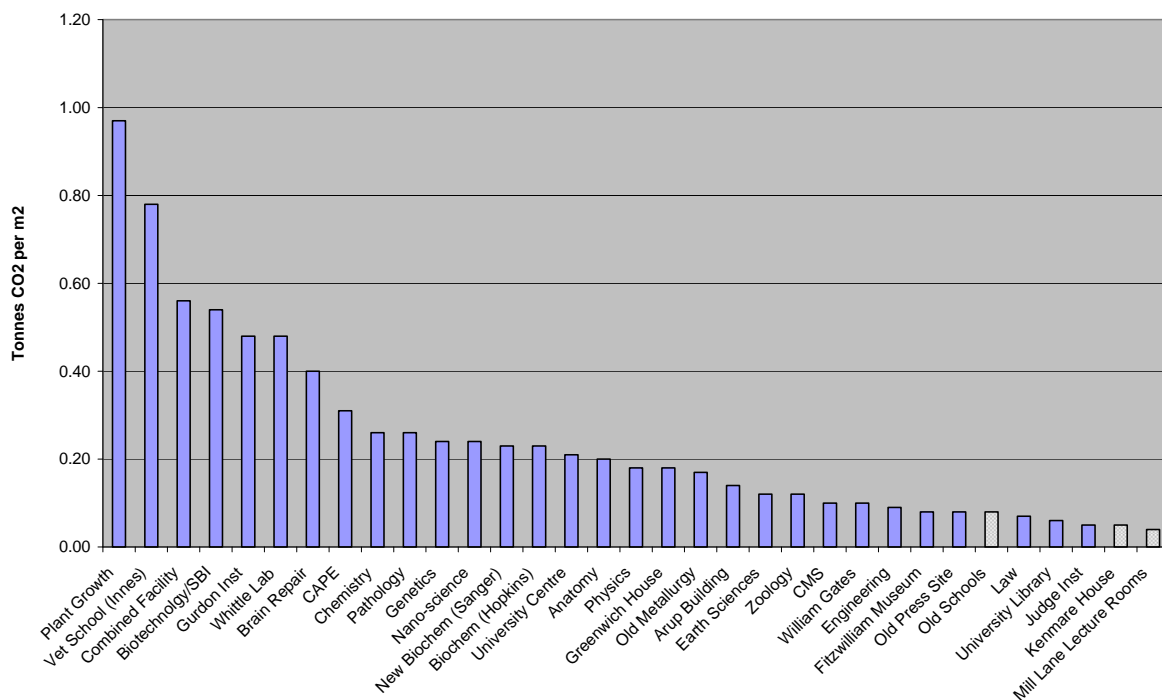
Figure 7: Highest 30 Buildings ranked by carbon intensity

It is interesting to note that the building with the highest energy intensity is the Plant Growth Facility, which is rated as BREEAM Very Good. Although the building envelope itself is very efficient, the energy profile of the building is totally dominated by the electricity consumption of the plant growth chambers.

A comparison in recent growth in a selection of individual buildings is shown in Figure 8.

CO$_2$ emissions 2002-2008 for Chemistry / University Library / Gurdon Inst / Biotechnology & SBI / The Old Schools
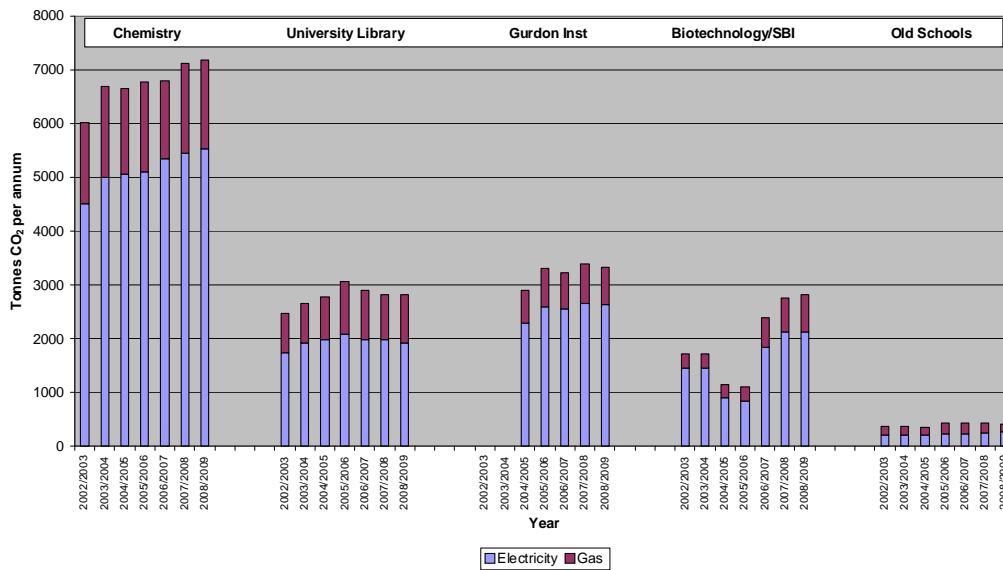
Figure 8: Comparison in recent growth in a selection of individual buildings

The effect of changing use within a building is clearly demonstrated in the case of one building on Tennis Court Road, currently occupied by the Department of Biotechnology and the Systems Biology Institute (SBI).

Prior to 2004 the building was shared between Wellcome/CRC and the Institute of Biotechnology, with annual emissions in the region of 1800 t/y. However, Wellcome/CRC relocated to the Gurdon Institute in 2005 and emissions subsequently dropped to around 1,200 t/y while the vacated section of the building was being refurbished for SBI. Following the occupation of the building by SBI in 2007, annual emissions increased to around 2,800 t/y as a direct result of changing activities within the building, even though the building envelope had remained essentially unchanged throughout. Clearly, increased efficiency of building use in this case has led to an increase in emissions.

3.4   Effect of research activity on heating load

There is a huge variation in heating load, as indicated by gas consumption per m^2 across the University Estate, as shown in Figure 9. However, the buildings with a high intensity of gas usage are not necessarily wasteful or badly performing. In fact, detailed analysis of gas consumption data for all University buildings has revealed a strong correlation between the type of activity engaged in within the building and the intensity of energy used for space heating.

Figure 9: Gas Consumption (kWh/m²) for selected buildings across the University Estate

Degree day analysis (as is common practice in energy management) has been used to determine the relationship between the weather and each building's usage of gas. Almost without exception this has proved that heating systems are well controlled, evidenced by the strong correlation (coefficient > 0.95) between gas consumption and weather on a month-by-month basis.
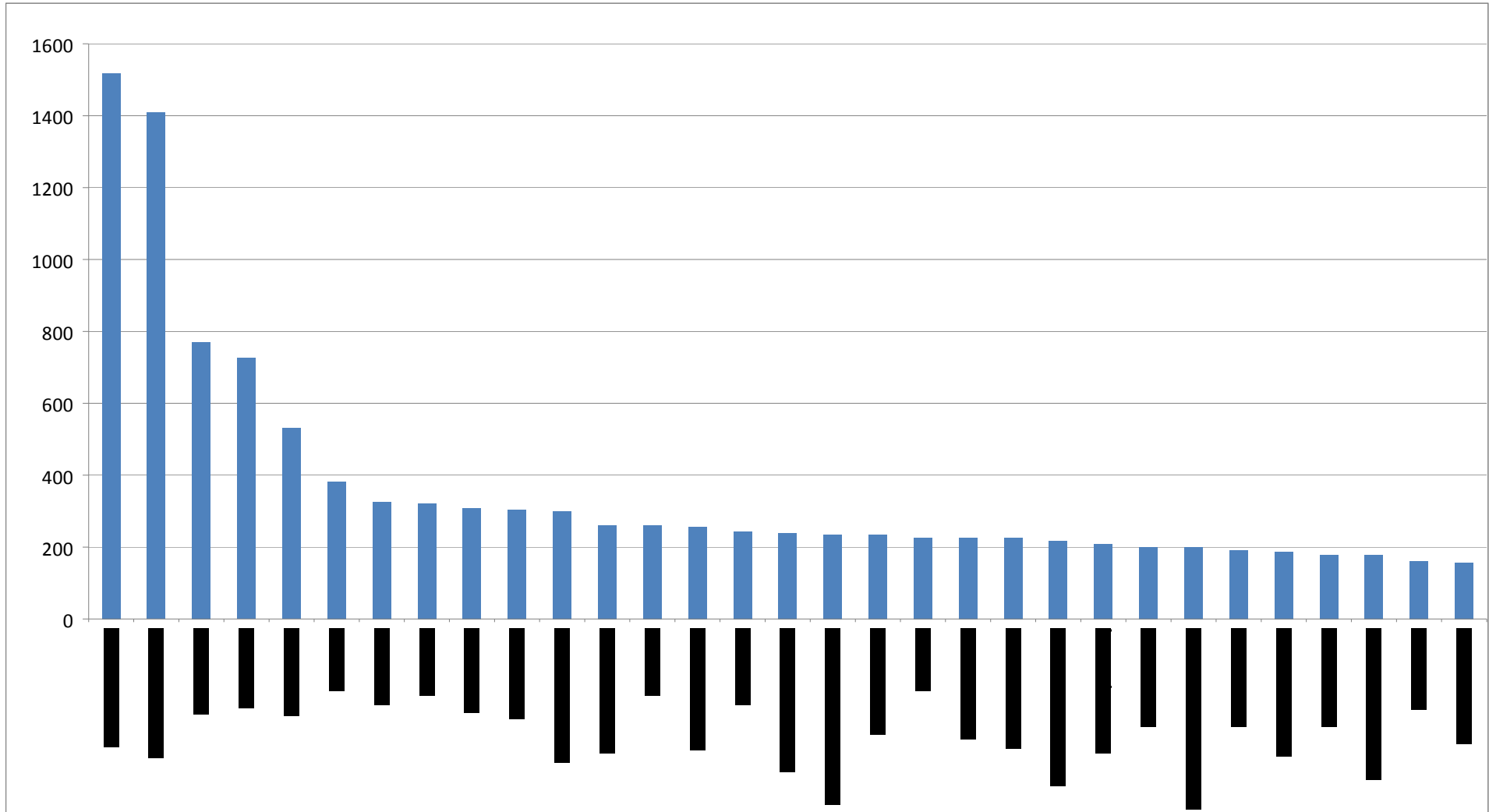
The same analysis can be used to work out how much of each building's gas consumption is related to space heating and how much is everything else, termed 'baseload'. In arts, humanities and administration type buildings this baseload will be mainly domestic hot water for hand washing. In the science buildings it will be used to meet process loads.

The largest baseloads are in the biomedical buildings. This is because they have controlled environments and heat is required for humidity control. Quite often, the air is chilled down to below the dew point, excess water condenses out and the air then reheated to the required temperature. The same is true of some of the University's libraries and museums.

The energy required for space heating on a per square metre basis is arguably a more meaningful measure of a building's energy efficiency than many other metrics. However, the influence of air change rates on these figures is hugely significant. It has been found that even a relatively poor performing administration building like the Old Schools at 164 kWh (space heating) / m^2 is much less demanding than the Chemical Lab at 266 kWh (space heating) / m^2. The former is a grade 1 listed building dating from the 15th Century while the latter is a 1950s laboratory that has around 300 fume cupboards. As a result, there is clear evidence that the targeted instigation of pilot schemes to address the largest areas of consumption of energy could have great impact.

3.5   Scope 3 emissions

The primary scope 3 emissions from the University are associated with water, waste, farm animals, business travel, student & staff commuting, and procurement.

Although procurement has been estimated by SQW to potentially represent 50% of total sector emissions, the absence of a suitable methodology and the difficulty of obtaining meaningful data for the huge range of materials procured by the University means that it has not been possible to consider this factor further at the present time.

A tentative preliminary estimate of the University's scope 3 emissions (not including procurement) is shown in Figure 10 and compared with scope 1 & 2 emissions.

The assumptions used to arrive at the preliminary estimates of the University's scope 3 emissions are shown in Annex 2, along with a confidence rating associated with the assumptions made in making those estimates. Further work is on-going to refine these estimates using more reliable data. However they do start to provide some indication of the possible magnitude of scope 3 emissions associated with the various activities giving rise to them.
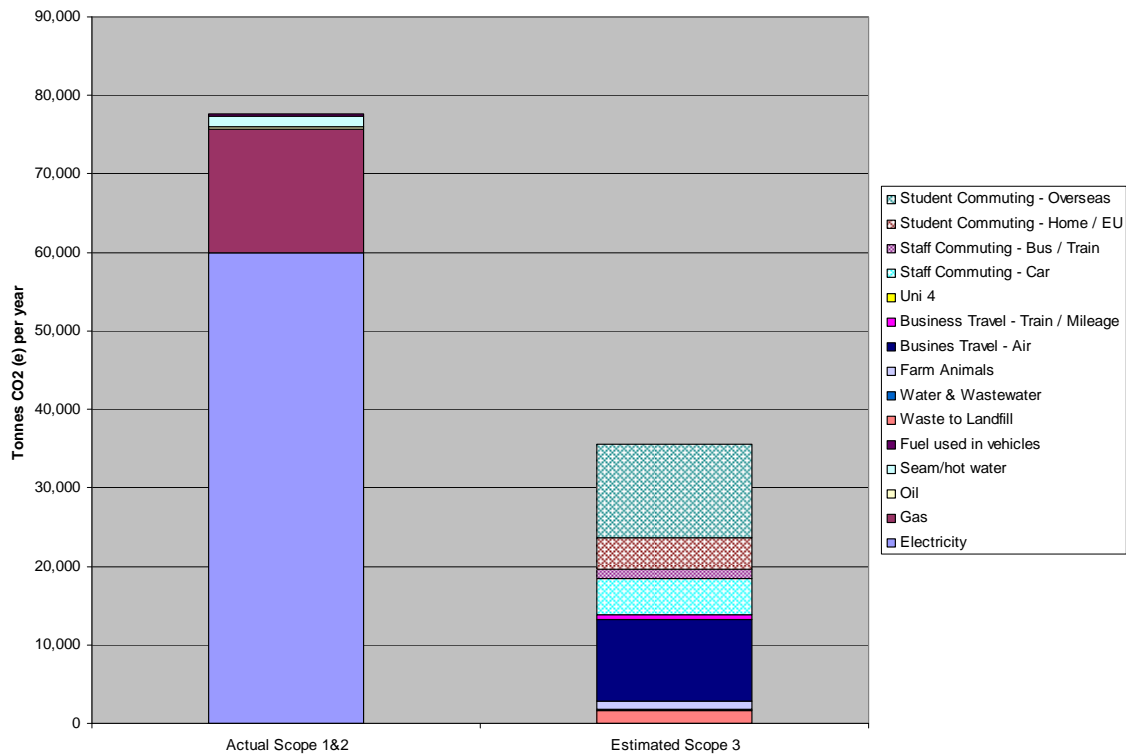
Figure 10:   Actual Scope 1 & 2 Emissions and Preliminary Estimates of Scope 3 Emissions (very preliminary estimates of staff and student commuting with low levels of confidence shown shaded)

The breakdown of the University's 2005 baseline for the preliminary estimate of scope 3 emissions is compared with 2005 Sector baseline calculated for HEFCE by consultants SQW, as shown in Figure 11.

The University recognises that scope 3 emissions are important and will continue to seek to introduce schemes to reduce them. However it must be recognised that they are substantially smaller than emissions associated with building usage which must remain the main focus of attention in order to make significant reductions in the University's overall carbon footprint.

Cambridge Baseline

Legend:
- Oil
- Gas
- Electricity
- Coal
- Transport Fuel
- Water
- Waste
- Transpot (Business)
- Transport (Staff Commute)
- Transport (Student Commute)
- Transport (Air International Student)
- Transport (Air Business)
- Transport Air Exchange

Cambridge Baseline values: 3%, 0%, 2%, 13%, 3%, 6%, 2%, 2%, 0%, 0%, 0%, 54%, 15%

HE Sector 2006 Baseline

HE Sector 2006 Baseline values: 1%, 1%, 6%, 12%, 17%, 11%, 8%, 37%, 4%, 1%, 1%, 1%, 0%

Figure 11:   Comparison of Cambridge and HE Sector Scope 3 Emissions

Unsurprisingly, the estimate for student commuting at Cambridge (3%) is significantly lower than the HE Sector (11%) although further work is required to obtain accurate data for Cambridge.

4.0   RECENT INITIATIVES FOR REDUCING CARBON EMISSIONS

In addition to building up a much greater level of understanding of the nature of carbon emissions from the University, a wide range of sustainability initiatives have been developed in recent years to improve its environmental impact and limit its impact on climate change. These form the foundation upon which the plan for 2010-2020 is built, and include:

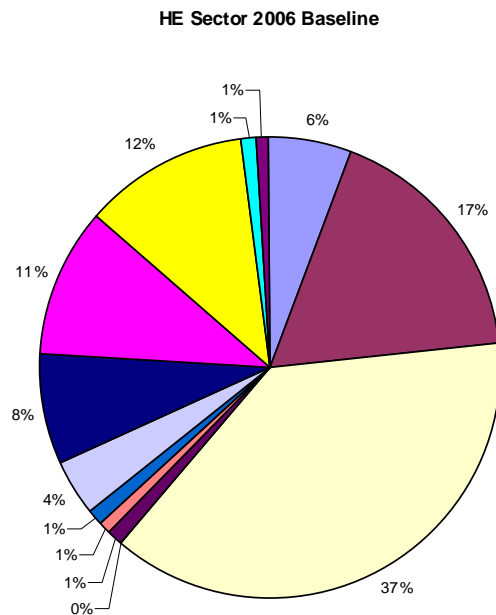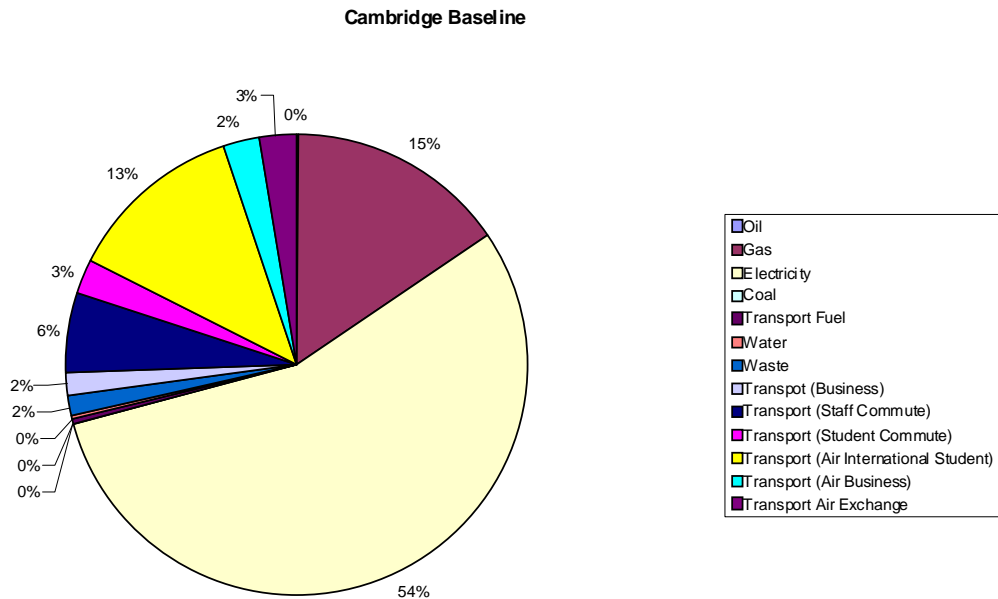| Scope 1 & 2 emissions	
Electricity, Gas, Oil	
Higher Education Carbon Management Programme	Cambridge was one of 18 HEIs in the first tranche of the Carbon Trust Higher Education Carbon Management Programme. This involved the development of a range of initiatives intended to reduce building-related emissions by 10% from 2005/2006 levels by 2010/2011.
Electricity Incentivisation Scheme	The Electricity Incentivisation scheme, introduced in Aug 2008 to make departments more accountable for energy costs, saved £720k on electricity costs (3,606 Tonnes CO_2) in first year of operation, compared with Business as Usual.
Departmental Energy Champions	A network of 71 Departmental Energy Champions was established in Aug 2008 to promote energy efficiency within their Department. Initial basic training was provided by the Energy Team.
CRC Energy Efficiency Scheme	The University will participate in the mandatory CRC Energy Efficiency Scheme from April 2010.
Space Utilisation	A University Council-approved policy aims to increase utilisation of lecture theatres and seminar rooms by 5% year-on-year (November 2009).
Research Plug Loads	Preliminary investigations indicate that plug loads associated with academic scientific research (including ventilation etc. to satisfy H&S requirements) could account for around 60% of University carbon emissions. We are engaging with HEEPI to carry out a study of Dept. of Chemistry in collaboration with Universities of Oxford and Edinburgh.
Green Procurement	The University Green Procurement Guide, published in 2008, contains advice on benefits of purchasing energy-efficient equipment. Presentations on Green Procurement are made at annual Purchasing Exhibitions and meetings of Commodity Groups.
Meters on the Web Project	Web-based Energy Consumption Data is available to Departmental Energy Champions using the 'Systemslink' system. Work is on-going to develop this resource through a joint EM/UCS/Computer Laboratory 'Meters on the Web project' to make energy consumption data more accessible to departments.
Carbon Trust Standard	Accreditation to the Carbon Trust Standard was awarded in May 2010 and will be valid for 2 years.
Energy Conservation Measures	£0.25 M per annum is allowed for within the Long Term Maintenance Plan for energy conservation works in operational buildings. These works are to include improved control of heating, cooling, ventilation and lighting as well as building fabric improvements to reduce heat loss.
	Additional to this is the Revolving Green Fund set up with £0.3 M from HEFCE and £0.3 M from Salix provided over 3 years. This ring-fenced fund is reimbursed from the energy savings every year and will allow investment of £0.2 M annually on any energy saving measures that are compliant with the Salix criteria.
	Council decision to invest in motion detector lighting controls.

BEEP	Memorandum of Understanding signed for BEEP (Buildings Energy Efficiency Programme), facilitated through the Clinton Climate Initiative. Initial meeting has been held with London Development Agency to take proposals forward for up to 20 buildings for retrofit of energy conservation measures provided by an ESCO (Energy Services Company) against guaranteed energy saving targets.
Sustainable construction	A University policy on the design and construction of environmentally sustainable new buildings promotes integrated passive design such as natural ventilation & daylight and the use of exposed thermal mass & night-time cooling. New buildings over 1,000 m^2 are assessed under BREEAM with a target of 'Excellent' and minimum of 'Very Good'. 8 Buildings have been assessed for BREEAM (1 Excellent, 6 Very Good and 1 Good). The University is participating in an initiative with BRE to develop an HE-specific template for BREEAM.
IT	Work is on-going to introduce sever virtualisation during IT upgrade initiatives to reduce energy consumption associated with server operation and cooling. Low energy cooling for server rooms is being implemented at the Department of Engineering and investigated at Astronomy and Earth Sciences (Madingley Rise).
Renewable and decentralised energy	10% of the energy requirement of new buildings is provided by on-site renewables to satisfy local planning requirements, including: Ground Source Heat Pumps (Architecture and Astronomy), PV (Sainsbury Laboratory), Biomass Boiler (Institute for Manufacturing) and Labyrinth air pre-treatment system (Hauser Forum). A feasibility study was carried out by Faber Maunsell in 2008 to assess the feasibility of providing a site-wide renewable energy system, including large-scale wind turbines, Anaerobic Digestion and CHP / District Heating Systems. AECOM was commissioned in April 2009 to undertake a feasibility study to assess opportunities for shared facilities for CHP / District Heating / Cooling for North West Cambridge and West Cambridge developments.
New developments	A Carbon Footprint study of the Estate Implementation Plan was undertaken by Ramboll (formerly Whitby Bird) in May 2010. Sustainability Consultants (AECOM) were appointed to take forward earlier sustainability objectives for the University proposals for the future development of North West Cambridge, including key worker housing, college, academic and commercial research facilities. A Sustainability Panel (Prof Peter Guthrie, Prof Koen Steemers and Prof Robert Mair) established to oversee sustainability aspects of future development proposals for NWC.
Transport Fuel	
Uni 4 bus	The University subsidises the Uni 4 bus service, operated by Stagecoach, to provide reduced fares for University staff travelling within Cambridge.
Fleet vehicles	A Green Fleet Review of existing EM vehicle fleet was carried out by the Energy Savings Trust (EST) in May 2010. The Vehicle Green Procurement Guide, published in 2009, was quoted as an example of procurement best practice in HEFCE Sustainable Development Resource Guide.
Pool bikes	EM operates a staff 'Pool Bike' scheme for short inter-site visits to reduce vehicle movements.

Scope 3 emissions	
Water	
Water conservation	The highly successful long-standing water conservation programme has led to a 50% reduction in metered water supply since 1987. This has resulted in gaining the Highly Commended award in the Water Conservation and Continuous Improvement Categories of the 2005 and 2007 Green Gown Awards respectively.
Waste	
Waste & recycling	Extensive network of recycling facilities for paper, cardboard, glass, plastic, aluminium cans, fluorescent tubes, toner cartridges and WEEE, resulting in 30% of University waste stream being recycled to meet EM KPI of 10% annual increase in the amount of material collected for recycling. This resulted in a Highly Commended award in the waste management category of the 2005 Green Gown Award.
Construction waste	The University has signed up to the WRAP 'Halving Waste to Landfill' initiative, which aims to cut construction waste to landfill by 50% by 2012.
Agricultural practices	
University Farm	The co-location of the beef unit with the dairy herd at new accommodation at Park Farm provides enhanced opportunities for improved animal husbandry. Changes in milking practices will significantly reduce the consumption of water. The move to having all of the animals on one site will eliminate the current necessity of travelling between sites for feeding and observing the animals. There is also the possibility of energy exchange in cooling the milk.
Business Travel – Air	
Travel policy	The University Travel Expenses Policy was revised in Jan 2010 to allow environmental considerations (not just cost) to be taken into account in deciding most appropriate mode of travel on University business. Typically this would mean choosing rail travel instead of domestic or short-haul air travel.
Capture and reporting of air travel data	The University Travel Insurance system was revised in 2010 to include a 'mode of travel' question to enable carbon emissions associated with international business travel to be calculated.
Video conferencing	Existing central video conferencing facilities are provided by University Computing Service as well as numerous departmental facilities throughout the University.
Business Travel – Car	
Travel policy	The existing University Travel Policy requires staff to use public transport (rather than claim mileage) where there is a direct service.
Staff Commute	
Travel to Work Survey	The University participates in the annual Travel for Work Survey to assess staff commuting of key employers in Cambridge. The University's 2009 survey results compare favourably with other participating organisations: only 22% of University staff journeys to work are made in single-occupant vehicles, compared with 50% for other organisations. Trends from 2003 show a steadily decreasing proportion of journeys to work made by car. The survey results help to demonstrate the continuing success of the University's travel plan measures.

University Travel Plan	The University adopted a Travel Plan in October 2000. The plan sets out the University's policies and actions in providing access to work by a range of modes of transport.
Staff car parking	Limited parking is available for staff parking on site through a centrally-managed car park badge allocation system.
Season ticket loans	10% reductions on the costs of season tickets are available from First Capital Connect and National Express East Anglia.
Cycling	Salary sacrifice scheme for cycle purchase introduced in November 2009. Network of Departmental Cycle co-ordinators established to act as focal point for cycle-related activities within departments. A Park & Cycle facility has been established to as an alternative to encourage drivers not to drive into the city centre to park Review of existing Cycle Parking provision undertaken in 2009.
Car share schemes	The University is a member of Camshare (a web-based car sharing scheme).
Car club	The University has joined the Zipcar car club and cars are now located at the Judge Business School and West Cambridge site. The availability of car club cars helps to reduce the need for University pool cars. It also means that vehicles can be used at work, where necessary, without the need for staff to drive to work.
Student Travel	
Student travel to and from University	39-week College accommodation contracts are offered to minimise excessive international travel by overseas travel at Christmas and Easter holidays.
Student Commuting	Students generally live in College accommodation within Cambridge and are not allowed to keep vehicles, except in exceptional circumstances by permission granted by the Motor Proctor. Student travel is therefore generally by foot or cycle for city centre sites, whilst subsidised travel is available on the Uni4 bus for travel to outlying sites, including Addenbrooke's Hospital and West Cambridge.

Other Environmental Management initiatives that contribute to the overall reduction of scope 1, 2 & 3 emissions

Research	Information concerning University inter-disciplinary research activities in the field of sustainable development is co-ordinated by the Cambridge Environmental Initiative, who maintain a website with details of a register of research. The Cambridge Programme for Sustainability Leadership provides programmes for senior business leaders to build capacity for sustainability within their organisations.
National HE sector sustainability initiatives	Cambridge has supported various recent HEFCE consultations relating to sustainability. The Vice-Chancellor supported UUK 'Statement of Intent' on sustainable development to signal the commitment of university leaders to sustainable development. The Environment Officer is a member of the Southern Universities Purchasing Consortium (SUPC) Sustainability Advisory Group. Environmental, Energy and Procurement teams are active participants in the Environmental Association of Universities & Colleges (EAUC). The Director of Estates is a member of Association of University Directors of Estates (AUDE) Sustainability Forum.

International sustainability initiatives	Cambridge is one of the ten participating Institutions of the International Alliance of Research Universities (IARU). Engagement with IARU continues for the development of an IARU Global Campus Sustainability standard. Two students are exchanged with other IARU Institutions for a 6-week summer sustainability fellowship exchange programme annually.
	Cambridge is one of the 23 participating institutions of the Global Universities Leadership Forum (GULF). Support is given to the ISCN (International Sustainable Campus Network) Sustainable Campus Charter endorsed at the GULF Davos meeting in January 2010.
Local and regional sustainability initiatives	The University of Cambridge was one of the founding signatories of the Cambridge Climate Change Charter, which enacts the obligations under the Nottingham Declaration for the city of Cambridge.
	The University is represented on Cambridge Sustainable City Reference Group and Cambridgeshire Horizons.
Environmental Management	The Pro-Vice-Chancellor for Institutional Affairs has specific responsibility for Carbon Reduction and Sustainability.
	Obligations under the University's Environmental Policy are fulfilled by way of an Environmental Management System based on ISO 14001, with time-bound Environmental Objectives and Targets set out in a 3-year Environmental Plan approved and monitored by the Environmental Strategy Committee.
'Universities that Count'	The University participated in the 2009 'Universities that Count' Business in the Community - Environmental Index. It scored 67% overall and 78% in the Environmental Performance Section.
Estate Management Statistics	Utilities, space and waste data are collected annually for participation in the HEFCE Estate Management Statistics.
Carbon sequestration	The planting of 15,000 trees during the 10 hectare extension of Madingley Wood as part of the University's 800 Celebrations has resulted in the potential for the sequestration of around 150 tonnes per year of CO_2.

5.0 THE 2010-2020 CARBON MANAGEMENT PLAN

On the basis of past analysis and the above reduction initiatives, it is proposed that a new plan be adopted by the University for the period 2010-2020.

This plan has an amended management structure and a new framework to encourage greater integration of carbon emission reduction schemes into the overall planning procedures and policy development functions of the University. As a result, a new carbon framework is proposed to ensure that the different activities are coordinated for optimal effect and involve consultation with all relevant stakeholders.

It is proposed that the plan be rolling in nature, with formal annual reviews. At this stage, in addition to the setting of long-term targets, specific goals have been proposed for 12-month and 36-month timescales. Again, review of these specific goals will be made on an annual basis. Risk analyses will be developed as the activities within the plan develop.

5.1 Responsibility for Carbon Management

As stated previously, the governance structures for carbon management by way of the Environmental Strategy Committee and Planning & Resources Committee have been changed recently to recognise its growing importance.

Clear lines of responsibility for carbon management involving both management responsibilities and Committee oversight have been established, as shown below in Figure 12 (dotted lines indicate indirect reporting lines).
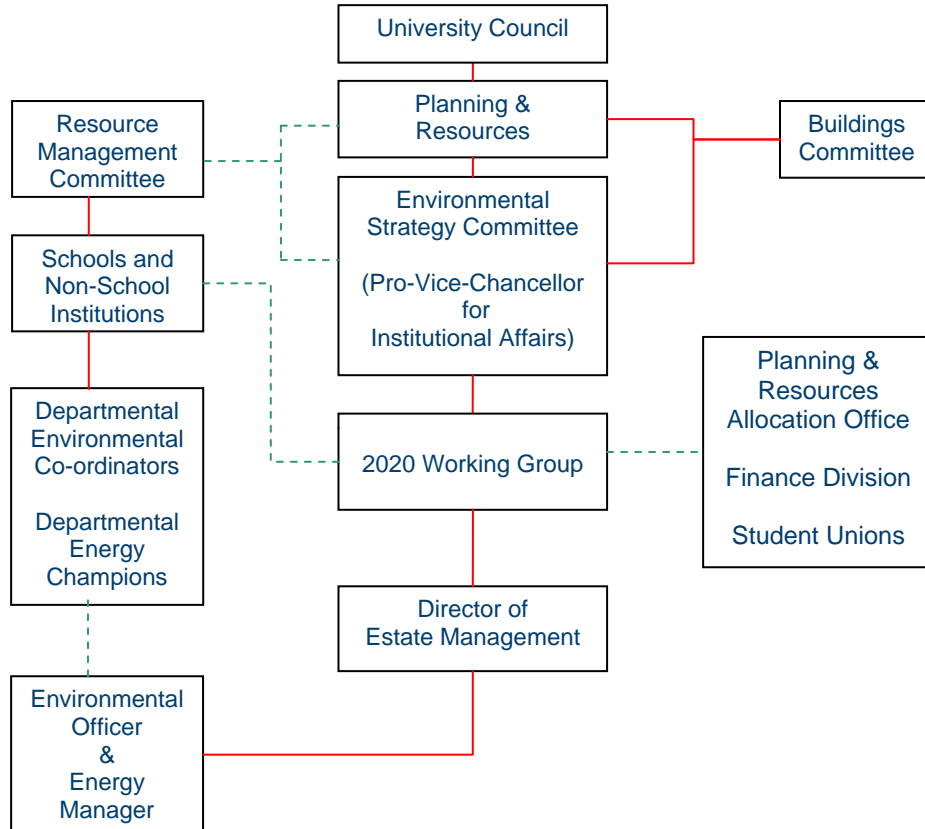

Figure 12:   Reporting Lines for Carbon Management

5.2 Carbon Management Framework

In order to ensure that the University can reduce carbon emissions as effectively as possible, a framework, as shown in Figure 13, has been developed. This identifies different spheres of activity so that targeted actions can be pursued, but allows for their coordination for maximum impact. The work activities have been set up to ensure full engagement of the University with the different facets of carbon emissions. Importantly, they draw together the full range of University institutions required to address carbon emissions, targeting expertise to where it is most relevant. As the coordination of activities is of great importance, the framework has been designed to ensure communication between activities and lead partners.
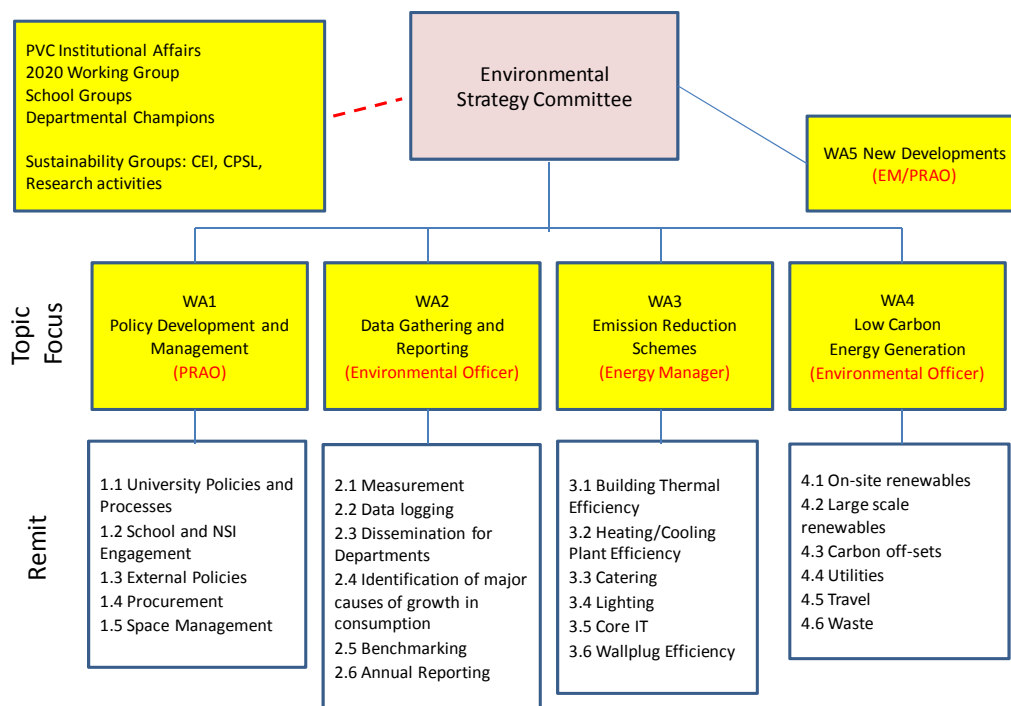
Figure 13:   Carbon Management Framework

Five major areas of work (or working activities) are proposed, each with lead coordinators from either Estate Management or other parts of the University administration to ensure a coordinated approach between the various interrelated issues (for example, waste and energy).

Summaries of the working activities are as follows, with details of specific initial activities being outlined in Section 6.2.

WA1: Policy Development and Management

1. *Policy Development:* This work area proposes that activities related to carbon emissions be integrated fully within the financial planning and policy development processes of the University. It is proposed therefore that carbon emissions be introduced into the annual planning processes, and that mechanisms be further developed to provide greater financial incentives for reducing carbon emissions, in a manner similar to that used in the electricity

incentivisation scheme. In turn, it is proposed that policies be developed so that where appropriate, and where possible, costs due to carbon emissions be passed to those funding University activity. In recognition of the impact of procurement and space management on emissions, new proposals are made to ensure emissions are reduced.

2. *Coordinated Implementation of Reduction Schemes:* It is recognised that, to date, the University has demonstrated substantial reductions in emissions through a range of pilot schemes. It is therefore proposed that a process be introduced whereby pilot schemes can be formally rolled out across the University, with a financial model being produced so that initial costs of reduction schemes can be funded from later savings in energy and carbon allowance costs. It is also proposed that renewed focus be placed on seeking third party funding for emissions control, particularly where advances in research activity can feed through into University operations.

3. *Collaboration in Sustainability:* Finally, it is recognised that the University has the opportunity to extend its impact in the way it operates, and hence it is proposed that a review of international collaborations be carried out so that activities can be targeted in the most effective manner.

WA2: Data Gathering and Reporting

1. *Carbon Measurement and Reporting:* It is recognised that if formal policies are to be developed whereby the costs due to carbon emissions are to be attributed to different parts of the University, and indeed to different funders, then an accurate system must exist to ensure that carbon emissions can be measured. It is therefore proposed that this be the focus of WA2, with a proposal that a web-based system for monitoring emissions be rolled out across the University. This system should then be made as flexible as possible so that University institutions and student bodies can gain the best possible understanding of the causes of their emissions and reduce them accordingly.

2. *Benchmarking:* In order to advise policy decisions, it is proposed that benchmarking be carried out so that the most effective opportunities for reduction of emissions can be identified.

WA3: Emission Reduction Schemes

1. *Scope 1 and 2 Schemes:* This work activity will develop pilot schemes to reduce emissions arising from major generic causes of energy consumption (for example heating/cooling, lighting, catering, IT). Proposals for these pilot schemes will be sought in conjunction with University institutions, being informed by the studies in WA2, including behavioural change initiatives to encourage different approaches to historical practices, for example, acceptable summer and winter temperature ranges. Particular attention will be placed on the likely savings per unit of investment (i.e. $TCO_2/£$). Successful pilot schemes will then be rolled out to the institutions with the largest emissions in that area before being fully rolled out across the rest of the Estate.

2. *Travel:* Proposals for scope 2 emissions relating to travel are also put forward.

3. *Waste Management:* Continuing emphasis will be placed on the management of liquid and solid waste, particularly in terms of recycling and waste minimisation.

WA4: Low Carbon Energy Generation

Given the large wall-plug and research related emissions of the University, it is anticipated that growing emphasis will be placed on developing more carbon offset schemes. The University already has a range of local renewable energy generation schemes, but there exists the opportunity to extend these considerably. The University should consider both local and remote offset schemes, and should engage with partners should economy of scale be feasible. In view of its importance, it is proposed that future energy utility management policies should consider the impact of supply choice on carbon emissions, and act accordingly.

WA5: New Developments

Given the recent growth of the University, and the large number of new institutions and initiatives in recent years, it is proposed that future planning studies should take account of the impact of carbon emissions. This should affect both the procurement process of any new buildings and also the agreements on major new activities. New policies must be developed at University level accordingly.

Within each work activity, as stated above, are a series of Task Areas and Technical Actions. Specific milestones have been identified to allow the plan to evolve effectively. These provide an ambitious programme of work, coordinated at the University level, making use of the new Governance Structure to ensure that progress can be made against University requirements.

In the Workpackages shown in Section 5 a specific individual has been assigned responsibility to lead on each task, as follows:

IW: Prof Ian White – Pro-Vice-Chancellor for Institutional Affairs

GM: Mr Graham Morrison – Head of Planning & Resource Allocation

KS: Mr Kerry Sykes – Deputy Director of Finance

PH: Mr Paul Hasley – Energy Manager (Estate Management)

MW: Mr Martin Whiteland – Environmental Officer (Estate Management)

5.3   Workpackage Goals and Actions

5.3.1   WA1: Policy Development and Management

#	Task Areas	Technical Actions	Lead	12-Month Goal	36-Month Goal
1.1	**University-level policies and processes**	Extend Electricity Incentivisation Scheme, incorporating CRC (also consider driving down utility costs in part to institutions)	PH KS	Fully auditable system of accounting for carbon developed and implemented. Costs of carbon attributed to end users. Incentivisation scheme sharpened to provide greater focus on carbon emissions. Engage with student bodies to involve students in schemes, and seek student proposals for action.	Scheme developed for full cost of carbon emissions in relation to plug loads to be devolved to Schools and NSIs.
		Implement schemes for funding emission reduction initiatives (e.g. through recycling of savings/BEEP)	KS PH	Develop policies so that loans for carbon emission reduction schemes can be funded from future reductions in utility costs. Develop and implement a pilot scheme with approved funding in an exemplar Department.	Implement policies on a phased basis, whereby pilot schemes are first chosen in each of the major consumption areas, and then rolled out firstly to the major emitting institutions and then across the University.
		Ensure organisational support for behavioural promotion of reduction of carbon emissions	MW	Identify appropriate levels of responsibility for carbon in Schools and NSIs, and determine organisational structure for "champions" across the University community.	Use organisational structures to implement new schemes to encourage behavioural change in respect of carbon.
1.2	**School and NSI engagement**	Carbon Emission Planning to be included in School Planning Round: indicate responsibilities for carbon within schools, identify areas where greatest savings may be made (work then to focus on School-level reductions)	IW GM	Request from Schools/NSIs that they: (i) indicate who holds responsibility for carbon emissions within their Institution; (ii) notify the University of potential areas within their institution where emissions might be reduced with relatively little required investment; (iii) notify the University of potential areas where there are significant emissions that should be considered for major study.	Require institutions to audit their wall-plug emissions and have plans for reducing these. Encourage additional sub-metering to allow more accurate allocation of energy consumption costs.

#	Task Areas	Technical Actions	Lead	12-Month Goal	36-Month Goal
1.3	**Policies relating to external bodies**	Highlight impact of new research initiatives on carbon emissions	IW	Request exemplars of research activity which have the potential to result in carbon emissions from Schools and NSIs, and provide estimates of their likely real benefit if fully exploited.	Have made at least one outcome from a University research project operational within the University Estate.
		Determine mechanisms for passing costs of carbon to sponsors	GM KS	Identify options for the pricing of carbon emissions costs for research activities funded by donations, etc., and develop methods for auditing.	Have fully operational pricing models that identify carbon costs for activities across the University.
		Strengthen involvement in international, national, and local sustainability initiatives	IW	Complete review of leading national and international sustainability initiatives, and determine which the University should engage with formally.	Target leadership position in such initiatives.
		Collaboration in Carbon Emission Reduction Schemes	IW	Review collaborative funding opportunities in carbon.	Initiate at least one collaborative project in a priority area.
1.4	**Procurement policies**	Green Procurement Initiative/ Sustainable Procurement National Action Plan	KS MW	Produce recommendations on extending the implementation of sustainable procurement in the University environment.	Develop procedures to ensure that the carbon effect of significant equipment purchases is considered adequately, and develop improved awareness across University as to which core products have the least carbon impact.
1.5	**Space management**	Extend schemes to improve space utilisation	GM	Identify methods of monitoring utilisation of various categories of space. Michaelmas Term 2010: - SMAG to review whole range of types of space and measures of (and proxies for) utilisation with a view to determining priorities for action - Explore with ISSS cheap ways of capturing and transmitting data on space utilisation - Explore with Estates Management how space utilisation data could be	Have completed a review of the assumptions about operations that are implicit in estate strategy and review of space "norms" to inform planning of new/refurbished buildings. Lent & Easter Term 2011 : - Undertake pilot studies to see whether any are worth pursuing - Ensure that carbon emissions are taken into account in any new

				interfaced with their systems	refurbishment or construction scheme (e.g. CIF) Michaelmas Term 2011: - Redraft (and consult about) Capital Projects Process to require explicit statement about expected impact on University's carbon footprint [including both building and plug load] so that there is an explicit target to assess in the first instance, and to monitor performance against. From Michaelmas Term 2011: – Post-completion reports and post-occupancy evaluations to include assessment of carbon implications
		Ensure that carbon emissions are taken into account in any new refurbishment or construction scheme (e.g. CIF)	GM	Change Capital Projects process to require analysis of carbon impact. Investigate whether Minor Works Review Group could review carbon implications of smaller jobs. Develop methodology to assess relationship between capital costs and future research income for new projects.	Post-completion and post-occupancy reports to include carbon implications. Implement procedures to assess relationship between capital costs and future research income for new projects.

5.3.2 WA2: Data Gathering and Reporting

#	Task Areas	Technical Actions	Lead	12-Month Goal	36-Month Goal
2.1	**Measurement**	Develop multi-utility Automatic Monitoring & Targeting (aM&T). Improve sub-metering arrangements of buildings	PH	Install AMR on large gas meters to achieve 90% CRC Early Action Metric.	95% AMR coverage of emissions and energy.
		Improve sub-metering arrangements of buildings	PH	Within-building monitoring of energy use applied to top 5 energy users.	Within-building monitoring of energy use applied across 50% of Estate.
2.2	**Data logging**	Provide detailed emissions information	PH	Systems for reporting of energy and carbon are fit for purpose and satisfy CRC auditing requirements.	Maintain appropriate systems to comply with future reporting requirements.
2.3	**Dissemination for institutions**	Meters on the Web project	PH	Web-based access to accurate and up-to-date energy and carbon data for all University Estate.	Develop functionality of reporting tool for end users for example to allow addition of targeted metering and optimisation of consumption.
2.4	**Identification of major causes of growth in emissions**	Determine separate emission levels due to conventional building use and wallplug	PH	Wallplug loads identified and a robust assessment made of their impact.	Accuracy of plug load assessment refined, including direct measurement.
2.5	**Benchmarking**	Identify typical international benchmarks for emissions	MW	Carry out a review of international emissions benchmarks through IARU and other international initiatives to develop emissions targets.	Implement strategies to comply with established benchmarks.
		Identify internal benchmarks to assist the setting of targets	MW	Develop targets for non-wallplug energy consumption in buildings.	Implement targets across top 30 buildings.
2.6	**Annual reporting**	Develop reporting mechanisms for scope 3 emissions for HEFCE / CRC / Others	MW	Establish a benchmark for scope 3 emissions (not including procurement).	Develop estimates of emissions associated with procurement.

5.3.3 WA3: Emission Reduction Schemes

#	Emission Reduction	Technical Actions	Lead	12 Month Goal	36 Month Goal
3.1	**Enhance energy efficiency of building envelope**	Assess and develop energy efficiency projects using internal investment, Salix or BEEP funding models as appropriate. To include: - Upgrade insulation on pipework. - Upgrade local controls on comfort cooling units. - Upgrade of lighting and retrofit of automatic controls. Upgrade / extend / improve BEMS.	PH	Continue successful implementation of Salix-funded projects. Implement first phase of BEEP. Develop methodology for appraisal and prioritisation of energy / carbon saving.	Complete first phase of BEEP and begin 2nd and 3rd phases. Develop long list of energy saving opportunities based on agreed methodology.
3.2	**Enhance efficiency of heating / cooling plant**	Review heating systems to enhance efficiency	PH	Analyse performance of all heating systems to identify poor performers.	Poor performers identified and corrective action taken.
		Carry our further feasibility work on CHP	MW	Undertake review of options for CHP across University Estate.	Implement findings of CHP review.
		Rationalise compressed air systems	PH	Review compressed air systems in Biochemistry and Engineering.	Complete review of all compressed air provision across Estate.
3.3	**Catering**	Investigate energy efficiency improvements in catering operations	MW	Undertake review of emissions implications of catering activities across the University Estate.	Implement findings of review.
3.4	**Enhance efficiency of core IT infrastructure**	Reduce emissions associated with core IT	MW	Establish Green IT Working Group under Information Strategy & Services Syndicate (ISSS) to carry out a review of core IT infrastructure, including desk-top resources and server rooms, to identify opportunities for reducing emissions, including opportunities for: - Server Virtualisation - Low energy cooling - Thin client rationalisation - Remote shutdown	Implement recommendations of Green IT Working Group.

#	Emission Reduction	Technical Actions	Lead	12 Month Goal	36 Month Goal
3.5	**Transport**	Minimise emissions from vehicles and transport	MW	Carry out detailed review of traffic and transport impacts, including University vehicles, business travel and staff & student commuting to identify opportunities for reducing emissions. Consider parking management schemes and public transport incentives to reduce commuting.	Implement recommendations arising from review.
		Minimise emissions from University travel	MW	Revise University Travel Expenses Policy to ensure that transport activities are properly logged and also to allow access to carbon offset scheme.	Implement voluntary University carbon offset scheme for air travel and encourage low emission travel (for example by extending the use of ICT for virtual meetings).
3.6	**Waste**	Minimise emissions from waste/recycling	MW	Carry out detailed investigation to quantify emissions associated with waste disposal and identify improvements in waste management practices to identify opportunities for reducing emissions.	Implement recommendations arising from review.
			MW	Improve accessibility of recycling scheme by introduction of mixed recyclables collection scheme.	Identify further waste minimisation / recycling initiatives.

5.3.4 WA4: Low Carbon Energy Generation

#	Task Area	Technical Actions	Lead	12-Month Goal	36-Month Goal
4.1	**Small scale on-site renewable schemes**	10% on-site scheme for new build and refurbishments	MW	Undertake review of existing on-site renewable energy systems to develop strategy for future installations.	Implement findings of review.
4.2	**Large scale off-site renewable generation**	Study of low carbon generation schemes	MW	Review previous large scale renewable energy proposals for wind turbines and anaerobic digestion in the light of recent changes on emphasis in the planning application process.	Implement findings of review.
4.3	**Other forms of offsetting**	Tree planting schemes for offsetting (e.g. 800 Wood)	MW	Undertake a review of the University Estate to identify suitable tree-planting or other off-setting schemes.	Implement off-setting schemes to mitigate against unavoidable emissions.
4.4	**Energy utility management policies**	Minimise emissions from purchased energy	PH	Formulate policy for approach to emissions as part of energy supply contracts.	Implement policy as adopted.

5.3.5 WA5: New Developments

#	Task Area	Technical Actions	Lead	12-Month Goal	36-Month Goal
5.1	**Approval of New Activities**	Develop policies for University approval of large-scale activities	GM KS	Introduce processes for determining the impact of new research activities on carbon emissions, and identify mechanisms for cost attribution.	Review implementation of approval and cost attribution scheme.
		Approval of New Buildings	MW	Devise proposals for carbon emissions to be introduced into CPP scheme.	Monitor accuracy of CPP scheme in assessing carbon emissions and modify accordingly.
5.2	**North West Cambridge**	Integrate sustainability considerations into NWC Development Plans	MW GM	Confirm arrangements for ensuring compatibility between NWC developments and evolving University policy.	Confirm which [if any] elements of NWC proposals are to be excluded from University's carbon monitoring programme.

6.0 CARBON REDUCTION TARGETS

The University is required to set targets for emissions within the 2020 plan. Although it is intended that the sector reduce emissions by 34% from 1990 levels by 2020, each institution is allowed to set its own emissions. However, all targets must result in an overall absolute reduction across scope 1, 2 & 3 emissions from 2005 levels by 2020.

Figure 14 shows the actual University emissions in recent years, along with indications of the required reductions that would be required were the University to reach the sector target in 2020. The graph also shows the estimated dramatic impact of new buildings due for completion in 2010/2011 (including the Sainsbury Laboratory in the Botanic Garden), which further reinforces the need for urgent action to reverse this trend.

Due to the almost doubling of emissions associated with energy use in buildings since 1990, it would therefore be necessary for the University to make a 60% cut in its 2005 building-related emissions to comply with the sector target of a 34% reduction on 1990 emissions by 2020, as shown in Figure 14.
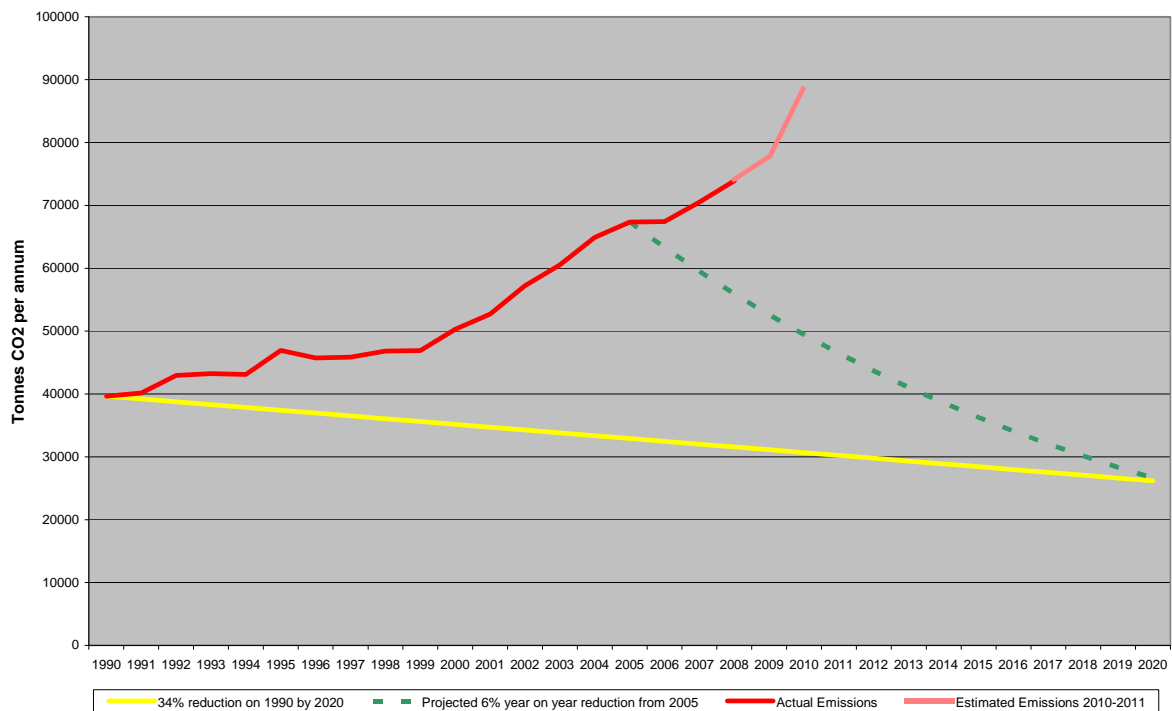
Figure 14:   Actual 1990 – 2008 and predicted 2009 – 2010 emissions against a projected 6% year-on-year reduction from 2005 vs. 34% reduction by 2020 from Actual 1990 Baseline.

Given the continued growth of the leading universities in the HE sector, a more appropriate way of framing targets is to relate emission to a metric which recognises growth (e.g. staff/student numbers, size of the estate or income). In research-intensive universities such as Cambridge, the most appropriate growth metric is based on income. This is because emissions are dominated by scientific research,

which may not involve large numbers of people or require a large amount of space but are likely to be highly expensive.

To achieve a 60% reduction in emissions related to either Total Income or Research Income would require a 6% year-on-year reduction between 2005 and 2020, as shown in Figure 15.
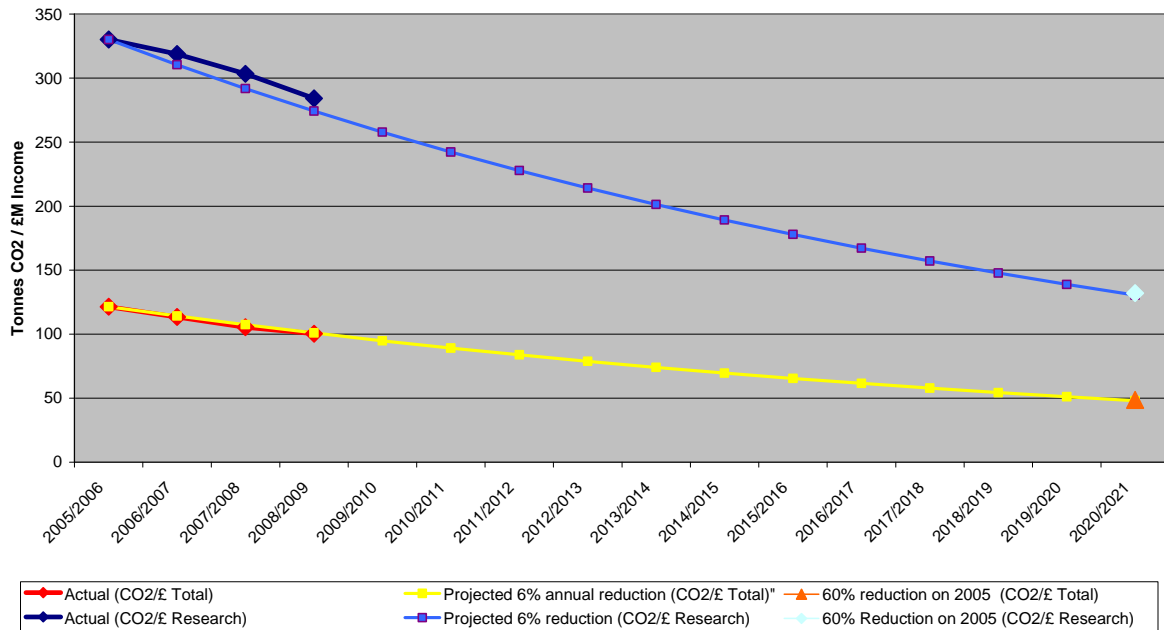
Figure 15:   Emissions Related to Total Income and Research Income

Having undertaken a detailed assessment of the emissions associated with the activities at the University of Cambridge and elsewhere in the HE sector, it is clear that it is necessary for research-intensive universities to find a mechanism that allows the separate treatment of emissions associated specifically with research activities from those associated with building envelopes and other activities, such as catering and administration.

It is proposed that targets should be established on the basis:

1. That there should be an absolute reduction in the total scope 1, 2 & 3 emissions from 2005 levels by 2020.

2. That scope 1 & 2 emissions attributable to activities which are not associated with scientific and technical research within departments should seek reductions in absolute emissions of 34% from 2005 levels by 2020, subject to the availability of suitable cost-effective technology and progress towards meeting Government targets for decarbonisation of the grid.

3. That scope 1 & 2 emissions attributable to activities which are associated with scientific and technical research within departments, as defined by tonnes CO_2/£ related to research income, should seek to reduce by 34% from 2005 levels by 2020, corrected to take into account changes in RPI.

4. That the development of large new University activities be treated on a case by case basis, taking account of the overall targets for scope 1, 2 & 3 emissions.

7.0   REFERENCES

1.   *Carbon reduction target and strategy for higher education in England, 2010/01*, HEFCE, January 2010.

2.   *GHG Protocol*, World Resources Institute, 2004.

3.   *Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting*, 2009

4.   *Annual Utilities Report to the Buildings Committee, University of Cambridge Estate Management, BC(10)06*, January 2010.

5.   *Carbon Baselines for individual HEIs in England* (Draft), SQW, January 2010.

ANNEX 1: Committee Membership

2020 Working Group

Prof Ian White - PVC Institutional Affairs (Chair)
Mr Michael Bienias - Director of Estate Management
Prof Dame Ann Dowling - Head of the Department of Engineering
Prof Peter Guthrie - Environmental Strategy Committee
Prof Koen Steemers - Environmental Strategy Committee
Prof Michael Kelly - Cambridge City Retrofit
Dr Ian Lewis - Director of University Computing Service
Mr Graham Morrison - Head of Planning & Resources Allocation
Mr Kerry Sykes - Deputy Director of Finance
Mr Ant Wilson - AECOM
Mr Paul Hasley - Energy Manager
Ms Sophie Hemery and Mr Jamie Gibson – CUSU Ethical Affairs co-chairs
Mr Sacha Grodzinski - Department of Engineering - MPhil student
Mr Martin Whiteland - Environmental Officer (Secretary)

Environmental Strategy Committee

Prof Ian White - PVC Institutional Affairs (Chair)
Dr Jonathan Nichols - Registrary
Mr Michael Bienias - Director of Estate Management
Prof Peter Guthrie - General Board, on the nomination of the School of Technology
Prof Koen Steemers - Financial Board, on the nomination of the School of Arts and Humanities
Prof Colin Lizierie - Financial Board, on the nomination of the School of Humanities & Social Science
Prof Bill Adams - General Board, on the nomination of the Schools of Physical Science
Vacancy - Council, on the nomination of the School of Biological Sciences
Dr Margaret Adey - Cambridge Programme for Sustainability Leadership
Mr Graham Morrison - Head of Planning & Resources Allocation
Mr Mike Hall - Planning & Resources Allocation Office
Mr Kerry Sykes - Deputy Director of Finance
Mr Paul Hasley - Energy Manager
Ms Linda Hinton Mead - H&S Office
CUSU Ethical Affairs co-chairs
Uven Chong - Environmental Director Graduate Union
Miss Wendy Evans - Bursars' Committee
Vacancy - Joint Union Safety Committee
Mr Martin Whiteland - Environmental Officer (Secretary)

Annex 2:   Scope 3 Assumptions

Assumptions made in estimating scope 3 emissions:

Category	Assumption (units per annum)	
Waste to landfill	Estimated tonnes to landfill x factor	🟨
Water and waste water	Metered water m3 x DECC factor	🟩
Farm Animals	Head of cattle (dairy/beef) + sheep	🟨
Business Travel - Air	Based on University Travel Insurance data with 50% uplift	🟨
Business Travel - Train	100% of staff do 500 km by train	🟥
Business Travel - Car	Based on mileage returns using DECC conversion factor for average car	🟨
Uni 4	150,000 x 3 km trips	🟨
Staff Commuting - Car	2078 parking spaces x 225 days x 50 km	🟥
Staff Commuting - Train	6% of staff travel by train (100 km)	🟥
Staff Commuting - Bus	9% of staff commute by bus (20 km)	🟥
Student Travel - Home (car)	75% of 14,206 home/EU students make 2 x 500 km car journeys	🟥
Student Travel - Home (train)	Half of 75% of 14,206 home/EU students make 2 x 500 km train journeys	🟥
Student Travel - Home (bus)	Half of 75% of 14,206 home/EU students make 2 x 200 km bus journeys	🟥
Student Travel - EU	25% of home/EU students make 2 x S-H (Geneva) flights	🟥
Student travel - Overseas	3,398 overseas students make 1.5 L-H (Beijing) trips	🟥

Level of confidence in estimated emissions:

High (accurate data and standard conversion factor)	🟩
Medium (reasonable estimated data and/or non-standard conversion factor)	🟨
Low (very tentative preliminary estimated data)	🟥

List of Abbreviations

aM&T	Automatic Monitoring and Targeting
AMR	Automatic Meter Reading
AUDE	Association of University Directors of Estates
BEEP	Building Energy Efficiency Programme
BREEAM	Building Research Establishment Environmental Assessment Method
CEM	Committee for Environmental Management
CHP	Combined Heat and Power
CIF	Capital Infrastructure Fund
CMP	Carbon Management Plan
CO$_2$	Carbon Dioxide
CPO	Central Purchasing Office (Finance Division)
CPP	Capital Planning Process
CPSL	Cambridge Programme for Sustainability Leadership
CRC	Carbon Reduction Commitment Energy Efficiency Scheme
CT	Carbon Trust
CUSU	Cambridge University Students Union
DEC	Departmental Environmental Co-ordinators
DECC	Department of Energy and Climate Change
DEFRA	Department of Environment, Farming and Rural Affairs
EA	Environment Agency
EAUC	Environmental Association of Universities and Colleges
EM	Estate Management
EMS	Environmental Management System
EMS	Estate Management Statistics (HEFCE)

ESC	Environmental Strategy Committee
EST	Energy Savings Trust
GHG	Greenhouse Gas
GIA	Gross Internal Area
GDP	Gross Domestic Product
GU	Graduate Union
GULF	Global Universities Leadership Forum
H&S	Health and Safety
HECMP	Higher Education Carbon Management Programme
HEEPI	Higher Education Environmental Improvement project
HEFCE	Higher Education Funding Council for England
HEI	Higher Education Institution
HEPPI	Higher Education Pay and Price Index
IARU	International Alliance of Research Universities
ICT	Information and Communication Technologies
IPPC	Intergovernmental Panel on Climate Change
ISCN	International Sustainable Campus Network
ISSS	Information Strategy and Services Syndicate
kWh	Kilowatt hour
KPI	Key Performance Indicator
LDA	London Development Agency
MISD	Management Information Services Division
MWh	Megawatt Hour
NSI	Non School Institution
NWC	North West Cambridge

PRAO	Planning and Resources Allocation Office
PRC	Planning and Resources Committee
PV	Photovoltaic
PVC	Pro-Vice-Chancellor
RAE	Research Assessment Exercise
RMC	Resource Management Committee
RPI	Retail Price Index
SBS	School of Biological Sciences
SMAG	Space Management Advisory Group
SQW	SQW Consultants
SUPC	Southern Universities Purchasing Consortium
UAS	Unified Administrative Service
UCS	University Computing Service
UTC	Universities that Count – Environmental Index
UUK	Universities UK
VC	Vice-Chancellor
WEEE	Waste Electrical and Electronic Equipment
WRAP	Waste and Resources Action Programme