



Carbon Management Plan 2009 – 2012

**A plan for reducing greenhouse gas emissions
and energy consumption**



January 2011

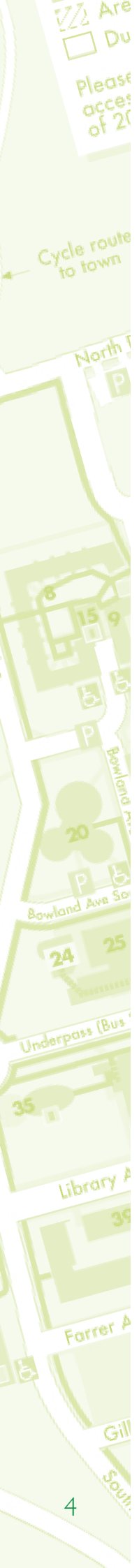


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FOREWORD FROM VICE CHANCELLOR PROFESSOR PAUL WELLINGS

Carbon management is a critically important global issue and I am delighted that Lancaster University has been able to participate in the Higher Education Carbon Management Programme and produce this comprehensive plan for managing the University's carbon emissions. The plan sets us some challenging targets, but I am confident that the programme of proposed projects, combined with behavioural changes will enable the University to meet these goals.

This document sets out the first steps on a long term project. Given the drivers of climate change and resource depletion, combined with the University's high public profile and academic appreciation of these issues, it is essential that we set the standard for managing and reducing our carbon emissions. The long term sustainability of the planet is at risk, and Lancaster University needs to demonstrate how it can rise to the occasion and address this challenge with a practical and considered plan. Lancaster University's Carbon Management Plan provides this framework.

Professor Paul Wellings
Vice Chancellor, Lancaster University



FOREWARD FROM THE CARBON TRUST

Cutting carbon emissions as part of the fight against climate change should be a key priority for higher education establishments - it's all about getting your own house in order and leading by example. The UK government has identified the university sector as key to delivering carbon reduction across the UK in line with its Kyoto commitments and the Higher Education Carbon Management Programme is designed in response to this. It assists universities in saving money on energy and putting it to good use in other areas, whilst making a positive contribution to the environment by lowering their carbon emissions.

Lancaster University was selected in 2008, amidst strong competition, to take part in this ambitious programme. Lancaster University partnered with the Carbon Trust on this programme in order to realise vast carbon and cost savings. This Carbon Management Plan indicates that a target of reducing greenhouse gas emissions by 36% by 2020 against a 2005 baseline year is possible and there are potential financial savings to the University of up to £18.9 million. The potential emissions reduction and savings are however only achievable in the event of the contributing projects being successfully implemented.

Universities can contribute significantly to reducing greenhouse gas emissions. The Carbon Trust is very proud to support Lancaster University in their ongoing implementation of carbon management.

Richard Rugg
Head of Public Sector, Carbon Trust





EXECUTIVE SUMMARY

Introduction

Lancaster University recognises the need to reduce its energy consumption and carbon emissions. The impact of fossil fuel consumption on our environment and the resulting global warming and climate change, as well as consequential resource depletion are major issues, which as an institution we need to address. The current financial background makes it very important to reduce costs. The reductions in energy consumption set out in this plan will make major contributions to reducing energy costs. Lancaster University is a leading university in terms of environmental research and teaching. This is a strong reason for the University to be ambitious in its carbon emission targets and in the projects it implements in order to achieve them. The Carbon Management Plan (CMP) recognises this position, incorporating a range of projects from the conventional to the cutting edge. It is critical that that all types of technology are considered as the longer term carbon emissions reduction targets for 2020 and 2050 will only be achieved through the deployment of all available technologies.

The University has already implemented a wide programme of carbon reduction projects, including energy efficiency measures, a nationally-recognised Travel Plan and the construction of sustainable developments including student residences to the highest environmental performance measures.

Through participating in the Higher Education Carbon Management Programme and working through the processes of consulting with staff, students and external bodies, analysing current energy consumption and carbon emissions, we now wish to increase our activity towards a more energy efficient future. Lancaster University's CMP has been produced to provide a strategic route map, detailing how the University proposes to reduce its carbon emissions through the implementation of a range of policies and projects.

Throughout this document 'carbon' and 'carbon emissions' are used as a shorthand for 'carbon dioxide equivalent' (CO₂e) emissions. Fossil fuel consumption releases a range of 'greenhouse gases' including carbon dioxide (the most significant), methane and nitrogen oxides which contribute to global warming. Emissions of these gases can be expressed as 'carbon dioxide equivalent' based on the combined 'Global Warming Potential' of the individual gases. Where 'carbon emissions' or carbon are referred to in the text of this document it should be assumed (unless stated otherwise) that this refers to carbon dioxide equivalent emissions (ie an appropriately weighted 'basket' of 'greenhouse gases').

The principal objectives of Lancaster University's Carbon Management Plan are:

- To identify and quantify Lancaster University's carbon emissions sources.
- To provide a strategy for managing carbon emissions in the short, medium and long term and reducing energy consumption.
- To enable the development of a detailed programme of environmental management practices and projects, the implementation of which will reduce carbon emissions.
- To increase institutional awareness of Lancaster University carbon emissions, and their resultant climate and resource depletion impacts to academic and administrative staff, students and key external stakeholders.

Baselines and Targets

The Higher Education Funding Council for England (HEFCE) published a carbon reduction strategy for higher education in January 2010. The strategy includes the adoption of national government targets for the higher education sector for reduction in carbon emissions of 34% by 2020 and 80% by 2050. These targets are set against a 1990 baseline and comprise 'scope 1 & 2 emissions'. Scope 1 & 2 emissions are defined as carbon emissions (from a Higher Education establishment) from electricity generation, fossil fuel consumption (for heating) and emissions from owned vehicles. HEFCE have assessed institutional greenhouse gas emissions for 2005 (more comprehensive data is available for HE sector institutions for 2005) and compared these to 1990 sector emissions, producing revised baseline emissions for individual HE institutions and sector wide targets for 2005. Lancaster University's Scope 1 & 2 carbon emissions in 2005 were 29,131 tCO₂e. The University has set the following institutional targets in order to contribute to meeting the sector targets. The targets are listed below and include milestone targets in 2012 and 2017 as well as the National Government Targets for 2020 and 2050.

Lancaster University Carbon Reduction Targets

	Target Years			
	2012	2017	2020	2050
Higher Education sector target for carbon reduction (%)	-12	-29	-43	-83
Lancaster University target for carbon reduction (%)	-34.9	-35.6	-43	-83
Lancaster University target for carbon reduction (tCO₂e)	19,266	18,751	16,868	5,031

Notes:

1. The baseline year for carbon reductions is 2005.
2. The Higher Education sector targets are derived from national targets for 1990 converted to equivalent targets for 2005.
3. The CMP currently calculates that carbon emissions could be reduced by -35.7% (18,707 tCO₂e) by 2020 using current planned and proposed projects. Future (as yet undefined) projects will be proposed and developed in order for Lancaster University to meet its target of reducing carbon emissions by 43% by 2020 and 83% by 2050.

The CMP shows that Lancaster University can achieve significant reductions in carbon emissions by 2012. Reductions in carbon emissions between 2012 and 2020 are currently shown to be more limited as the majority of projects within the CMP will be implemented by 2012. Future editions of the CMP will incorporate new (currently undefined) projects which will contribute to additional reductions in carbon emissions between 2012 and 2020 and enable the challenging Lancaster University and national target of a 48% reduction in carbon emissions to be met by 2020.

Carbon Reduction Required from Currently Undefined Projects

Current planned and proposed projects will enable Lancaster University to achieve its carbon reduction targets for the years 2012 and 2017. However they will not enable the 2020 year target to be reached. An additional reduction in carbon emissions of 3,550 tCO₂e will be required between 2017 and 2020 in order to achieve the target of reducing carbon emissions by 48% by 2020.

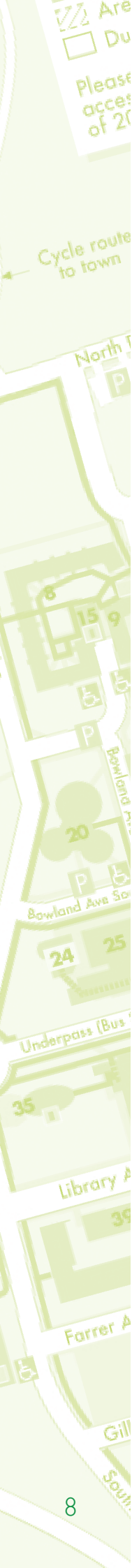
Lancaster University is committed to achieving this reduction in emissions and is planning to develop projects at the appropriate time in order to meet the target of reducing carbon emissions to 15,148 tonnes by 2020.

Contributing Projects

The following projects provide the basis for the calculated carbon savings necessary in order to achieve the aforementioned targets:

- Energy and utility efficiency projects
- Utility metering project
- Awareness campaigns
- Voltage reduction project
- Installation of new gas thermal boilers
- Installation of new CHP boiler
- Installation of a biomass boiler
- Wind turbine project

In order to achieve the carbon reductions detailed in the CMP it is essential for all of the projects to be implemented in full. Low carbon emission projects such as the Wind Turbine Project and biomass boiler are of particular significance and will need to be successfully completed if Lancaster University is going to meet its carbon emission targets. Low carbon emission projects such as these will need to be deployed on a much greater scale by Lancaster University in order to meet the 2050 carbon emissions target and the early adoption of these technologies will be a significant step towards this.



CMP Carbon and Financial Savings

The CMP is projected to have the potential to save an aggregated total of £18.9 million between 2008 and 2020 and result in aggregated CO₂ savings of 135,000 tCO₂ over the same period.

CMP Governance & Reporting

Under the overall authority of the University's Vice Chancellor, responsibility for the implementation and review of the CMP will rest with the Carbon and Energy Management Team (CEMT), led by the Environment and Sustainability Manager. The Carbon and Energy Management Team will report on the CMP through the Carbon and Environment Executive Board (CEEB), which will review the CMP and recommend the report to the University Management Advisory Group (UMAG) for approval. An annual carbon report will be produced by the Environmental and Sustainability Manager, who will be responsible for the ongoing maintenance and management of the Plan.

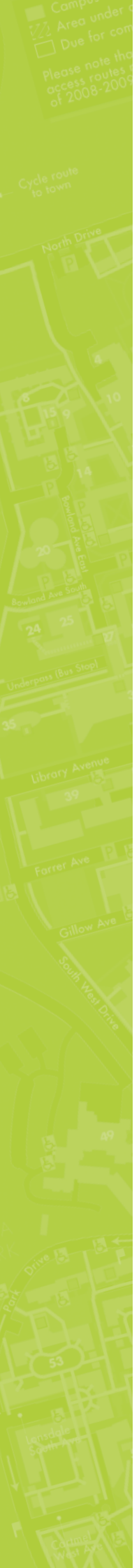
Through the implementation of this Plan, carbon management will become embedded in strategic planning of the University.

CMP Review Periods

Lancaster University CMP covers the period 2009-2020. This edition of the CMP primarily relates to projects which have been or will be implemented between 2009 and 2012 (2012 being the first milestone target date set by HEFCE). The CMP will be reviewed, updated and published annually to report on progress and update on existing and new projects.

Conclusion

The University is committed to meeting the targets that have been set within this Carbon Management Plan. It regards the implementation of the Carbon Management Plan as a means to ensure continued success and improvement in carbon management through education, training and investment.



I. INTRODUCTION

I. Introduction

As an academic institution, a high proportion of staff and students at Lancaster University have a thorough understanding of the causes and impacts of global warming and resultant climate change. In addition there are a number of external drivers that require us to take this issue seriously. Evidence for global warming/climate change and the necessity for reducing carbon emissions is beyond reasonable doubt. The issue of resource depletion, in particular oil and gas depletion, makes reducing reliance on these energy sources essential. Furthermore the related rise in utility costs in recent years gives an added impetus to seeking to reduce consumption and resultant carbon emissions. Finally, the drive from Government through HEFCE is that the higher education sector should reduce its energy consumption and carbon emissions in order to ensure long term sustainability. This is a particularly important consideration given the current financial background for higher education

Lancaster University's Carbon Management Plan sets out a clear and prescriptive programme to enable the issues of climate change and resource depletion to be addressed. The plan provides a route map detailing how the university proposes to reduce its carbon emissions through the implementation of a range of policies and projects.

The CMP forms an overall framework for carbon management at Lancaster University from 2009 through until 2020. This edition of the CMP primarily relates to the period from 2009-2012 as this is the period during which the majority of projects comprising the CMP will be implemented and 2012 is the first target date for emissions reduction set by HEFCE. Subsequent editions of the plan will cover the periods 2012-2017 and 2017-2020 in greater detail. The CMP will be reviewed and updated on an annual basis.



2. CARBON MANAGEMENT STRATEGY

2.1 Environmental Drivers for Carbon Management

Climate Change

Climate change is arguably one of the main threats to human civilisation. It has become very clear in the last 15 years that global warming and the resultant climate change are the result of anthropogenic emissions. The physical manifestations of global warming such as loss of Arctic Ocean sea ice, rapid glacial retreat, ice shelf loss and permafrost thawing, together with unprecedented periods of drought in areas such as the south west USA and Australia are becoming obvious to all. The IPCC Fourth Assessment Report (published 2008) which assessed a comprehensive selection of expert research data concluded with a high degree of certainty that anthropogenic sources of emissions were causing climate change.

Resource Depletion

The second major issue driving carbon management policies is resource depletion. Arguably this is an even more significant medium to long term threat to highly developed societies than climate change. Of particular concern is the depletion of fossil fuels such as oil, gas and coal. Modern societies are essentially designed around the use of these very convenient energy sources. However the expert view is that the world is at, or close to (within 5 years), peak production of oil, with peak production of gas within 15 years and even the possibility that the world production of coal could peak as early as 2025. The volatility of oil prices in recent years indicates how tight oil supply and demand have been. Peak oil represents a massive challenge and is likely to result in major changes to developed societies. It is thus vitally important for such societies and organisations within such societies to begin to move away from oil or gas based energy sources for electricity, heat generation and transport, before they are forced to do so. A major benefit of this will be a resultant reduction in carbon emissions and reduced dependence on non-renewable and ever scarcer resources. Lancaster University's Carbon Management Plan essentially also comprises an 'energy descent plan', and shows how the University plans to reduce its imported energy requirements.

2.2 National Drivers for Carbon Management

UK Climate Change Programme and Climate Change Act

The UK government has fully accepted the need for action on climate change and has developed the UK Climate Change Programme as a response. The UK Government has signed up to the Kyoto Protocol committing to a 12.5% cut in CO₂ emissions by 2010. The Climate Change Act, passed in 2008 commits the UK to a 34% cut in greenhouse gas emissions by 2020 against a 1990 baseline. Furthermore the Climate Change Act commits the UK to cutting greenhouse gas emissions by 80% by 2050. Carbon budgets have been set under the Climate Change Act covering the periods 2008-12, 2013-17, 2018-22.

The Climate Change Programme has included the introduction of the Climate Change Levy, UK Emissions Trading Scheme, Renewables Obligation and Energy Efficiency Commitment, as well as the introduction of industrial sector targets as part of the Integrated Pollution Prevention & Control (IPPC) regulations. It has also resulted in the establishment of the Carbon Trust.

Display Energy Certificates & Energy Performance Certificates

The Energy Performance of Buildings Directive introduced in 2006 was developed in order to reduce emissions from building stock (which make up 40% of final energy consumption in Europe). The Directive has resulted in the introduction of certification schemes for existing and new buildings, so their energy performance can be assessed. Display Energy Certificates (DEC's) are now displayed on or in 30 Lancaster University buildings. The purpose of the legislation behind these is to improve energy efficiency and management in buildings, by identifying poorly performing buildings and improving their performance or replacing them.

Carbon Reduction Commitment

The Carbon Reduction Commitment (CRC) has been introduced as part of the Climate Change Bill. The Commitment comprises a mandatory carbon trading and 'cap and trade' system for large business and public sector organisations, with the objectives being to cut carbon emissions by 1.2million tonnes/year by 2020 and introduce absolute targets for carbon reduction. The CRC will be phased in from 2010 over three years, commencing in full in 2013.

Lancaster University will be required to report annually on its carbon emissions from gas, electricity and other fuel types and will need to purchase carbon emission permits from April 2011. The payment will be returned in September 2011 with up to a +/- 10% variation based on the following criteria:

Installation of smart metering (50%)

Achievement of the 'Carbon Standard' (50%)

From 2012 onward the criteria used to determine the repayment would comprise the following:

- Absolute reduction in emissions
- Relative reduction in emissions
- Smart metering
- Achievement of carbon standard

Energy Prices

Energy prices have risen significantly and rapidly in recent years and are unlikely to return to the exceptionally low and stable prices seen in the late 1990's. Energy resource scarcity is likely to increase prices and make prices more variable, making planning more challenging. The increased cost of energy is thus a significant driver to control usage and the resultant emissions.

Building Research Establishment Environmental Assessment Methodology (BREEAM) Standards

Major capital investment projects typically lie outside the operational envelope of environmental management for higher education establishments, as they are one-off time-limited projects generally managed by external contractors. Such projects do however have a significant environmental and carbon impact during construction. In order to ensure that new build or refurbishment projects meet the highest environmental standards Lancaster University subscribes to achieving gradings of BREEAM 'Excellent' for new-build projects and BREEAM 'very good' for refurbishment projects. These are challenging standards to achieve and a major driver for sustainability. On the most recent new build project at Lancaster, the target is to achieve the newly introduced BREEAM 'outstanding' grade.

2.3 Sector Drivers for Carbon Management

Introduction

Since the publication of the Toyn report there have been a wide range of initiatives from Government and the funding councils aimed at developing a structure for and improving sustainability in Higher Education Institutions. The two most important recent developments being HEFCE's 'Sustainable Development

in Higher Education Report' Published in 2005, and the Higher Education Carbon Management Programme run through the Carbon Trust.

Financial Drivers for the HE Sector

The Higher Education sector is likely to face a challenging period over the next few years as government spending in education will be squeezed. Capital funding is likely to be reduced in particular. Achieving reductions in energy consumption and reducing energy costs will be essential in this financial climate in order to reduce the utilities spend.

HEFCE - Carbon reduction target and strategy for education in England

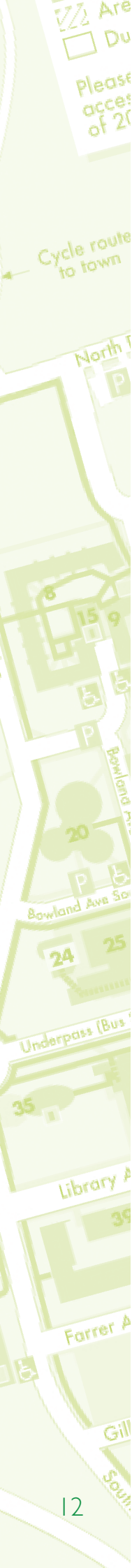
In July 2009 HEFCE issued a consultation document on a carbon reduction target and strategy for higher education in England. The principal aims of the consultation were to gain agreement on sector (carbon) targets that at least meet government targets, seek views on the strategy for supporting carbon emission reductions, consult on carbon management plan guidance, assess views on linking capital funding to carbon emission performance and raise the sector's role and commitment. Following a review of the consultation responses HEFCE issued the following documents detailing its carbon reduction target and strategy for higher education in England:

- Statement of policy - Carbon reduction target and strategy for higher education in England
- Carbon baselines for individual higher education institutions in England
- Carbon management strategies and plans – a guide to good practice

Taken together these documents comprise the overarching framework for carbon management planning in the higher education sector:

Carbon reduction target and strategy for higher education in England

The HEFCE carbon reduction target and strategy policy document sets higher education sector targets for reducing carbon emissions of 34% by 2020 and 80% by 2050, in line with national government targets. The policy statement noted that the aspirational targets for the sector should be higher than this. The targets and strategy currently relate to 'Scope 1 and 2 emissions'. (These comprise of direct emissions from sources owned or controlled by the institution (boilers and owned vehicle fleet) and emissions from purchased electricity). The targets will be against 1990 emission levels (although 2005 data will be used proxy, with resultant higher targets where 1990 data is not available).



Each institution can set its individual targets within the sector envelope, but these individual targets will have to add up to the required sector targets. HEFCE will link future capital funding to carbon reduction performance against institutional targets from 2011.

HEFCE will require annual monitoring and reporting against institutional targets. Milestone target dates have been set (in order to co-ordinate with national government carbon budgets) for 2012, 2017 and 2020 and these are presented in full in Chapter 3.

HEFCE identified in the policy statement that 'Scope 3 emissions', (from higher education procurement and travel) need to be included in carbon management plans in future. However it was recognised that additional work is required to clarify the level of emissions and individual institution Scope 3 emission baselines. HEFCE plan to identify institutional Scope 3 emission baselines by December 2012 and require targets to be set for these emissions by December 2013.

All of the dates stated by HEFCE refer to academic years. The year 1990 thus refers to the academic year 1990/91.

Carbon baselines for individual Higher education Institutions in England

The carbon baselines for individual higher education establishments for 1990 and 2005 have been assessed by SQW Energy for HEFCE. The 1990 carbon baseline for Lancaster University 22,584 tCO₂e, (derived from energy consumption information collated for around 30 higher education institutions including Lancaster University in 1990). This figure correlates almost exactly with consumption figures for 1990 held by Lancaster University. HEFCE have also derived carbon baselines for Lancaster University for 2005 from EMS statistics and a previous version of the CMP. The figure derived from the EMS statistics is low, as it excludes utilities from the Universities Partnership Programme (UPP) portion of the Lancaster University estate, whilst the figure taken from the previous version of the CMP is high as it used slightly different carbon emission factors compared to those used by HEFCE. Applying the HEFCE carbon emissions factors to the 2005 data for Lancaster University gives an accurate baseline figure of 29,131 tCO₂ for 2005. As good data on individual institution owned vehicle fleet emissions is not available for most higher education establishments, HEFCE have calculated mean baselines for 1990 and 2005 based on the available data. A factor of 0.71% is added to the other Scope 1 and 2 emissions of each higher education institutions to

account for owned vehicle emissions in these baseline years.

Carbon Management Plans and Strategies

In order to achieve their institutional carbon targets HEFCE require all higher education institutions to prepare a carbon management plan and make this publically available. This document sets out the basic requirements of the carbon management plans, which must include the following:

- A carbon baseline for 2005 for Scope 1 and 2 data. (Scope 3 data can be included and will be required in the longer term).
- Carbon reduction targets covering Scope 1 & 2 emissions set against a 2005 baseline. (Other targets can also be set against other baseline's)
- Be set against a target date of 2020, with interim milestone dates.
- An implementation plan to achieve *absolute carbon emission reductions* across Scope 1, 2 and 3 emissions including timescales and resources.
- Clear responsibilities for carbon management and a commitment to monitor progress.
- The Carbon Management Plan must be signed off by UMAG.

2.4 Local Drivers for Carbon Management

Lancaster Sustainability Partnership

Lancaster University is a member of Lancaster Sustainability Partnership. This forum promotes sustainability, environmental projects and objectives within the Lancaster District and was originally formed in order to implement the Local Agenda 21 in local authorities. The forum promotes and supports a wide variety of environmental and carbon reduction initiatives locally.

'Merton Rule'

Lancaster City Council has adopted the 'Merton Rule' of requiring all major new developments to adopt on-site renewables energy to reduce annual CO₂ emissions by 10%. This criteria has been applied to the recent LICA planning application and will impact all future University major developments.

NI186 Target for Lancaster District

Lancaster District has been assigned a target of 14.01% reduction in per capita carbon emissions (compared to a 2005 baseline) as part of the National Indicator 186 target. Of this 10.79% will come from national measures. The district wide emissions will be re-assessed in 2011.

2.5 The CMP and Lancaster University Strategic Planning Documents

Lancaster University has produced a number of different strategic planning documents which set out a framework for the future development and operation of the University. In addition a number of other policies, objectives and targets are also in place. The compatibility of the Carbon Management Plan with these plans and other documents is considered below.

University Masterplan

The University Masterplan sets out an outline strategy for the sustainable long term development of campus covering the years 2007-2017. The Masterplan encompasses sustainability in its emphasis for refurbishment of existing buildings and construction of new buildings to high environmental standards within the timeframe of the plan.

Lancaster University Strategic Plan

Lancaster University Strategic Plan sets out the overall objectives of Lancaster University. The new plan for 2009-2015 recognises the need to respond to issues of environmental sustainability.

Landscape Masterplan

The Landscape Plan was prepared in 2005 and sets out a detailed strategy for development of University built landscape and estate.

Biodiversity Masterplan

The Biodiversity Masterplan was produced in 2007 and sets out an overall strategy for conserving and enhancing biodiversity across the University Estate. Many of the proposals in the Biodiversity Masterplan will result in reduced carbon emissions and the plan is compatible with the objectives of the Carbon Management Plan.

Infrastructure Masterplan

The Infrastructure Masterplan provides an implementation plan for infrastructure projects for the period 2007-2017. The Infrastructure Masterplan sets out Lancaster University's strategy and proposals for energy generation and the upgrade/replacement of mechanical, electrical and fire alarm infrastructure services. Remedial works to highways and drainage are also included. The plan emphasises the need for producing energy more efficiently and with reduced carbon emissions. A key element of the plan is the development of a new 'energy centre', which will generate heat and electricity with a significantly reduced carbon footprint. Zero and low carbon intensity generation options are a key part of the design of the

new energy centre, for which work started on site in Summer 2010. The Infrastructure Masterplan is thus fully compatible with the CMP, shares many of the same objectives and is mutually supporting. Individual projects within the Infrastructure Masterplan will result in significant reductions in carbon.

Lancaster University Travel Plan

In order to address transport issues Lancaster University introduced a Travel Plan in 2004, the purpose of which was to encourage changes in travel mode. The Travel Plan, which was revised in 2010, sets out a comprehensive approach to travel management, the aim of which is to alter travel behaviour such that single occupant car journeys are reduced, and other travel modes such as walking, cycling and bus travel are increased. The Travel Plan will be important in setting out a strategy for managing certain travel related 'Scope 3' emissions, as these are required to be incorporated into the CMP in future years. Lancaster University Strategic Purchasing are developing systems to assist with capture of data which will enable Scope 3 emissions to be calculated more effectively.

2.6 The CMP and District/Regional Strategic Planning Documents

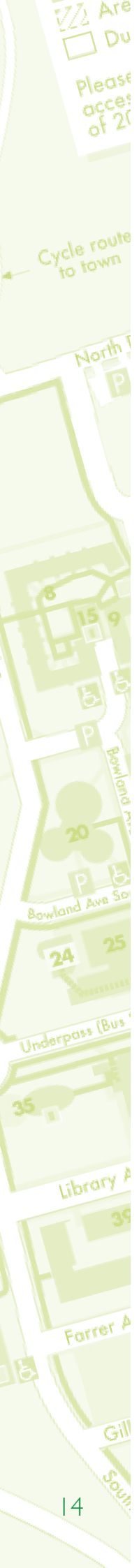
Lancaster District Core Strategy

The Lancaster District core strategy was produced by Lancaster City Council in 2006 and sets out a development framework for the district. Strategy objectives in relation to Lancaster University include the expansion of higher education and knowledge based industries and the housing of students on campus, or in areas with good transport links to the University.

2.7 The CMP and Lancaster University Environmental Policies

Environmental Policy

Lancaster University's Environmental Policy is the principle strategic document in terms of setting a framework for managing the University's environmental impacts. The policy recognises the impact that the University's activities and operations have on the environment and commits the University to improving its environmental performance. The policy, by its very nature addresses the totality of Lancaster University's environmental impacts.



It does however specifically commit to a number of principles directly relevant to the Carbon Management Plan including:

- Reducing emissions of greenhouse gases
- Improving energy and water use efficiency
- Reducing the environmental impacts of travel
- Selecting contractors and suppliers who demonstrate good environmental management practices.

The Environmental Policy statement was formally adopted by the University in 2005 and is fully compatible with the CMP, as it commits the University to reducing greenhouse gas emissions.

Energy & Carbon Management Policy

The Lancaster University Energy & Carbon Management Policy has been approved. The policy commits the University to reducing its carbon emissions, improving its energy efficiency and sets out the University's core principles for energy and carbon management. It is a key part of energy and carbon management and sets the policy framework within which the CMP is developed and reviewed.

Waste & Recycling Policy

The Lancaster University Waste & Recycling Policy has been approved. The policy commits the University to the efficient use of resources and minimisation of waste disposal. Achievement of the objectives of the policy will result in a reduction in carbon emissions.

Sustainable Procurement Policy

The Strategic Purchasing Department of Lancaster University has developed a sustainable Procurement Policy. The policy is implemented through a Green Purchasing Guide and a Sustainable Procurement Strategy and procedures, are being developed.

Green IT Policy

A Green IT Policy and Strategy has been developed by Information Support Services (ISS) in order to reduce energy consumption from centralised IT services.

2.8 Lancaster University Low Carbon Vision

Lancaster University plans to transform its carbon management, with emissions being significantly reduced and firmly established on a downward trend. The University plans to be well on the way to becoming a low carbon campus by 2020. This is a major challenge, and the University is striving to be a leader in carbon management with the aim of becoming a sector leader:

2.9 Strategic Themes

The Carbon Management Plan encompasses individuals from across the University with activities being undertaken across a wide area including students, administrative and academic departments. This section details the key functional areas of the University where activity will be focused on emissions saving and key external partnerships, which will feed information into the CMP.

Facilities Division

The core functional area at Lancaster University, through which carbon management is and will continue to be implemented, is Facilities. The Environment & Sustainability Team of staff are based in Facilities and have responsibility for carbon management policy, planning and project identification and implementation. The responsibility for identifying and securing carbon savings for the University lies with Facilities, but everyone in the institution has a part to play. Carbon reduction will thus be secured through the following functional areas:

- The Head of Infrastructure will lead on the Lancaster University Wind Turbine Project.
- The Energy Manager will be identifying and implementing a large number of smaller shorter payback period projects designed to improve energy and utility efficiency. These projects will include those identified by the Energy Manager and also identified as part of the HECMP process.
- The Infrastructure section of Facilities will be implementing a series of linked major heat and power generation projects.
- A joint approach on carbon savings in respect of behavioural change with Facilities and Lancaster University Students Union (LUSU) and will be promoted for students through Green Lancaster and for staff through the network of departmental Environmental Champions.

Information Support Services

Lancaster University Information Support Services Division (ISS) have developed a Green IT policy and strategy. A number of potential energy and carbon saving projects have been identified for rolling out as part of this strategy.

Faculties and Academic Departments

A large number of research projects and specific studies relating to carbon management are undertaken at Lancaster University through various departments and faculties, in particular Lancaster Environment Centre (LEC), Management School, Engineering Department and Computing Department. These studies may be directly or indirectly relevant to management of carbon emissions at Lancaster University. Where necessary, the Environment and Sustainability Team provide data and staff time to assist these projects and can benefit from the results of the study or research findings.

Lancaster Local Sustainability Partnership

The local district forum is designed to promote

sustainability within local authority areas. Lancaster University will be working with partnership members to share experience and best practice in reducing carbon emissions.

HECMP Alumni Institutions

Lancaster University will create partnerships and linkages with similar HEI institutions in terms of size and date of construction (such as institutions within the 1994 Group) in order to enable the mutual exchange of information on relevant carbon reduction projects.

Project Rollout and Communication

The Carbon Management Plan incorporates a detailed communication plan to aid its rollout and implementation.

3. EMISSIONS BASELINE AND TARGETS

3.1 Carbon Emissions Baseline

Carbon Emissions

In accordance with the HEFCE carbon reduction target and strategy for higher education in England Lancaster University's emissions baseline year is taken as the year 2005. In line with HEFCE guidance the 2005 baseline year targets can be directly linked to 1990 emission levels. The carbon emissions baseline for Lancaster University for 2005 (academic year 2005/06) has been calculated as 29,131 tCO₂e. Carbon emission changes will be calculated against this emissions baseline figure. Lancaster University Scope 1 and 2 carbon emissions in 1990 are indicated to be 22,584tCO₂.

Scope of Emissions

The emissions baseline is calculated in respect of Scope 1 and 2 emissions comprising:

- Scope 1: Direct emissions from sources owned or controlled by Lancaster University (primarily gas and oil consumed in site boilers and fuel consumed in the owned vehicle fleet).
- Scope 2: Emissions from purchased electricity.
- Scope 3 emissions (comprising those relating to procurement and travel) are not included in the CMP at present. Baseline Scope 3 emissions will be incorporated into the Carbon Management Plan in line with HEFCE requirements from December 2012.

3.2 Carbon Emissions Analysis

Introduction

Lancaster University has undertaken a detailed study of its carbon emissions. The study provided a comprehensive assessment of Scope 1, 2 and 3 emissions. Certain issues were not covered in this assessment including those related to major capital new-build and refurbishment projects and student travel to and from home at the beginning and end of term/year.

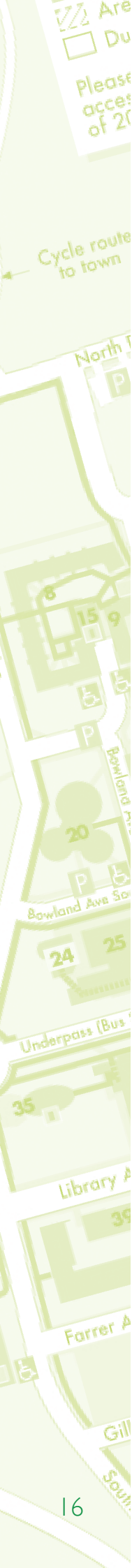
In respect of the Scope 1 and 2 emissions the analysis of the carbon emissions provided a detailed breakdown of the areas where Scope 1 and 2 emissions were produced. This has been of particular assistance in targeting projects where they will be most effective in reducing emissions.

Scope 1 Emissions - Gas

Gas consumption was 69.6GWh in 2005 and comprised approximately 48.7% of Scope 1 and 2 carbon emissions, totalling 14,203 tCO₂. Of the gas consumed 51.6% was consumed in the old CHP unit, 21% in the main gas fired boilers supplying the district heating system, with the remaining 27.4 % used in local gas fired boilers in buildings not served by the district heating system. The old CHP unit ceased operation in May 2008.

When the district heating system is switched off in the summer months electric heaters are utilised to provide hot water supplies locally within buildings, a use which accounts for 6% of the University's electricity consumption.

All residential cooking facilities are electrical, this is less carbon efficient than gas.



Scope 1 Emissions – University Owned Vehicles

Lancaster University owns a small vehicle fleet of cars, vans and agricultural vehicles. Fuel consumption figures for these vehicles were not held for 2005 and so have been estimated using the HEFCE calculated factor of 0.71% of all other Scope 1 & 2 emissions. The emissions from the vehicle fleet for 2005 are estimated to be 205 tCO₂ based on the HEFCE emissions factor. The exact emissions figures for University owned vehicles will be calculated in future years.

Scope 2 Emissions – Grid Purchased Electricity

Electricity consumption was 35.2GWh in 2005. Of this total 7.8GWh (22.2%) was generated by the old CHP unit and 27.4GWh (77.8%) imported. The 27.4GWh of electricity imported comprised approximately 50.5% of Scope 1 and 2 carbon emissions. The operation of a gas CHP unit increases gas consumption, but reduces electricity consumption. The higher efficiency of electrical generation in a CHP unit also results in lower carbon emissions than importing electricity.

Breakdown of electricity consumption

A detailed analysis of the electricity consumption indicates the following breakdown of uses:

Information Technology:

Information technology is estimated to comprise 29% of electricity consumption. The majority of this (21% of electricity usage) is attributable to staff, student, library and laboratory computers. The remainder is information technology infrastructure, which includes the air conditioning required to cool servers and the High Performance Cluster:

Residential Appliances (other than lighting and computers):

This category accounts for 23% of all electricity use. It includes kitchen appliances, and other appliances in student rooms.

Scientific Equipment:

Scientific equipment is estimated to account for 13% of electricity consumption. This includes greenhouses, low temperature physics, CEH monitoring equipment, engineering and other laboratories.

Indoor Lighting:

Indoor lighting is estimated to account for 13% of electricity consumption (5% residential and 8% non residential).

Air Conditioning (other than used in computing infrastructure):

This accounts for 7% of all electricity use.

Immersion heaters:

The gas powered district heating system is supplemented with electric heat exchangers. These operate in the summer to provide hot water when the district heating system is not operating. They are estimated to account for 6% of electricity use.

Figure 1: Lancaster University's electricity consumption by functional use

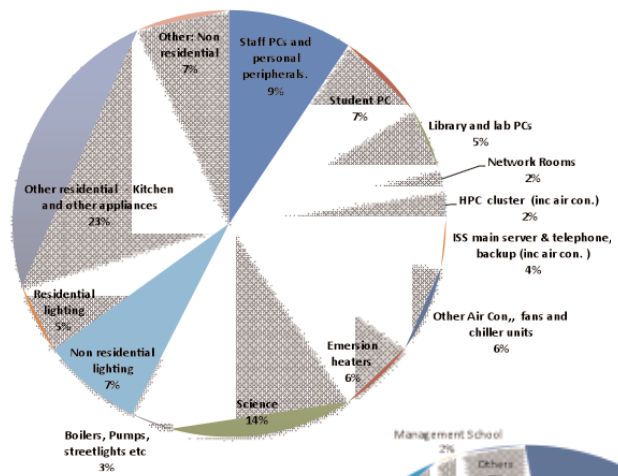
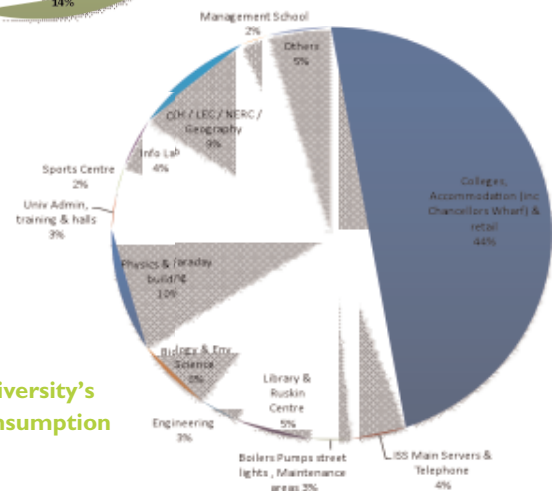


Figure 2: Lancaster University's electricity consumption by location



3.3 Higher Education Sector Carbon Reduction Targets

The HEFCE Carbon Reduction Target and Strategy sets the higher education sector targets for reducing carbon (CO₂e) emissions by 34% by 2020 and 80% by 2050 based on a 1990 baseline (the same as national government targets). For the higher education sector this has been converted into equivalent targets using 2005 as the baseline year (due to the availability of better data). Using 2005 as a baseline year the targets for reducing carbon (CO₂e) emissions are by 48% by 2020 and 84.5% by 2050. The HEFCE Carbon Reduction Target and Strategy indicates that the aspirational targets

for the Higher Education sector and individual institutions should be higher than this. In addition milestone target dates have been set for 2012 and 2017 in order to assess progress. The Higher Education sector carbon reduction targets are detailed below.

Higher Education Sector Carbon Reduction Targets

	Target Year			
	2012	2017	2020	2050
Higher Education Sector Targets (2005 baseline year)	-20%	-35%	-48%	-84.5%
Equivalent carbon emission reductions using 1990 as a baseline year.	+1%	-18%	-34%	-80%

3.4 Lancaster University Carbon Reduction Targets

Lancaster University carbon emissions targets for 2012, 2017, 2020 and 2050 are presented in the table below.

	Target Year			
	2012	2017	2020	2050
Higher Education Sector Target for carbon reduction (%) Lancaster University	-20	-35	-48	-84.5
Target for carbon reduction (%)	-34.9	-35.6	-48	-84.5
Lancaster University Target for carbon reduction (tCO₂e)	19,266	18,751	15,148	4,515

Notes:

- The baseline year for carbon reductions is 2005.
- The Higher Education sector targets are derived from national targets for 1990 converted to equivalent targets for 2005.
- The CMP currently calculates that carbon emissions could be reduced by -35.7% (18,707 tCO₂e) by 2020 using current planned and proposed projects. Future (as yet undefined) projects will be proposed and developed in order for Lancaster University to meet its target of reducing carbon emissions by 48% by 2020 and 84.5% by 2050.

Lancaster University is committed in principle to the long term target of reducing carbon emissions by 84.5% by 2050. This would require a reduction of carbon emissions to 4,515 tCO₂e by 2050.

Lancaster University carbon reduction targets detailed above are based on the implementation of the carbon reduction projects and savings detailed in Section 4 of this Carbon Management Plan. The projects comprising the CMP are primarily planned to be implemented between 2009-2012 and so carbon emissions would be anticipated to reduce most rapidly during this initial period. The CMP projects carbon emissions as a result of all the projects in the CMP until 2020.

It is anticipated that subsequent versions of this CMP will incorporate a variety of (currently unspecified) projects which will contribute to reductions in carbon emissions after 2012. These future (currently unspecified) projects will be required to reduce carbon emissions by a further 3,550 tonnes between 2017 and 2020 in order to meet the Lancaster University target of a 48% reduction in emissions by 2020.

It should be noted that the targets are based on the gas and electricity consumption projections for Lancaster University for 2010-2020 which are set out in Section 3.8. The carbon reduction targets will need to be revised if the specification, or projected carbon emissions from carbon reduction projects are revised or other factors noted above alter.

Scope 3 emissions targets will be incorporated into the Carbon Management Plan in line with HEFCE requirements from December 2013.

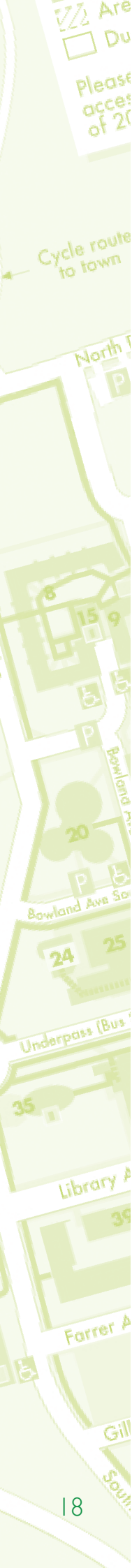
3.5 Electricity Consumption Target

A target of a 5% reduction in total electricity consumption in 2010/2011 compared to 2009/2010 has been set. The target is set against the 2009/2010 electricity consumption levels and excludes 'new' consumption from entirely new buildings coming on line during 2010/2011, in particular the ISS building. The consumption from such 'new' buildings is being monitored separately.

This target incorporates savings achieved from a range of projects as detailed in Section 4 of this report.

3.6 Gas Consumption Target

A target of a 5% reduction in total gas consumption in 2010/2011 compared to 2009/2010 has been set. The target is set against the 2009/2010 gas consumption



levels and excludes 'new' consumption from entirely new buildings coming on line during 2010/2011, in particular the ISS building. The consumption from such 'new' buildings is being assessed separately.

This target incorporates savings achieved from a range of efficiency projects as detailed in Section 4 of this report. Gas consumption is dependant to a significant extent on external temperatures, which were for example particularly low over the 2009/10 winter.

3.7 Water Consumption Target

A target of a 5% reduction in total water consumption in 2010/2011 compared to 2009/2010 has been set. The target is set against the 2009/2010 water consumption levels. Emissions related to water supply and disposal are classified as Scope 3 emission and so are not included in the total carbon emission calculations in this CMP at present.

This target incorporates savings achieved from a range of efficiency projects as detailed in Section 4 of this report.

3.8 Projected Utility Usage and Carbon Emissions (without Carbon Reduction Projects)

Projected Gas Consumption (Scope 1 Emissions)

Gas consumption is projected to increase on the basis of the expanding work of the University and any increases in floor space. A number of new buildings comprising the Charles Carter building, new Sports Centre and LICA will be completed within the next year and the projected increase in gas consumption from these buildings is understood. Additional academic buildings may be constructed prior to 2020 and an allowance for the projected gas consumption of such buildings has been incorporated into calculations of future gas consumption.

Gas consumption is projected to change from 49,065MWh in 2009 to 55,215MWh in 2020. This projected change in consumption takes no account of any of the projects which will replace gas use or improve gas efficiency as detailed in Section 4 below.

Projected University Owned Vehicle Fuel Consumption (Scope 1 Emissions)

The fuel consumption of University owned vehicles is projected to reduce as older vehicles are replaced with more efficient or lower carbon emission models.

Significant changes in the size of the University owned vehicle fleet are not anticipated. Vehicle emissions will continue to be calculated as 0.71% of other Scope 1 and 2 emissions (as per HEFCE guidance) until detailed projections on the future fuel consumption of University owned vehicles are available.

Projected Electricity Consumption (Scope 2 Emissions)

Electricity consumption is projected to increase on the basis of the expanding work of the University and any increases in floor space. A number of new buildings comprising the Charles Carter Building, new Sports Centre and LICA will be completed within the next year and the projected increase in electricity consumption from these buildings is understood. Additional academic buildings may be constructed prior to 2020 and an allowance for the projected electrical consumption of such buildings has been incorporated into calculations of future electricity consumption.

Electricity consumption is projected to increase from 36,018MWh in 2009/2010 to 46,421MWh in 2020. This projected increase in consumption takes no account of any of the projects which will generate electricity on site or improve the efficiency of use of electricity as detailed in Section 4 below.

Projected Scope 1 and 2 Carbon Emissions (without carbon reduction projects)

On the basis of the above projections for the future consumption of gas, fuel (from University owned vehicles) and electricity it is calculated that Lancaster University Scope 1 and 2 carbon emissions would be as follows (without any projects to improve efficiency of use or reduce carbon emissions):

	2005	2008	
Scope 1 and 2 Carbon Emissions	29,131 tCO ₂	26,781 tCO ₂	
	2012	2017	2020
Projected Scope 1 and 2 Carbon Emissions (without carbon reduction or efficiency projects)	31,478 tCO ₂	30,276 tCO ₂	31,108 tCO ₂

4. CARBON REDUCTION PROJECTS

4.1 Project Prioritisation

In order to reduce its projected carbon emissions Lancaster University has implemented or is planning to implement a number of projects which are designed to reduce utility consumption, improve efficiency of use of utilities or to introduce a low or zero carbon emission alternative.

The carbon reduction projects detailed in this section have been prioritised against a series of criteria. Savings projects (whether energy or utility) are given a high priority in order that consumption (or projected consumption) can be reduced in the first instance. Generation projects are prioritised after consumption savings. The other key criteria for prioritisation are projected carbon savings and projected capital costs. The projects are divided into three categories; *operational projects, projects being implemented and projects planned*. Each project is described in greater detail in Appendix B.

4.2 Operational Projects

Electrical Efficiency Projects: An extensive programme of small-medium short payback period electricity efficiency projects (primarily related to lighting and small appliance use) have been identified and are currently being implemented by the Energy manager. The electrical efficiency projects include approximately 60 specific projects. The projects include the following types of works:

- Installation of new BMS controls
- Installation of PIR detectors on lighting circuits
- Ensuring lighting controls in new/refurbished buildings are correctly installed and operating optimally
- Undertaking night time lighting surveys
- Installation of 'police' lighting systems for night time periods
- Removal of unnecessary uplighters
- Removal of low efficiency lighting and obsolete light fittings
- Optimisation of lighting levels
- Installation of high efficiency inverter driven pumps
- Introduction of building 'switch off' standards and procedures
- Fitting timing controls on vending machines
- Removal of all convector heaters
- Installation of timing controls on copiers

Voltage Change Project: This very simple project, has seen Lancaster University reduce the voltage of the electricity across campus from 248v to 240v. This change is projected to have reduced electricity use by approximately 1.75%, and contributed to the overall electrical savings. The cost of this project is minimal and further voltage reductions may be possible following a period of monitoring to assess the impact.

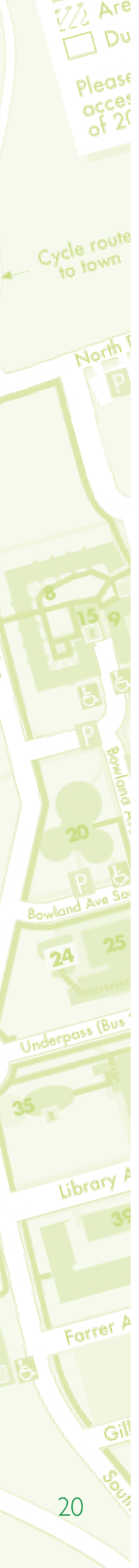
Utility Metering Project: A site wide comprehensive electrical, gas and thermal output metering project has been completed as of December 2009. This project has seen the installation of real time utility metering data of gas, electricity, water and hot water on all University buildings and facilities, thus allowing immediate assessment and localisation of unusual or excessive consumption. The project itself will not save any utilities. The real time data available will enable characterisation of utility consumption profiles and identification of further projects, which could reduce utility consumption. In addition unusual utility consumption profiles can be identified to pinpoint leaks or excessive use. This £500,000 project is self funded by Lancaster University.

Awareness Campaigns: Staff and student awareness campaigns are targeted at reducing carbon emissions through saving electricity, gas and water. Student campaigns already include carbon (reduction) competitions for three colleges and provision of energy saving advice and information. The profile of carbon management is planned to be increased in summer 2010 with a major awareness campaign for staff and students. This type of campaign is reported to have the capability to reduce to reduce utility use by 1-2%.

Combined Impact of Electrical Efficiency Projects: If fully implemented electricity efficiency projects are projected to save 63,169MWh of electricity up until 2020/2021, a carbon saving of 29,752 tCO₂ or cash saving of £5.181 million.

Gas Efficiency Projects: A programme of small-medium short payback period gas efficiency projects (including optimising boiler efficiency and usage, BMS controls and local user controls have been identified and are currently being implemented by the Energy manager.

If fully implemented gas efficiency projects are projected to save 90,462MWh of gas up until 2020/2021, a carbon saving of 18,448 tCO₂ or cash saving of £1.691 million.



Combined Impact of All Efficiency Projects: It is difficult to separate the individual impacts of efficiency projects, in particular awareness campaigns. Their combined impact will be reflected in changes in utility consumption. Taken together these projects have a target of reducing gas, electricity and water use by 5% for the year 2009/10 compared to 2008/09. Entirely new utility loadings (from buildings such as ISS) are not included in the required target. These projects are anticipated to reduce electricity consumption by 1.7GWh, gas consumption by 2.2GWh and water consumption by 22,800m³ in 2009/10.

Efficiency Targets for Future Years (2010-2020): Targets for reducing utility (gas, water and electricity) consumption from the efficiency, metering and awareness campaign projects noted above will be set for individual years at future dates up to 2020. This Carbon Management Plan needs to include such efficiency targets in order to be able to calculate carbon reductions and projected emissions in future years. Putative efficiency targets (for gas and electricity consumption) have been incorporated into the carbon emissions projections for future years and are detailed below:

	2009/ 2010	2010/ 2011	2011/ 2012/	2012/ 2013/	2013/ 2014/	2014/ 2015/
Annual Target	5	4	3	2	2	1.5
Cumulative Target	5	8.8	11.6	13.31	15.04	16.32
	2015/ 2016	2016/ 2017	2017/ 2018/	2018/ 2019/	2019/ 2020/	2020/ 2021/
Annual Target	1.5	1	1	0.5	0.5	0.5
Cumulative Target	17.57	18.4	19.3	19.7	20.1	20.5

There will be a gradual reduction in the potential for improvements for efficiency as easier and short payback projects are implemented initially. Utility use from new buildings is excluded from the targets.

4.2 Projects Being Implemented

Installation of New Combined Heat & Power Engine:

Lancaster University is installing a new CHP engine by Spring 2011. The 1.9MW electrical/1.9MW gas unit is projected to generate 8,208MWh of electricity per annum or 24.1% of electricity consumed at Lancaster University in 2008/2009. The unit is also projected to generate 8,208MWh of thermal output per year or 47.5% of 2008/2009 thermal output requirements.

The installation of the new CHP engine is projected to save £0.833 million on gas (for thermal output) and £5.223 million in electricity costs up until 2020/2021, or £0.575 million per year. The carbon saving from the new CHP engine would be 29,473 tCO₂ (9,093 tCO₂ from reduced gas use and 20,384 tCO₂ from displaced grid electricity. This equates to an annual carbon saving of 2,800 tCO₂

Installation of Thermal Gas Boilers: Lancaster University is planning to install three high efficiency 4.8MW thermal gas boilers. The boilers are designed to accommodate peak projected thermal loading demands, whilst the CHP and biomass boiler would meet base load thermal demand. The improved efficiency of these units is projected to reduce CO₂ emissions per MWh of thermal output by 28%.

The installation of the new gas boiler is projected to save 49,894MWh of gas up until 2020/2021, a carbon saving of 23,620 tCO₂ or cash saving of £0.933 million.

Wind Turbine Project: Lancaster University is planning to install two x 2.05MW wind turbines on its campus. The project has recently been refused planning permission and the University is considering appealing. The Wind Turbines are projected to generate 7,364MWh of electricity per year or 21.6% of Lancaster University's 2008/2009 electricity consumption.

Building Energy Management Plans: There are a wide variety of buildings on Lancaster University campus and each one has different energy use characteristics. Building Energy Management Plans are being developed for each building in order to save electricity and other utilities. The purpose of these is to establish a mini plan for energy management in each building on campus, incorporating building, room and user specific guidance on how to use energy most efficiently in that building.

4.3 Planned Projects

Installation of Biomass Boiler: Lancaster University is planning to install a new biomass thermal boiler in 2012 as part of its sustainable energy generation strategy. The 1.0MW unit is projected to have a thermal output of 4,320MWh per annum or 25% of 2008/2009 thermal output requirements.

The installation of the new biomass is projected to save 41,806MWh of gas up until 2020/2021, a carbon saving of 8,523 tCO₂.

4.4 Projected Utility Usage and Carbon Emissions (with Carbon Reduction Projects)

The full implementation of the carbon reduction projects detailed in this Carbon Management Plan will result in reductions in utility consumption and resultant carbon emissions. The projected emissions based on the implementation of current and planned projects are presented in the table below. As noted in the Executive Summary and Section 3.4, whilst these projected reductions in emissions will result in Lancaster University meeting its targets for the years 2012 and 2017, additional reductions in carbon emissions will be required to meet the 2020 and 2050 carbon reduction targets.

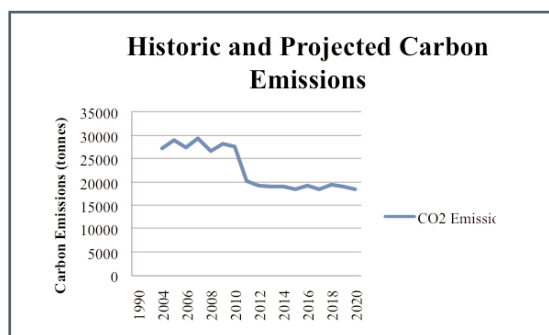
Lancaster University Projected Carbon Emissions (Current Planned/Proposed Projects)

	Year		
	2012	2017	2020
Lancaster University Projected Carbon Emissions (%)	-34.9	-35.6	-35.7
Lancaster University Projected Carbon Emissions (tCO₂e)	19,266	18,751	18,704

Notes:

- The baseline year for carbon emissions is 2005.
- The CMP currently calculates that carbon emissions could be reduced by -35.7% (18,707 tCO₂e) by 2020 using current planned and proposed projects. Future (as yet undefined) projects will be proposed and developed in order for Lancaster University to meet its target of reducing carbon emissions by 48% by 2020 and 84.5% by 2050. (These projects would need to reduce carbon emissions by 3,550 tCO₂e.

Historic and projected carbon emissions over the period 1990-2020 are indicated on Figure 3 below.



5. IMPLEMENTATION PLAN FINANCING

5.1 Overall Project Cost and Emission Savings

The overall cost of the programme between 2008 and 2020 is £13,372 million with total savings of £18.908 million projected up until 2020/2021.

Total aggregated emission savings of 126,033 tCO₂ are projected up until 2020/2021.

Lancaster University has been awarded £5,000,000 from the HEFCE Transformational Fund in order to part finance the £7,345,000 Wind Turbine project.

The University has funded the £500,000 metering project for electricity, heat and gas metering, from its own funds. In addition, Lancaster University is also committed to self funding the new Energy Centre projects comprising the £1,545,000 for the new CHP engine and £725,000 for the three new gas boilers. (The total project cost for the

Energy centre is £4,600,000). The biomass boiler will also be self funded, although grant funding (if available at the time) will be applied for. The energy centre projects will be funded from the Universities Capital budget.

5.2 Assumptions

Cost of electricity: 8.21p/kWh (January 2010 prices)

Cost of gas: 1.87p/kWh (January 2010 prices)

Cost of Wood Chips (biomass 20-25% moisture content): 2.1p/kWh

All costs for future carbon saving projects are quoted at 2010 prices.

£5m funding from HEFCE Transformational Fund is in place from 2009.

5.3 Benefits / savings – quantified and un-quantified

	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015
Annual saving (tCO ₂)	1,392	7,822	11,536	11,946	12,359	12,641
	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020	2020 2021
Annual saving (tCO ₂)	12,906	13,062	13,895	13,931	13,969	13,999

5.4 Unquantified benefits:

Improved utilities consumption data shown in HEFCE Estate Management Statistics. Year-on-year reduction in carbon emissions will help to improve the University's standings in benchmarking exercises such as the People & Planet Green League and the Business in the Community (BITC) Environment Index.

6. EMBEDDING CARBON MANAGEMENT & REPORTING

6.1 Introduction

An assessment of the level to which carbon management was integrated into the University's operations and management was undertaken using the Carbon Trust's Carbon Management Embedding Matrix (See Appendix A). The University currently has a medium level of embedding. Our projected position on the matrix is shown in bright green. This section of the CMP, outlines the action needed to ensure full ownership of the project by the University's members and integration of carbon management into all.

6.2 Corporate Policy and Strategy

The CMP will form a key strategic document for the University. The principal conclusions, recommendations and targets from the CMP will support other University Strategic documents and incorporates as appropriate:

- Lancaster University Strategic Plan
- Lancaster University Masterplan
- Infrastructure Masterplan
- Landscape & Biodiversity Masterplans
- Lancaster University Travel Plan
- Procurement Strategy

The carbon management elements of these policies and strategies will be audited by the Carbon and Energy Management Team, as outlined in Section 7, to ensure full integration and continual improvement.

6.2 Setting & Embedding Targets

The targets for carbon reduction currently relate to Scope 1 and 2 emissions (utility consumption and University owned vehicle fuel consumption). The carbon emission targets in the CMP and the annual targets proposed will be submitted to the Carbon and Environmental Executive Board (see Sections 7.1 and 7.3 below) in September each year for their agreement.

6.3 Responsibility

Responsibility for oversight of the CMP will reside with the Carbon and Environmental Executive Board. Responsibility for preparation of the CMP lies with the Environment and Sustainability Manager. Responsibility for the implementation of the projects comprising the CMP is split depending on the nature of the particular project. The key staff and their areas of responsibility are detailed as follows:

Name	Position	Area of Responsibility
Jonathan Mills	Environment & Sustainability Manager	Preparation, revision and update of CMP, Carbon Footprint Assessment, energy & carbon campaigns
Mike Sheppard	Head of Infrastructure	Implementation of Infrastructure Masterplan, including installation of new thermal, CHP and biomass boilers
Peter Lawson	Maintenance Operations Manager	Energy Efficiency Projects, Metering Project
Nick Bird	Green ICT Project Manager	Implementation of Green IT Policy
Linda Wardle	Operations Procurement Manager	Development and implementation of systems to enable capture of Scope 3 (travel and procurement) carbon emissions.
Louisa Duff	Communications Officer; Facilities	Development of communication strategy. Ongoing publicity of carbon management projects to both internal and external community.

6.4 Reporting, Auditing and Annual Review

Introduction

Reporting on carbon emissions is a critical aspect of the CMP. Reporting on carbon emissions is closely linked to the reporting on energy consumption and in defining a framework for reporting these issues it is considered appropriate that for certain reporting requirements these two issues should be reported together. Reporting will be required at several levels and at differing frequencies. The CMP will initially derive virtually all of its information on Lancaster University carbon emissions from utility consumption data (Scope 1 and 2 emissions). From 2012 the scope of carbon emissions required in the CMP (by HEFCE) will be widened to incorporate Scope 3 emissions (travel and procurement), hence a much wider range of data will be required in order to report on carbon emissions post 2012.

The following reporting of carbon emissions is planned.

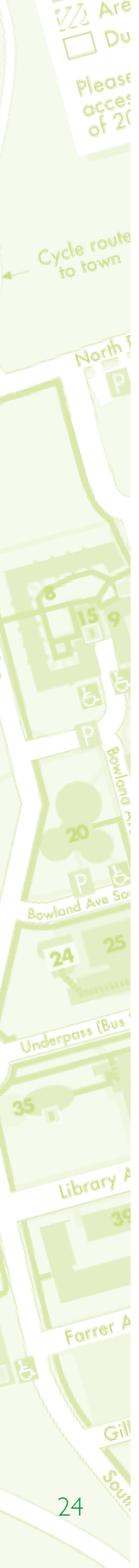
Monthly Reporting

Carbon emissions will be reported on a monthly basis as part of the Lancaster University Monthly Utilities

report. The carbon emissions reported will be based on monthly utility (electricity consumption). The monthly utilities report will be published approximately two weeks after the end of the reporting month. Responsibility for the preparation of the monthly energy report will lie with the Senior Accountant, Financial Planning & Budget Support (Paul Farley) in Lancaster University Finance Division. The report will be reviewed and commentary added by the Environment & Sustainability Manager (Jonathan Mills) and Maintenance Manager (Peter Lawson), prior to a final review by the Head of Infrastructure (Mike Sheppard) and publication.

Annual Reporting – Energy & Carbon Emissions Reports
Carbon Emissions will be reported on an annual basis as a stand-alone 'Energy and Carbon Emissions Report' prepared for the Carbon and Environmental Executive Board (see Sections 7.1 and 7.2 below). The report will be prepared for the September meeting of the Carbon and Environmental Executive board.

Primary responsibility for the preparation of the annual Energy and Carbon Emissions report will lie with the Environment and Sustainability Manager who will obtain the relevant data and prepare the report. The report



will be reviewed by members of the Carbon and Energy Management Team (see Sections 7.1 and 7.3 below) and finalised prior to submission for the Carbon and Environmental Executive Board meeting. The report will be published following the Carbon and Environmental Executive Board Meeting.

Annual Reporting - CRC

Carbon emissions need to be reported on an annual basis as part of the requirements of the Carbon Reduction Commitment scheme. The CRC has specific reporting requirements and reporting is made direct to the CRC registry. An initial 'Footprint Report' will need to be submitted between April and end July 2011, with annual reports submitted in subsequent years.

Responsibility for submission of annual CRC reports will lie with the Environment and Sustainability Manager. The reports will be prepared in close coordination with the Senior Accountant, Financial Planning & Budget Support and reviewed by the Head of Infrastructure prior to submission.

Auditing of Data

In order to check the accuracy of the carbon emissions data utilised within the CMP the contributing data and models used to determine carbon emissions will be subject to internal audit. The data and model will be audited following the calculation of carbon emissions for the Energy and Carbon Emissions Report in September each year.

The internal audit will be undertaken by staff from Lancaster University Finance Division.

CMP - Annual Progress Review

The CMP will be reviewed annually at the September meeting of the Carbon and Environmental Executive Board. The review will cover the following:

- Annual energy and carbon emissions report
- Progress against carbon and energy targets
- Progress with project implementation
- Unplanned projects
- Proposals for new projects
- Progress on cultural change
- Financial commentary and cost savings
- Proposed targets for forthcoming year
- Proposed changes to the CMP

The papers for the annual review will be prepared by the Environment & Sustainability Manager for initial consideration by the Carbon & Energy Management Team and presented to the Carbon & Environment Executive Board at their September meeting for recommendations to be made to UMAG and the Vice Chancellor.

An updated version of the CMP will be produced following the annual review and following final agreement published by end November each year.

6.5 Communication, Training and Learning

Communications

In order to ensure the success of the Carbon Management Plan it is essential that all relevant parties are kept informed on how they can assist the University in achieving its carbon emissions reduction targets as well as communicating success stories on what has already been achieved.

Throughout the CMP preparation process, key stakeholders have been consulted. Following the publication of the final plan, including the Carbon Footprint Report, briefings will be given to key stakeholders and awareness raising events held.

Training

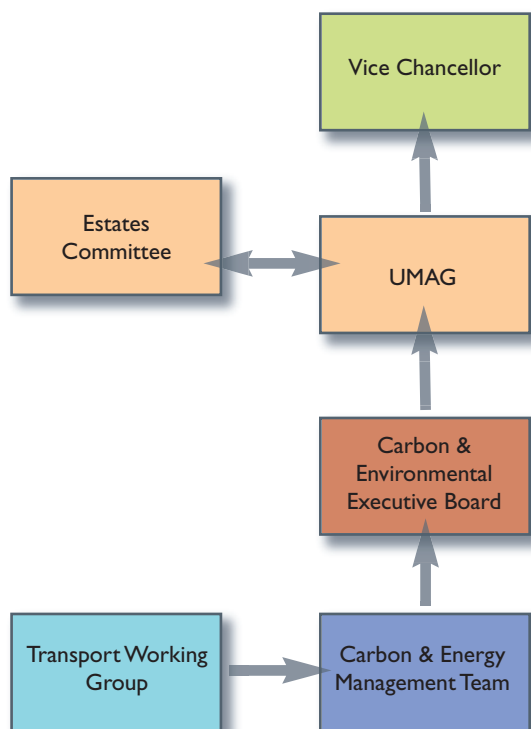
Training in carbon awareness and energy saving will be provided for specific groups of staff. Building specific guidance will be developed on energy management and training given on its implementation. As part of student inductions, the Facilities environment team will participate in Fresher's Fair and other events to promote energy efficiency and good carbon management.

7. GOVERNANCE STRUCTURE AND PROGRAMME MANAGEMENT

7.1 Carbon Management Governance Structure

Successful implementation of the CMP will require effective, on-going and committed programme governance. This is a challenging situation and it will be necessary to set up structures for programme governance that have senior ownership and the necessary resilience to continue through changes in circumstance and personnel.

The following governance structure is proposed. The Carbon & Energy Management Team would report to the Carbon & Environmental Executive Board, which would report direct to UMAG and the Vice Chancellor. The proposed governance structure is shown below.



The strategic importance of carbon management will be clarified and simplified following the publication of this plan and its roll-out programme. The CMP reinforces the necessity for a senior level governance structure which will maintain oversight of projects (which might typically

be being implemented via different departments or through cross-functional structures), and ensures project delivery by enabling the identification and removal of any potential barriers that may be preventing continual progress. Such a governance structure would also provide the appropriate forum for project owners to ensure coordination and information sharing on individual carbon reduction projects.

7.2 The Carbon & Environment Executive Board

It is proposed that the Carbon & Environmental Executive Board is established. This Board would provide oversight to the implementation of the CMP and a level of strategic ownership. Suggested Carbon & Environment Executive Board membership might comprise the following:

- Pro-Vice Chancellors - Trevor McMillan
- Chief Operating Officer – Andrew Neal
- Director of Facilities – Mark Swindlehurst
- Director of Finance – Sarah Randell Paley
- Director of Information Systems Services – John Gallagher
- LUSU President – Robbie Pickles
- Head of Strategic Purchasing – Hilary Holt
- Director of Lancaster Environment Centre – Prof Graham Harris
- Environment & Sustainability Manager – Jonathan Mills (secretary to committee)

The Terms of Reference for the Board are to meet termly in October, January and May to cover the following areas:

- Progress of carbon/utilities saving projects
- Annual carbon emissions and utilities consumption report
- Financial implications of projects and carbon emissions
- Other carbon emissions issues and initiatives
- Annual reports on other environmental issues (such as waste and recycling or transport)
- Incorporation of Scope 3 emissions into the CMP

The Carbon & Environmental Executive Board would report to the senior management of the University through UMAG.

7.3 The Carbon & Energy Management Team (CEMENT) – delivering the projects

It is envisaged that the Carbon & Energy Management Team will initially comprise core members of the HECMP project team as indicated below. Membership will be extended to co-opted members as required, such as

(student) 'carbon ambassadors'. It is envisaged that the Carbon & Energy Management Team will meet monthly, reporting to the Carbon Management Board tri-annually.

All project information and files such as footprint calculations, tables, charts, energy data and mileage data will be kept on Facilities shared drive ensuring continuity.

Position (Role)	Name	Temporary Successor	Permanent Successor
Environment and Sustainability Manager	Jonathan Mills	Phil Longton, Travel and Environment Co-ordinator	Replacement Environment and Sustainability Manager
Head of Infrastructure (Chair)	Mike Sheppard	Mark Woodhouse, Mechanical Engineer	Replacement Infrastructure Manager
Finance representative	Paul Farley	Christine Harwood	Replacement Senior Accountant
Maintenance Manager	Peter Lawson	Simon Corless, Electrical Engineer	Replacement Energy Manager
Green Lancaster Project	Darren Axe	Phil Longton, Travel and Environment Co-ordinator	Replacement Environmental Co-ordinator
Head of Technical Infrastructure	Nick Bird	Andrew Meikle	Replacement Head of Technical Infrastructure
Operations Procurement Manager	Linda Wardle	Angela Wearden	Replacement Operations Procurement Manager
Communications Officer, Facilities	Louisa Duff	Vacant	Replacement Communications Officer, Estates Management
Environmental Champions Rep (Secretary to CEMENT)	vacant Jane Quinn	vacant vacant	vacant vacant

7.4 Ongoing Stakeholder Management

A variety of groups, committees and other interested parties will need to be kept informed of progress.

Group		Frequency	Responsible person from Carbon Management Team or Programme Board	Report Format
UMAG	Report from Carbon & Environment	Annually	Chair of CEEB supported by Director of Facilities	Annual Report
Estates Committee	Report from Carbon & Environment Executive Board	Annually	Director of Facilities	Annual Report
Director of Facilities	Direct updates and regular updates through Head of Infrastructure	As necessary	Environment & Sustainability Manager	Email, face to face meetings, individual project proposals
Dean of Faculties/ Head of Departments	Initial briefing on CMP then annual updates	Variable	Environment & Sustainability Manager	Email, direct meetings
Environmental Champions	Initial briefing on carbon footprint and CMP then regular updates	Three times a year	Environment & Sustainability Manager	Email circulation list, termly meetings
Student Green Committee	Initial briefing on carbon footprint and CMP then annual updates	Updates at bi-weekly meetings during term	Environment & Sustainability Manager	Attendance at green com meetings

Appendix A: Carbon Management Matrix - Embedding

	CORPORATE POLICY & STRATEGY	RESPONSIBILITY	DATA MANAGEMENT	COMMUNICATION & TRAINING	FINANCE & INVEST	PROCUREMENT	MONITORING EVALUATION
BEST 5	<ul style="list-style-type: none"> SMART Targets signed off Action plan contains clear goals & regular progress reviews Strategy launched internally & to community 	<ul style="list-style-type: none"> CM is full-time responsibility of a few people CM integrated in responsibilities of senior managers VC support Part of all job descriptions 	<ul style="list-style-type: none"> Quarterly collation of CO2 emissions for all sources Data externally verified M&T in place for: <ul style="list-style-type: none"> Buildings Waste 	<ul style="list-style-type: none"> All staff & students given formalised CM: <ul style="list-style-type: none"> Induction Training Plan Communications CM matters regularly communicated to: <ul style="list-style-type: none"> External community Key partners 	<ul style="list-style-type: none"> Granular & effective financing mechanisms for CM projects Finance representation on CM Team Robust task management mechanism Ring-fenced fund for carbon reduction initiatives 	<ul style="list-style-type: none"> Senior purchasers consult & adhere to ICLEI Procura+ manual & principles Sustainability comprehensively integrated in tendering criteria Whole life costing Area-wide procurement 	<ul style="list-style-type: none"> Senior management review CM process Core team regularly reviews CM progress Published externally on website Visible board level review
4	<ul style="list-style-type: none"> SMART Targets developed but not implemented 	<ul style="list-style-type: none"> CM is full-time responsibility of an individual CM integrated in to responsibilities of department managers, not all staff 	<ul style="list-style-type: none"> Annual collation of CO2 emissions for: <ul style="list-style-type: none"> Buildings Transport waste Data internally reviewed 	<ul style="list-style-type: none"> All staff & students given CM: <ul style="list-style-type: none"> Induction Communications CM communicated to: <ul style="list-style-type: none"> external community Key partners 	<ul style="list-style-type: none"> Regular financing for CM projects Some external financing Sufficient task management mechanism 	<ul style="list-style-type: none"> Environmental demands incorporated in tendering Familiarity with Procura+ Joint procuring between HEIs or with LAs. 	<ul style="list-style-type: none"> Core team regularly reviews CM progress: <ul style="list-style-type: none"> Actions Profile & Targets New opportunities quantification
3	<ul style="list-style-type: none"> Draft policy Climate Change reference 	<ul style="list-style-type: none"> CM is part-time responsibility of a few people CM responsibility of department champions 	<ul style="list-style-type: none"> Collation of CO2 emissions for limited scope i.e. buildings only 	<ul style="list-style-type: none"> Environmental / energy group(s) give ad hoc: <ul style="list-style-type: none"> Training Communications 	<ul style="list-style-type: none"> Ad hoc financing for CM projects Limited task management No allocated resource 	<ul style="list-style-type: none"> Whole life costing occasionally employed Some pooling of environmental expertise 	<ul style="list-style-type: none"> CM team review aspects including: <ul style="list-style-type: none"> Policies / Strategies Targets Action Plans
2	<ul style="list-style-type: none"> No policy Climate Change aspiration 	<ul style="list-style-type: none"> CM is part-time responsibility of an individual No departmental champions 	<ul style="list-style-type: none"> No CO2 emissions data compiled Energy data compiled on a regular basis 	<ul style="list-style-type: none"> Regular poster/awareness campaigns Staff & students given ad hoc CM: <ul style="list-style-type: none"> Communications 	<ul style="list-style-type: none"> Ad hoc financing for CM related projects Limited task coordination resources 	<ul style="list-style-type: none"> Green criteria occasionally considered Products considered in isolation 	<ul style="list-style-type: none"> Ad hoc reviews of CM actions progress
1 WORST	<ul style="list-style-type: none"> No policy No Climate Change reference 	<ul style="list-style-type: none"> No CM responsibility designation 	<ul style="list-style-type: none"> Not compiled: <ul style="list-style-type: none"> CO2 emissions Estimated billing 	No communication or training	<ul style="list-style-type: none"> No internal financing or funding for CM related projects 	<ul style="list-style-type: none"> No Green consideration No life cycle costing 	<ul style="list-style-type: none"> No CM monitoring

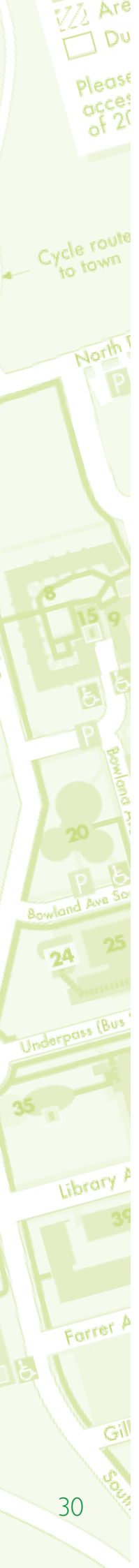
Shows current situation

Shows three year aim

Appendix B: Definition of Projects

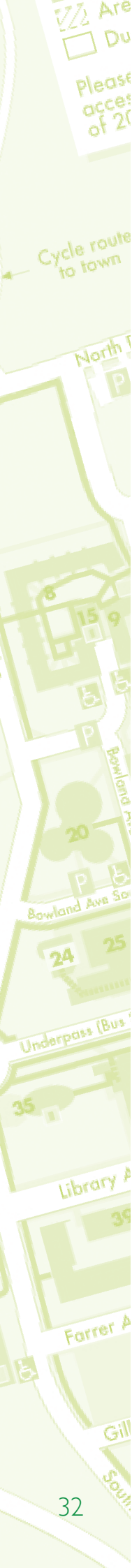
Project: Reference:	Electrical & Gas Efficiency Projects
Owner (person)	Peter Lawson
Department	Infrastructure, Facilities
Description	<p><i>Electrical Efficiency Projects:</i> An extensive programme of small-medium short payback period electricity efficiency projects (primarily related to lighting and small appliance use) have been identified and are currently being implemented by the Energy manager. The projects are designed to contribute towards a 5% reduction in electricity consumption in 2009/2010 (in conjunction with other electricity saving projects) compared to 2008/2009. The target excludes consumption from new building coming on line during 2009/2010.</p> <p><i>Gas Efficiency Projects:</i> A programme of small-medium short payback period gas efficiency projects (including optimising boiler efficiency and usage, BMS controls and local user controls) have been identified and are currently being implemented by the Energy manager. The projects are designed to contribute towards a 5% reduction in electricity consumption in 2009/2010 (in conjunction with other electricity saving projects) compared to 2008/2009. The target excludes consumption from new building coming on line during 2009/2010.</p>
Benefits	<ul style="list-style-type: none"> • Electricity savings 63,169MWh and gas savings of 90,462MWh until 2020/2021. • Financial savings: Electricity savings of £5.181 million, gas savings of £1.691million until 2020/2021. • Payback period: Less than three months • CO2 emissions reduction: Electricity 29,752 tCO₂, Gas 18,448tCO₂ until 202/2021.
Funding	<ul style="list-style-type: none"> • No specific initial cost of implementing project. • An annual budget of £50K has been set for ongoing combined electricity, gas and water projects • Source of funding: internal. • Funding committed for 2009/2010
Resources	<ul style="list-style-type: none"> • The Energy manager draws on additional resources of specialist staff from maintenance, contractors and consultants to assist in implementing the efficiency projects • Additional resources (other than those indicated above) are not required at present.
Ensuring Success	<ul style="list-style-type: none"> • The project is proving successful so far with a 6.5% saving made on electricity consumption in 2008/2009 compared to 2007/2008. The key to success is the Energy manager's comprehensive knowledge of the campus, identification of potential projects and rapid implementation. • Principal risks: Energy manager unavailable for extended period. Energy manager has the most comprehensive knowledge of campus systems/opportunities
Measuring Success	<ul style="list-style-type: none"> • The efficiency projects will assess total annual consumption. • The project will be assessed at the end of the University year (July/August).
Timing	<ul style="list-style-type: none"> • Milestones / key dates e.g. <ul style="list-style-type: none"> ◦ Start Date: August 2008 End date: Ongoing but reviewed annually
Notes	

Project Reference:	Voltage Change Project
Owner (person)	Peter Lawson
Department	Infrastructure, Facilities
Description	Reduction of the campus electricity voltage ('tap change') by an initial 2.5% in order to reduce electricity consumption. It is estimated that this reduced consumption by 1.75% in 2009 and contributed to the overall electrical savings. The cost of this project is minimal and further voltage reductions may be possible following a period of monitoring to assess the impact.
Benefits	<ul style="list-style-type: none"> Financial savings: See electrical efficiency projects above Payback period: See electrical efficiency projects above CO2 Emissions reduction: See electrical efficiency projects above
Funding	<ul style="list-style-type: none"> No capital cost. No operational costs.
Resources	<ul style="list-style-type: none"> This project has been implemented from existing resources.
Ensuring Success	<ul style="list-style-type: none"> The voltage change is being monitored to assess success and any consumer problems identified.
Measuring Success	<ul style="list-style-type: none"> Monthly site electricity consumption will be assessed
Timing	<ul style="list-style-type: none"> Milestones / key dates e.g. Start date: January 2009 Phase 1 End date: Phase 1 February 2009 Phase 2:TBC
Notes	
Project Reference:	Utility Metering Project
Owner (person)	Peter Lawson
Department	Infrastructure, Facilities
Description	Installation of comprehensive sub-metering of utilities (gas, electricity, water and hot water) on all major buildings to enable real time assessment of utility demand on a building by building basis.
Benefits	<ul style="list-style-type: none"> Financial savings: See electrical and gas efficiency projects Payback period: See electrical and gas efficiency projects CO2 Emissions reduction: See electrical and gas efficiency projects
Funding	<ul style="list-style-type: none"> Project cost: £500,000 Source of funding: internal, committed
Resources	<ul style="list-style-type: none"> Additional resources are not indicated to be required. This project is anticipated to be delivered within existing resources.
Ensuring Success	<ul style="list-style-type: none"> Project committed, project risks, technical are relatively low
Measuring Success	<ul style="list-style-type: none"> The metering project will not save any money/utilities in itself, but will help identify areas/buildings where savings can be made. It is considered likely that the project will make a significant contribution to identifying opportunities for efficiency savings in utility consumption
Timing	<ul style="list-style-type: none"> Milestones / key dates e.g. Start date: May 2009 End dates December 2009
Notes	



Project Reference:	Awareness Campaigns
Owner (person)	Jonathan Mills
Department	Operations, Facilities
Description	Awareness campaigns for staff and students are targeted at reducing carbon emissions through saving electricity, gas and water. Student campaigns already include carbon (reduction) competitions for three colleges and provision of energy saving advice and information. The profile of carbon management is planned to be increased in 2010 with a major awareness campaign for staff and students. The awareness campaigns are anticipated to contribute to reductions in overall utility consumption. The campaigns are likely to include a range of competitions and incentives (including prizes) which staff and students can participate in to help reduce energy consumption. Significant reductions in utility consumption have been recorded during the student carbon competitions.
Benefits	<ul style="list-style-type: none"> Financial savings: See electrical and gas efficiency projects above Payback period: See electrical and gas efficiency projects above CO₂ Emissions reduction: See electrical and gas efficiency projects above
Funding	<ul style="list-style-type: none"> Project cost: Communications & Marketing Costs (TBA), Roll out of campaigns and competition prizes (TBA) Source of Funding: TBA
Resources	<ul style="list-style-type: none"> Energy Manager, Environmental Manager & Green Lancaster
Ensuring Success	<ul style="list-style-type: none"> Project committed, project risks are relatively low
Measuring Success	<ul style="list-style-type: none"> A high level of awareness of the carbon emissions and utility saving projects and guidance.
Timing	<ul style="list-style-type: none"> Start date: October 2010 to be phased in over 2010/2011 University Year.
Notes	
Project Reference:	Installation of CHP Engine
Owner (person)	Mark Woodhouse & Peter McMullen
Department	Infrastructure, Facilities
Description	Installation of a 1.9MW (electrical output)/1.9MW (thermal output Combined Heat and Power engine. The engine will be installed by Summer 2011 and is projected to generate 8,208MWh of electricity per annum or 24.1% of electricity consumed at Lancaster University in 2008/2009. The unit is also projected to generate 8,208MWh of thermal output per year or 47.5% of 2008/2009 thermal output requirements.
Benefits	<ul style="list-style-type: none"> Financial savings: £6,056 million (£0.833 gas, £5,223 electricity) Payback period: 3 years CO₂ Emissions reduction: 2800 tCO₂/year or 29,473 tCO₂ until 2020/21
Funding	<ul style="list-style-type: none"> The project cost is £1,454,000 Source of funding: internal Project planned, funding will be committed in 2010/11
Resources	<ul style="list-style-type: none"> Specialist consultants and engineers identified and working on project. Further internal resources not required. The project is planned to be delivered within the Infrastructure Masterplan cost profile.
Ensuring Success	<ul style="list-style-type: none"> No additional factors identified. Relatively low risk project. University has experience of this type of plant and suitable team to deliver project.
Measuring Success	The CHP will have electric and heat meters monitoring output.
Timing	<ul style="list-style-type: none"> Milestones / key dates e.g. Start date: January 2010 End date: Summer 2011
Notes	

Project Reference:	Installation of Thermal Gas Boilers
Owner (person)	Mark Woodhouse & Peter McMullen
Department	Infrastructure, Facilities & Project Delivery, facilities.
Description	Installation of three 4.8MW (thermal output) gas boilers in the new energy centre. The boilers are modern boilers with an efficiency of 93%. These boilers are designed to accommodate peak projected thermal loading demands, whilst the CHP and biomass boiler would meet baseload thermal demand.
Benefits	<ul style="list-style-type: none"> Gas Saving: 49,894 MWh until 2020/2021. Financial savings: £0.933 million until 2020/21 Payback period: 2.7 years CO₂ Emissions reduction: 23,620tCO₂ until 2020/21.
Funding	<ul style="list-style-type: none"> The basic cost of the boilers is £725,000. However the cost, combined with all of the associated works involved in the installation and remodelling of the energy centre will total £1,757,388. The replacement of the boilers is being funded internally and funding has been committed.
Resources	<ul style="list-style-type: none"> This project will be completed within existing resources.
Ensuring Success	<ul style="list-style-type: none"> Project currently being implemented. Boilers planned to be installed by December 2011.
Measuring Success	<ul style="list-style-type: none"> Project risks are relatively low and primarily technical The thermal output of the boilers will be measured by dedicated heat meters.
Timing	<ul style="list-style-type: none"> Milestones / key dates e.g. Start date: 1st January 2010 End date December 2010
Notes	
Project Reference:	Wind Turbine Project
Owner (person)	Mike Sheppard/Jonathan Mills
Department	Facilities, Infrastructure & Operations
Description	Installation of two 2.05MW wind turbines on Lancaster University's Hazelrigg site. The turbines would supply approximately 10.7GWh electricity per annum, approximately 31.6% of current site electrical consumption. Funding of £5 million has been secured from HEFCE for the project, with the University contributing £2.3 million. The planning application for the turbines was rejected in May 2010. An appeal is being considered by the University.
Benefits	<ul style="list-style-type: none"> Financial savings: £ 800,000/yr Payback period: 6-10 years CO₂ Emissions reduction: 5,700 tonnes of CO₂ 2009/2010, 29,967 tCO₂ from grid imported electricity until 2020/2021
Funding	<ul style="list-style-type: none"> Project cost: £7,350,000 Source of funding: Internal (£2,350,000-committed), external (£5,000,000) Internal funding committed, external funding from HEFCE confirmed March 2009
Resources	<ul style="list-style-type: none"> A multidisciplinary project team has been established.
Ensuring Success	<ul style="list-style-type: none"> Principal risks: Planning permission, grid connection (obtained), turbine procurement period. Delay in programme causing problems in obtaining HEFCE funding.
Measuring Success	<ul style="list-style-type: none"> The renewable project would be metered at source
Timing	<ul style="list-style-type: none"> Milestones / key dates e.g. Start date: Project commenced April 2009 End date: TBC depending on decision on appeal
Notes	



Project Reference:	Installation of Biomass Boiler
Owner (person)	Mark Woodhouse
Department	Infrastructure, Facilities
Description	Installation of a 1.0MW biomass boiler running on woodchips or wood pellets in the energy centre. The 1.0MW unit is projected to have a thermal output of 4,320MWh per annum based on 180 days operation.
Benefits	<ul style="list-style-type: none"> Financial savings: -£0.177 million until 2020/22021 Payback period: n/a CO2 Emissions reduction: 8,532tCO2 until 2020/2021.
Funding	<ul style="list-style-type: none"> Project cost: not finalised (approximately £500,000) Source of funding: internal (but grant funding will be applied for if suitable scheme is available at the time). Decision on funding to be made in 2011/12
Resources	<ul style="list-style-type: none"> No additional resource requirements are required to enable delivery of this project. The project is projected to be funded from current resources
Ensuring Success	<ul style="list-style-type: none"> Infrastructure Masterplan funding arrangements maintained. Low-moderate technical risk as established technology.
Measuring Success	<ul style="list-style-type: none"> Heat output and efficiency of the boiler to be monitored at source.
Timing	<ul style="list-style-type: none"> Milestones / key dates e.g. Start date: August 2012 End date January 2013
Notes	
Project Reference:	Building Energy Management Plans
Owner (person)	Jonathan Mills/Peter Lawson
Department	Facilities Operations and Infrastructure
Description	Building Energy Management Plans are being developed for each building in order to save electricity and other utilities. The purpose of these is to establish a mini plan for energy management in each building on campus, incorporating building, room and user specific guidance on how to use energy most efficiently in that building.
Benefits	<ul style="list-style-type: none"> Financial savings: not finalised Payback period: n/a CO2 Emissions reduction: To be calculated for each building
Funding	<ul style="list-style-type: none"> Project cost: not applicable Source of funding: internal
Resources	<ul style="list-style-type: none"> Students, Facilities coordinators, Green Lancaster staff and Environmental Champions will be utilized to implement the Building Energy Management Plans.
Ensuring Success	<ul style="list-style-type: none"> Low risk approach working in conjunction with general awareness raising projects. Low-moderate technical risk approach.
Measuring Success	<ul style="list-style-type: none"> Improvements in utility consumption efficiency can be monitored via the automatic utility monitoring system.
Timing	<ul style="list-style-type: none"> Milestones / key dates e.g. Start date: Summer 2010 End date: Ongoing will be reviewed annually.
Notes	