London South Bank University

LSBU Carbon Management Plan

September 2010

Next Revision: September 2014

Version 04[1]

Approved by Estates & Accommodation Sub-Committee[2]

[1] *Version 03 was based on Phase 4 of HEFCE Carbon Management Programme and was prepared in partnership with the Carbon Trust*

[2] EASC is authorised on behalf of the LSBU's Executive to develop and decide Policy in areas listed within the objectives

Contents

Executive Summary

Energy security and the increasing concentration of greenhouse gases which contribute to global warming are one of the biggest challenges facing us today. The UK Government has committed itself in reducing carbon emissions by at least 34% by 2020 and 80% by 2050 against a 1990 baseline. Subsequently HEFCE has agreed to commit to the government targets for carbon emissions reduction. LSBU's commitment is to play its part in supporting HEFCE to meet the sector target for carbon reduction and lead by example.

Through this Carbon Management Plan LSBU commits to a target of reducing CO_2e[3] for scope 1 and 2 emissions by 35% by 2020 against a 2005/6 baseline. LSBU's scope 1 and 2 emissions for 2005/6 accounted to 12165 tones CO_2e. We intend to achieve the 35% reduction through contributions from capital carbon reduction projects (80%), student and staff engagement through behaviour change (5%) and the remainder (20%) through the redevelopment of estates.

A key element to ensure successful implementation of the carbon management plan is the availability of adequate resources in both finance and labour. Estimates from the carbon management plan suggest that an investment of £ 6 million will be required to implement the projects identified to achieve carbon reductions.

The responsibility of monitoring carbon management plan will rest with the Estates & Accommodation Sub-Committee whilst the Estates and Facilities Directorate will lead on the delivery of the carbon management plan. It is essential that all faculties and departments play an active role in supporting various carbon reduction initiatives. The Energy & Environment Manager will facilitate the implementation of the carbon reduction projects.

This Programme however is only the start of the journey. We will be reviewing the scope of the Carbon Management Plan in September 2014 to include scope 3 emissions. We will also include the progress made towards our carbon management plan in LSBU's annual environment report.

The production of this Carbon Management Programme, and its endorsement by the Board of Governors, will help raise the profile of energy conservation across the University, whilst the effective delivery of projects identified in the programme will lend support to the need for continued funding approval.

[3] CO_2e is a measure used to compare the emissions from various greenhouse gases including CO_2, CH_4, N_2O, *etc*. It is a universal unit of measurement used to indicate the global warming potential of one unit of carbon dioxide and used to evaluate the releasing of different greenhouse gases against a common basis

1 Introduction

The objective of carbon management is to minimise the risks and maximise the opportunities arising from carbon emissions and climate change, against a background of rapidly evolving regulation, market forces and stakeholder concerns. Carbon management is a strategic, whole-organisation approach that integrates with an organisation's existing strategy and management and enables the organisation to understand the impact of carbon emissions, to identify key risks and opportunities, to formulate a plan to reduce carbon emissions, to effectively implement, review and update the plan into the future, and to communicate success.

London South Bank University (LSBU) realises the importance of carbon management and reducing carbon emissions in tackling climate change, which is probably one of the most significant environmental challenges facing us today.

The carbon management plan (CMP) provides a convenient framework of actions to reduce the University's carbon emissions. It aims to quantify and systematically reduce the University's carbon footprint[4]. It consolidates into one document a range of initiatives to reduce carbon emissions of the University.

This CMP is based on the CMP (version 03) designed and planned in association with the Carbon Trust, as part of its Higher Education Carbon Management (HECM) Programme.

2 Context: LSBU Carbon Management Plan

LSBU Sustainable Development Strategy recognises the commitment to reduce the environmental impact of the University and improve choices available to staff and students. A key strand of this Strategy is the establishment, development and monitoring of a CMP with initiatives aimed at reducing the University's CO_2e emissions.

A structure of current existing strategy, policy and plans related to environmental sustainability is given in Appendix 1.

3 Drivers

There are many drivers that have contributed to LSBU's decision to revise its CMP. Although the basic premise remains to have a programme that will provide a framework to reduce our carbon footprint, the important change is the carbon emissions reduction target we have set ourselves.

[4] Amount of carbon dioxide (CO_2e) produced from its activities such as energy use in buildings, transport, waste disposal, and water use

The need to revise the CMP is primarily driven by the HEFCE's[5] requirement for higher education institutions (HEIs) to set their own targets for 2020 for scope 1 and scope 2 emissions against a 2005/6 baseline. The higher education sector has agreed to commit to meet the government targets for carbon emissions reductions in scopes 1 and 2 of 34 per cent by 2020 and 80 per cent by 2050 against a 1990 baseline. Against a 2005/6 baseline, this is equivalent to a reduction of 48 per cent by 2020 and 84 per cent by 2050. Furthermore, HEFCE has linked capital funding to institutional performance in reducing carbon emissions and expects HEIs to exceed the current government targets to reduce carbon emissions.

Other factors are *moral responsibility, legislative drivers* (carbon reduction commitment energy efficiency scheme, EU energy performance of buildings directive), *financial incentives* (climate change levy, recycling payments associated with CRC EES), *reputation and image,* etc.

4 Vision

London South Bank University wants to be regarded as a centre of excellence in carbon management. It aims to achieve this by systematically improving the institutions energy efficiency and use of resources by integrating sustainability with corporate strategies, policies and operational procedures. By embedding good practice within the organisation, it will encourage and support all sectors of the University to take ownership and responsibility for projects and initiatives to reduce CO_2 emissions.

5 Scope, Baseline & Target

Through this Carbon Management Plan LSBU commits to a target of reducing CO_2e for scopes 1 and 2 emissions by 35% against a 2005/6 baseline. LSBU's scope 1 and 2 emissions for 2005 accounted to 12165 tonnes of CO_2e.

5.1 Classification of Greenhouse Gas Emissions

The greenhouse gases (GHG) Protocol defines direct and indirect emissions as follows:

- Direct GHG emissions are emissions from sources that are owned or controlled by the reporting entity
- Indirect GHG emissions are emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity

These can be further categorised into three broad scopes

- Scope 1: all direct GHG emissions – emissions from fuel combustion and company vehicles

[5] Higher Education Funding Council for England

- Scope 2: indirect GHG emissions from consumption of purchased electricity, heat or steam i.e. emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity
- Scope 3: other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc.

The figure below represents the aforementioned GHG scopes.

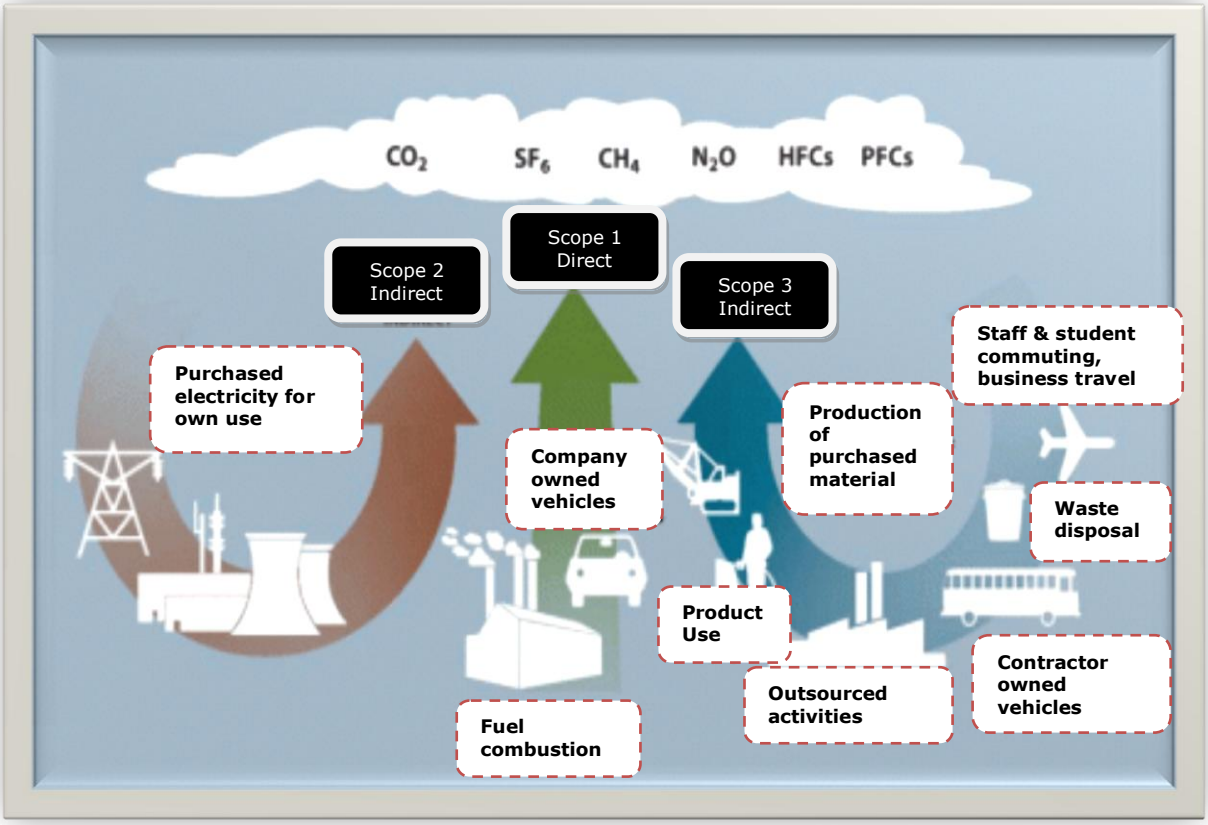


Fig: GHG Emissions Categories: Scope 1, 2 & 3[6]

5.2 Scope of LSBU's CMP

5.2.1 Phase 1: 2010-2013

For the purpose of this CMP, LSBU has included scope 1 and 2 emissions. This includes emissions from use of fuel for combustion, fugitive emissions, emissions from LSBU vehicles and emissions from electricity use in all LSBU buildings. The aforementioned targets are absolute targets, which mean achieving actual carbon reductions against the levels fixed in 2005/6.

5.2.2 Phase 2: 2014 onwards

[6] Adopted from World Resource Institute - Operational Boundaries of GHG Emissions

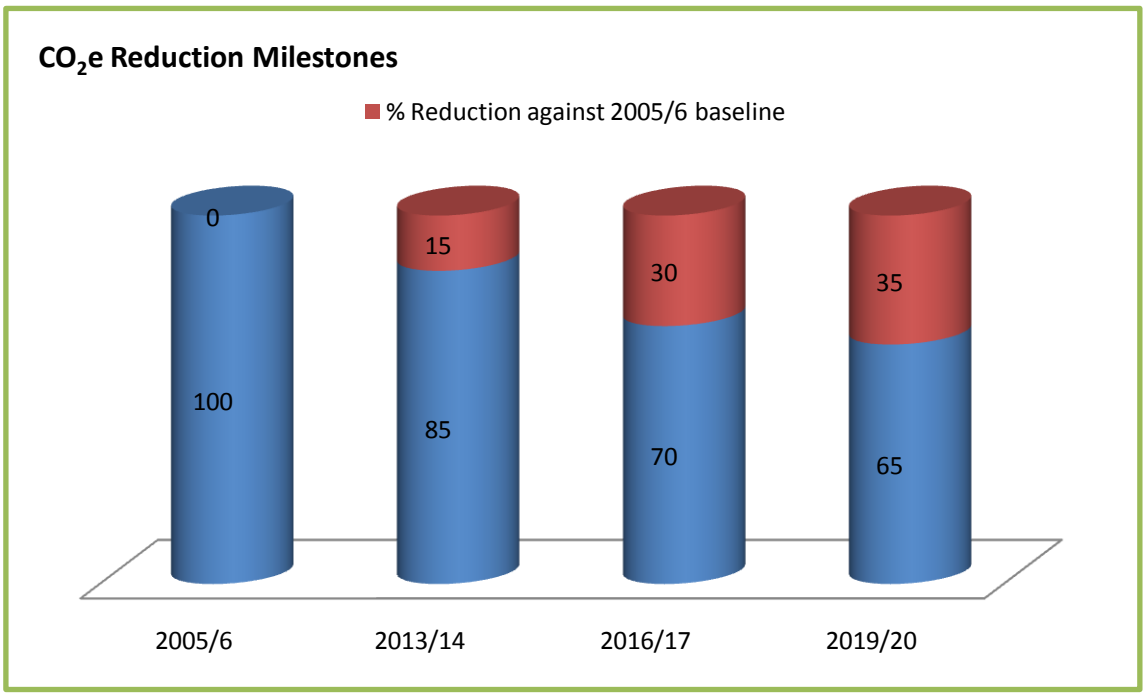
It is estimated that a significant amount of an organisation's footprint comes from the emissions embedded within the goods and services procured, both business and daily commuter travel. Our intention is to revise the scope of the CMP at the end of academic year 2013/14 to include scope 3 emissions. We will use this interim period to build capacity to put in place procedures and systems to start monitoring and recording scope 3 emissions.

The targets we set for scope 3 emissions will be guided by the HEFCE's sector targets for scope 3 emissions[7].

It is important to note that the above scope, although designed to allow LSBU to meet its carbon reduction target, is not a definitive list and should simply be regarded as a starting point from which LSBU can continue to progress.

5.2.3 Yearly work progress review

We believe it is important to have milestones in order to monitor progress against the aforementioned target.



[7] HEFCE intends to measure emission from procurement by December 2012 through Estates Management Statistics and subsequently set targets for scope 3 emissions by December 2013.

The table below lists the key annual activities from now until 2020.

Activities	***Year***
Annual carbon emissions report	2010/11, 2011/12, 2012/13, 2013/14
Review scope of CMP to include scope 3 emissions	September 2014
Annual carbon emissions report	2014/15, 2015/6, 2016/7
Review of CMP	September 2017
Annual carbon emissions report	2017/18, 2018/19, 2019/20
Review of CMP to for 2020-2030 period	December 2020

5.3 Baseline

LSBU has considered 2005/6 (1st August 2005 to 31st July 2006) as the base year for its emissions calculations. This year has been chosen as it is used for reporting against UK and HEFCE targets, and reliable information and data is available for scopes 1 and 2.

The following identifies the source of all data that has been used in calculating the baseline, as well as any assumptions and conversion factors that have been used. It is necessary to document all information of this kind in order to ensure that any future carbon emissions calculations can be performed by using the same methods enabling consistency and success of the programme.

Sources of information

- Electricity and Gas data: All information and data regarding consumption and expenditure on electricity and gas has been obtained from half hourly electricity, data, invoices, and manually read site meters
- Most buildings within the University's estate portfolio will have an individual figure for consumption of gas and electricity and their associated costs which will either have been produced as a result of a direct invoice or a metered appointed value. However, where individual meters are not available the appointed value will have been estimated and won't necessarily, therefore, reflect the buildings' true consumption
- Gross Internal Area: Information relating to Gross Internal Area of each building has been obtained from the University's estate terrier and reflects the data used for the EMS Return
- Staff and Student Numbers: FTE figures for staff and student numbers have been obtained from the EMS figures
- Fugitive emissions: These have been based on the findings of the LSBU environmental audit report, March 2008
- Vehicles miles: Information has been taken from the Estates Management Statistics returns and from the findings of LSBU environmental audit report, March 2008

For converting existing data sources (e.g. utility bills, car mileage, refrigeration and fuel consumption) into CO_2e emissions LSBU has used the latest GHG conversion factors published by DEFRA. As the conversion factors are updated annually LSBU will aim to achieve reductions in gas and electricity used (kWh).

5.3.1 Energy Management Practices

The existing energy management practices outlined in the Energy Management Matrix found in Appendix 2 are as follows:

5.3.1.1 Energy Policy

A full carbon management strategy has been developed as part of the CT HECM programme with the full support of top management. LSBU is at Level 4 on the Energy Management Matrix.

5.3.1.2 Organisation

Energy management is the responsibility of Anuj Saush, the Energy and Environment and Manager. He is supported by the Estates team, with some responsibility delegated to the site managers. Energy management responsibility is not yet embedded widely throughout the organisation. LSBU is at Level 2/3 on the Energy Management Matrix.

5.3.1.3 Training

There has been limited energy awareness related training carried out to date. LSBU is at Level 1/2 on the Energy Management Matrix.

5.3.1.4 Performance Measurement

Presently electricity and gas consumption data is collected on a monthly basis and some monitoring and target activities are being undertaken using the data. However there is a great potential to utilise the data further. LSBU is at Level 2 on the Energy Management Matrix.

5.3.1.5 Communications

A number of initiatives are being used for communication within the university on energy and environmental issues including the intranet, LSBU website and Environmental Progress Report. LSBU is at level 2/3 on the Energy Management Matrix.

5.3.1.6 Investment

The university has in place a budget for energy and carbon reduction issues. However, funds for the full implementation of CMP have not been secured. The site is at Level 3/4 on the Energy Management Matrix.

5.3.2 LSBU 2005/6 Baseline Emissions

Emissions Category	2005/6	Units consumed	KG CO_2e	% of total CO_2e
Scope 1	Gas (MWh)	15392	3,127,962	25.12
	Fugitive emissions	--	137,900[8]	1.19
	From vehicles (litres, diesel)	3200[9]	8550	0.07
Scope 2	Electricity (MWh)	16054	9,166,513	73.62
Total		**31,446**	**12,164,825**	

In comparison with the HEFCE study[10] which gives the carbon baselines for individual HEIs in England, the aforementioned KG CO_2e is higher. This can be partly attributed to the difference in the electricity kWh consumed and the fact that the study uses CO_2 whereas the above is CO_2e.

5.3.3 Relative Carbon Emissions Figures

Academic Year	Tonnes of CO_2e	Staff and student FTE	KG CO_2e per staff and student FTE	Total income (million)	Kg CO_2e per £ of income
2005/6	12439.97	17654	704.646	106.201	0.117136091
2006/7	11173.76	17453	640.219	113.089	0.098805012
2007/8	11431.5	18916	604.318	120.183	0.095117446
2008/9	11672.72	18653	625.768	131.177	0.088984502
2009/10	12084.66	19410	622.600	137.128	0.08812686

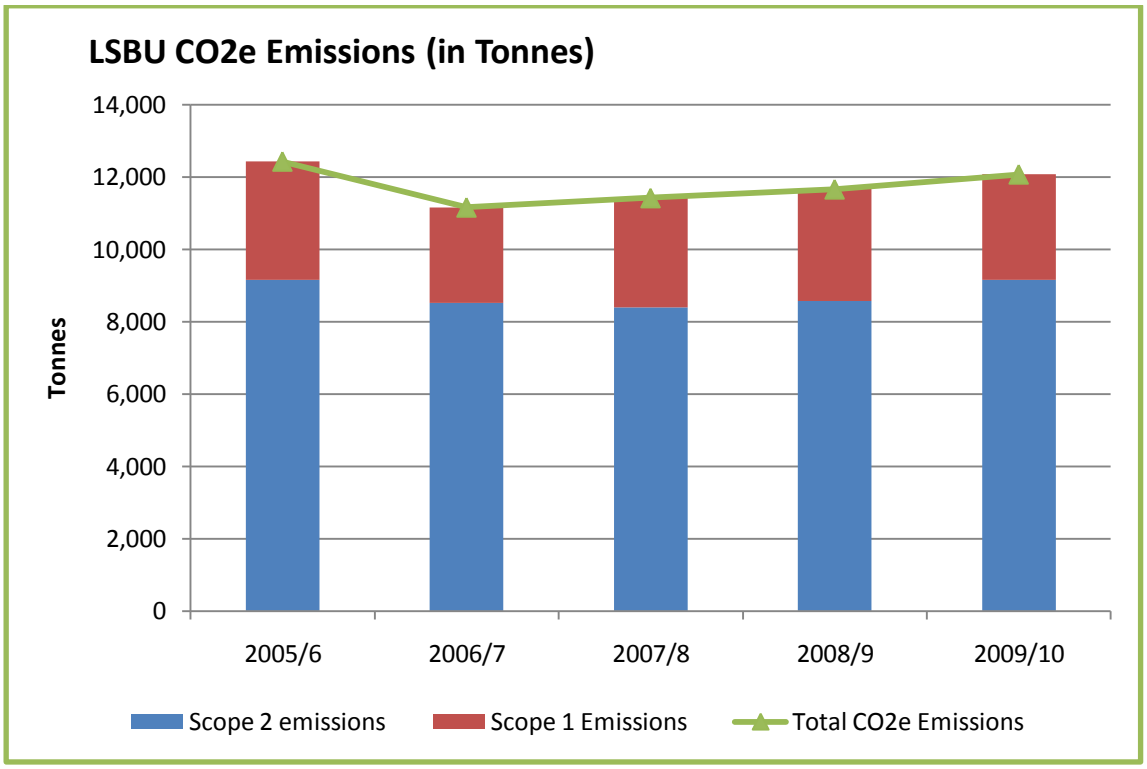
[8] Accurate information for fugitive emissions for 2005/6 is not available and the CO_2e is based on the 2006/7 emissions figure that have been extrapolated to reflect 2005/6 electricity consumption

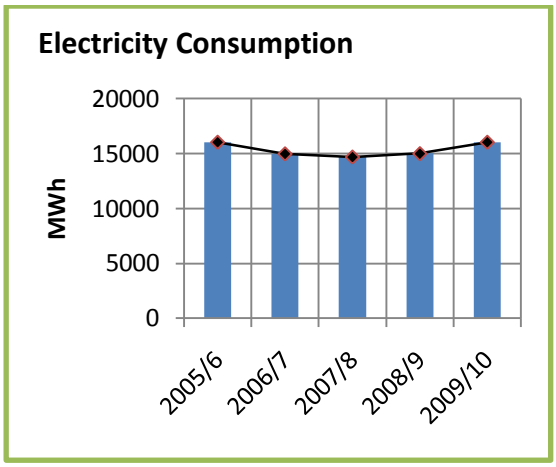
[9] Accurate information for fuel spend and the mileage in not available for 2005/6. The aforementioned figures have been based on the fuel spend and mileage log for 2008-09

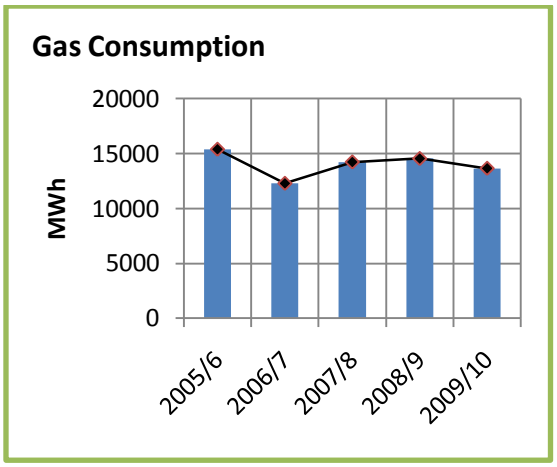
[10] Carbon baselines for individual Higher Education Institutions in England Report to HEFCE by SQW: http://www.hefce.ac.uk/pubs/rdreports/2010/rd14_10/

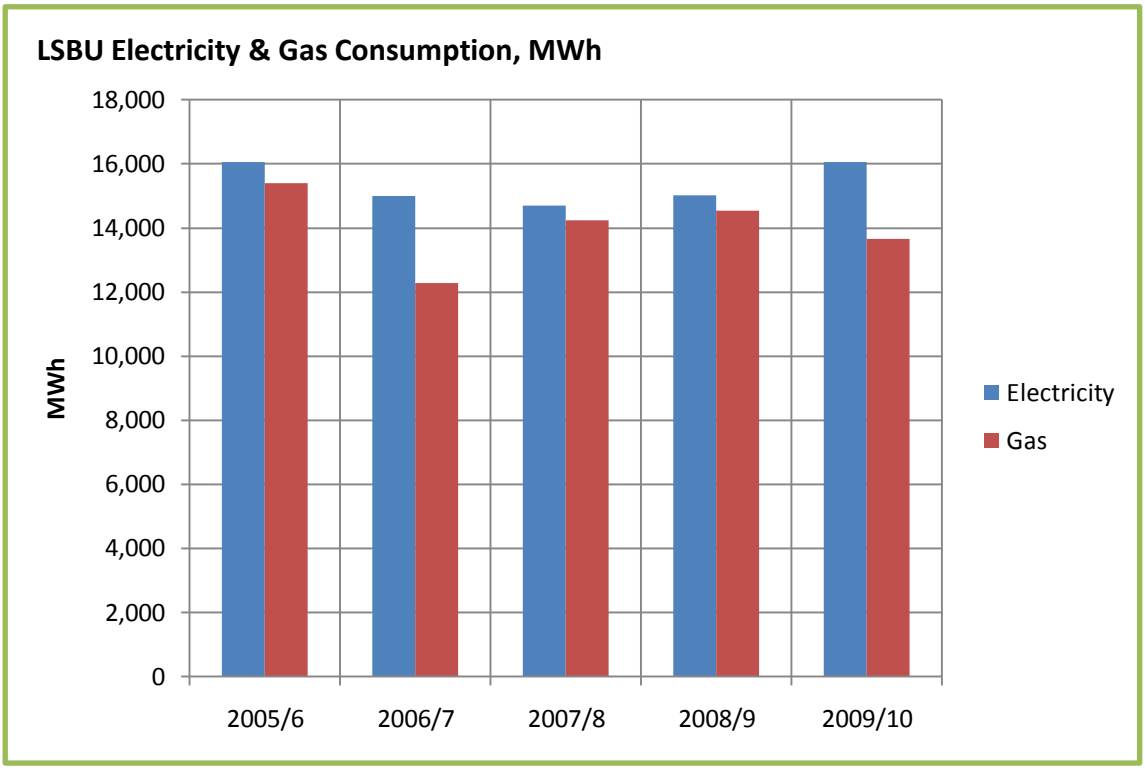
5.3.4 Trend Analysis

The charts below describe LSBU's CO_2e emissions, electricity and gas consumption for the last 5 years. We can observe a low gradient v-shape curve for the overall emissions. This is primarily due to the fact that electricity consumption follows that profile. Electricity consumption was lowest in 2007/8 and since then has increased by approximately 650 MWh/year. This has been partly attributed to the increase in estate size (m^2) and changes in the following factors which influence the consumption pattern - operating hours, occupancy levels, control mechanisms, degree days, building management system operation, increasing ICT equipment, equipment efficiency, type of equipment installed and behavioral issues.









One of the key reasons for the increase in electricity consumption in 2009/10 was the completion of our new building K2. Although built to high sustainability specification, electricity consumption during the last 12 months was approximately 1650 MWh.

The graphs in Appendix 3 and 4 give a graphical representation of gas and electricity consumption over the last 5 years. The Main building along with Tower, E, J and M blocks constitute to around 35% of the total gas consumption. Other buildings with a significant footprint are London Road and McLaren House. For electricity, the halls of residences together constitute to around 27% of the total electricity consumption. The other large contributors are the Main building, K2 and London Road.

6 Achieving Carbon Reduction

6.1 Approach

In 2005/6 LSBU used a total of 31,446 MWh of energy (electricity and gas). For LSBU to meet its carbon reduction target, it will have to reduce the energy consumption by at least 35%. This accounts to reducing LSBU's energy by 11006 MWh.

Achieving a 35% reduction in scope 1 and 2 emissions against a 2005/6 baseline by 2020 is a stretch target and we intend to adopt a multi-pronged approach to reduce our CO_2e emissions. We will focus on making interventions[11] in the following areas - behavioural change and new ways of working, lights and electrical appliances (including ICT), building energy and space management, building fabric upgrade, energy efficiency supply and renewable energy. All of these have different cost effectiveness and may require varied amount of investment. For example, although there is little/no capital investment to initiate behaviour change, it requires a significant amount of human resources to initiate any such programme.

Section 6.2 describes the specific projects which LSBU will implement to realise the MWh and/or CO_2e savings. Although the cumulative projected savings through these carbon reduction projects help meet LSBU's absolute emissions reductions target from a 2005/6 baseline, it would also depend upon certain variables core to the University's operation. These include the number of students and the provision of additional infrastructure which may have a direct/indirect effect on energy consumption.

Softer methods can play a significant part in highlighting institutional priorities and in encouraging behavioural and cultural change. LSBU, through staff and student empowerment, will aim to reduce their environmental impacts by encouraging, rewarding, and celebrating environmental improvements. We have estimated that behaviour change initiatives will contribute 5% towards the 11006 MWh savings.

The Estates Strategy is an integral part of service and strategic planning, and plays an important role in LSBU's overall plan to reduce its carbon emissions. Over the next 10 years, there will be emphasis on rationalising the estate with the objective of improving environmental sustainability and securing opportunities for the future. As part of this, it is proposed to create three anchors to give form to the campus, as a distinct and recognisable triangle. These anchors comprise of

- North East Corner, a new student centre (below the existing Tower Block),
- North West Corner, the refurbishment and bringing back into use the listed Terraces and disused public house (St George's Circus) and
- South Corner, the opportunity to redevelop the Technopark site to provide a new main entrance with centralized student services and student accommodation.

[11] As recommended by SQW in the hefce's Carbon reduction target and strategy for higher education in England

Consolidation of buildings and a move towards a low carbon estate as mentioned will deliver a saving of approximately 2200 MWh (20%). These figures have been based on the assumption that the any new buildings and/or refurbishment will be 50% less carbon intensive per sq meter.

We are confident that with the implementation of the projects outlined in the Implementation Plan, and the ongoing behaviour change initiative coupled with the Estates development plan will help us achieve our carbon reduction target.

6.2 Carbon Reduction Projects

LSBU's CMP identified a number of carbon savings projects and will prioritise them according to capital investment and carbon savings. The carbon reduction opportunities identified have been adopted from Version 3.0 of the CMP and findings from energy audits done over the last 12 months. The MWh and/or CO_2e savings and the investment required to implement the projects have been based on the industry best practice averages.

The following is a long list of potential projects the University is considering implementing over the next 4 years. The following projects will be included within the draft programme with funding sought from a range of sources, including the University's own resources, Salix and where appropriate other third party providers. This list is by no means exhaustive and will be reviewed by the Energy & Environment Manager regularly.

The predicted energy and CO_2 savings identified in each of the projects below come from a range of sources, including the university's retained M&E consultants, specialist environmental advisers and other specialists in the field. In respect of the PIR installation projects, for example, the predicted energy and CO_2 savings have been calculated by assessing the likely reduction in hours that lights are switched on. The calculations are based on the power consumption of the existing light fittings, but ignore the power consumed by the ballasts. The savings identified in these projects, therefore, are likely to be minimum estimates. It is also likely that in some instances minimum savings may not be realised as implementing a particular measure may decrease the effectiveness of a measure which is implemented later. For example, upgrading lighting to T5 will reduce the effectiveness of a voltage optimisation unit.

The carbon reduction projects identified can result in a maximum combined saving of 8898 MWh, accounting to approximately 80% of the savings target. However, as mentioned above if all of the projects were to be implemented the savings realised may be less than what we have estimated. Hence, for the purpose of this CMP we have rationalised the combined savings by 5% to deliver a savings of 8453 MWh. The estimated cost of implementing projects identified is circa £6 million.

The significant capital cost of many of these projects means that further investigative work may be required before a commitment to commission these projects.

A CHP feasibility study has been recently completed for the Southwark campus. The scheme was found to be uneconomical. We will again consider installation of CHP and commission a study in Phase 2 of this CMP i.e. post 2013/14.

Number	Initiative	Annual Savings kWh	Annual Savings £	Estimated Capital Cost (£)	Payback (years)	tCO2 saving
1	J Block: catering fridges and freezers - switch off during non-term time	3,600	£250	£0	0.0	2
2	LRC: VSDs for pumps and AHUs	273,267	£18,754	£10,000	0.5	63
3	McLaren House: review BMS control strategy	148,000	£6,900	£5,000	0.7	34
4	Faraday Wing: main AHU - reduce VSD speed during non-term time	28,700	£2,000	£1,500	0.8	16
5	J Block: main AHU - switch off during non-term time	18,700	£1,300	£1,000	0.8	10
6	McLaren House: replace desk lamp tungsten bulbs with CFLs	41,100	£2,900	£2,500	0.9	22
7	David Bomberg House: replace desk lamp tungsten bulbs with CFLs	19,400	£1,350	£1,500	1.1	11
8	Faraday Wing: main AHU - review damper control	5,600	£400	£500	1.3	3
9	Campus wide: review BMS settings and adopt energy saving strategies	750,000	£51,471	£100,000	1.9	204
10	Campus wide: PC/desktop power down software	500,000	£35,077	£75,000	2.1	272
11	Faraday Wing: insulated exposed pipe work and fittings	8,200	£350	£800	2.3	2
12	J Block: insulated exposed pipe work and fittings	8,300	£350	£800	2.3	2
13	Faraday Wing: Replace halogen spot lights with low energy equivalents	2,100	£150	£400	2.7	1
14	Keyworth Centre: lighting control	228,069	£16,000	£45,000	2.8	124
15	London Road: VSDs for pumps and AHUs	64,598	£4,433	£16,000	3.6	35
16	LRC: lighting replacement and control	147,712	£10,364	£40,000	3.9	80
17	London Road: lighting replacement and control	205,907	£14,447	£60,000	4.2	112
18	Tower Block: switch off AHU outside term time	10,200	700	£3,000	4.3	6
19	Perry Library: lighting control	116,284	£8,140	£47,000	5.8	63
20	Keyworth Centre: voltage optimisation	125,159	£8,781	£40,000	4.6	68
21	Perry Library: VSDs for pumps& AHUs	30,280	£2,078	£10,000	4.8	16
22	David Bomberg House: install controllers to electric heaters	123,300	£8,650	£43,500	5.0	67
23	Tower Block: install zone controls	93,000	£3,950	£20,000	5.1	21
24	Faraday Wing: install lighting controls	58,700	£4,100	£21,500	5.2	32
25	J Block: install lighting controls	64,500	£4,550	£24,200	5.3	35
26	Main Building (including E, M block): install roof insulation	141,900	£6,050	£34,100	5.6	33
27	Perry Library: boiler optimisation	81,600	£3,500	£20,000	5.7	19

Number	Initiative	Annual Savings kWh	Annual Savings £	Estimated Capital Cost (£)	Payback (years)	tCO2 saving
28	LRC: voltage optimisation	58,542	£4,107	£25,000	6.1	32
29	J Block: install T5 lighting	83,900	£5,900	£39,800	6.7	46
30	Faraday Wing: install T5 lighting	76,000	£5,350	£36,200	6.8	41
31	Keyworth Centre: lighting replacement and control	72,673	£5,099	£35,000	6.9	40
32	LRC: boiler optimisation	51,699	£2,178	£15,000	6.9	12
33	Keyworth Centre: boiler optimisation	65,280	£2,751	£20,000	7.3	15
34	Perry Library: voltage optimisation	62,579	£4,391	£35,000	8.0	34
35	Main Building (including E, M block): lighting controls	237,600	£15,200	£125,400	8.3	129
36	Main Building (including E, M block): upgrade lighting to T5 luminaries	530,200	£37,200	£310,900	8.4	288
37	McLaren House: install TRVs	154,500	£6,600	£62,300	9.4	36
38	McLaren House: replace boilers with high efficiency condensing boilers	288,500	£12,300	£120,000	9.8	67
39	Main Building: insulate exposed pipe work and fittings	35,600	£1,500	£15,000	10.0	8
40	Faraday Wing: HWS - reduce operating hours during non-term time	1,700	£100	£1,000	10.0	1
41	Faraday Wing: install TRVs	26,900	£1,150	£12,000	10.4	6
42	Main building (including E, M block): draught proofing	85,100	£3,650	£45,000	12.3	20
43	London Road: boiler replacement	435,750	£18,360	£300,000	16.3	237
44	Campus wide (or building specific): installation of CHP	3,000,000	£180,000	£3,500,000	19.4	816
45	J Block: replace boilers with high efficiency condensing boilers	237,333	£10,000	£400,000	40.0	55
46	J Block: primary heating pumps - install VSDs	7,500	£550	£15,000	27.3	4
47	Faraday Wing: replace chillers	44,600	£3,100	£100,000	32.3	24
51	Campus wide: ongoing PC upgrade to energy efficient PCs	44,118	£3,088	Not known		24
52	Campus wide: behavioural change initiative delivering 5% emissions reduction	550,305		Not known		299
53	Campus wide: estates strategy delivering 20% emissions reduction (assuming new portfolio to be 50% carbon intensive)	2,201,220		Not known		
	Total	**11,649,776**				

6.3 Financial Planning

It is envisaged that an investment of circa £1 million will be required year on year to meet LSBU's CMP targets and perform well in the CRC EES.

For 2010-11 allocation of £1 million has been made for financing carbon reduction projects. In addition, there is also circa £65,000 from Salix to spend on carbon reduction projects. This budget will cover a fair number of the measures identified; however the funding for the remainder is yet to be secured and are beyond existing budgetary allocations. The EAF Directorate will continue to bid for carbon reduction projects along with the utilities budget.

It is envisaged that there may be instances where larger projects (such as CHP), where the costs are outside the scope of these budgets, will need to be considered on a case by case basis with thorough feasibility proposals submitted to the Executive for consideration.

In general, projects with the shortest payback and most CO_2e saved will be given the highest priority. However, to meet our carbon reduction targets all projects identified irrespective of their paybacks will have to be considered.

In addition to the funding from the University, the EAF Directorate will explore the options for some external assistance with funding projects.

6.3.1 Assumptions

In calculating the estimated costs and savings to be achieved by this programme the following assumptions have been made:

- The cost of gas has been assumed to be approximately 4.251 p/ kWh
- The cost of electricity has been assumed to be approximately 7 p/ kWh
- The above costs are inclusive of the Climate Charge Levy
- Unless stated otherwise in the project description sheets the identified projects will be carried out by external contractors and the costs shown are inclusive of fees and VAT
- LSBU's programme management costs are included in the staff establishment costs for the Estates and Facilities Department.
- Additional revenue costs, over and above that already being incurred are only anticipated in a handful of projects (e.g. increased cost of maintaining additional sub-meters across the campus). In the majority of cases, existing revenue budgets will simply be transferred to maintain the new plant and equipment.

6.4 Other factors influencing outcome of the CMP

There are a number of contributory factors that will facilitate LSBU achieving its CMP targets.

6.4.1 Resource availability

As mentioned in section 5.6, capital investment in the region of £6-8 million will be required to achieve the carbon reduction targets. However, given the current economic climate and the funding outlook for the next 2-4 years, necessary funds required to implement the carbon reduction projects might not be made available.

6.4.2 Leading change to low carbon university

Whilst there is wide support for environmental management progress at LSBU, there is the danger that entrenched habits and opinions within the University populace will hamper achievement in some of the areas being targeted. It is important to ensure that there is recognition from the Executives, Faculty Deans and Heads of Department of the sense of urgency and institutionalise the new approach to a low carbon University.

6.4.3 Progress Report

It is essential to communicate the CMP, its aims and successes regularly throughout the university in order to ensure a constant level of interest in the programme. Similarly, keeping the Executive and Corporate Finance informed of the requirements that will be needed in order to ensure the programmes success for the forthcoming year early on may help secure the necessary funding.

6.4.4 Perception of carbon management

One of the most important thought of school amongst fellow colleagues and university employees that impedes successful implementation of any carbon reduction initiative is that *carbon and energy management is not just the sole responsibility of the EAF Directorate but the responsibility of the entire university.* It is imperative that all university employees are on board and actively participate and contribute to achieve carbon reduction. It is absolutely imperative that the University Board of Governors, the Executive, Faculty Deans and Head of Departments demonstrate clear leadership on carbon management and energy issues.

6.4.5 Engagement

Ongoing efforts to increase awareness and educate staff and students on energy and environmental matters will facilitate the success of the programme. It is recognised that not all stakeholders need to be champions of carbon management, but through effective communication the aim is to create an environment whereby everyone in the university contribute to the programme.

7 Data Management

Data management is the responsibility of the Energy & Environment Manager. The key to improving energy efficiency and the reduction of carbon emissions will be the regular and accurate recording and monitoring of energy consumption. A rolling programme of installing electrical sub-meters will enable the Energy & Environment Manager to better understand where and when consumption peaks are occurring. Targeted action designed to reduce consumption can then be taken.

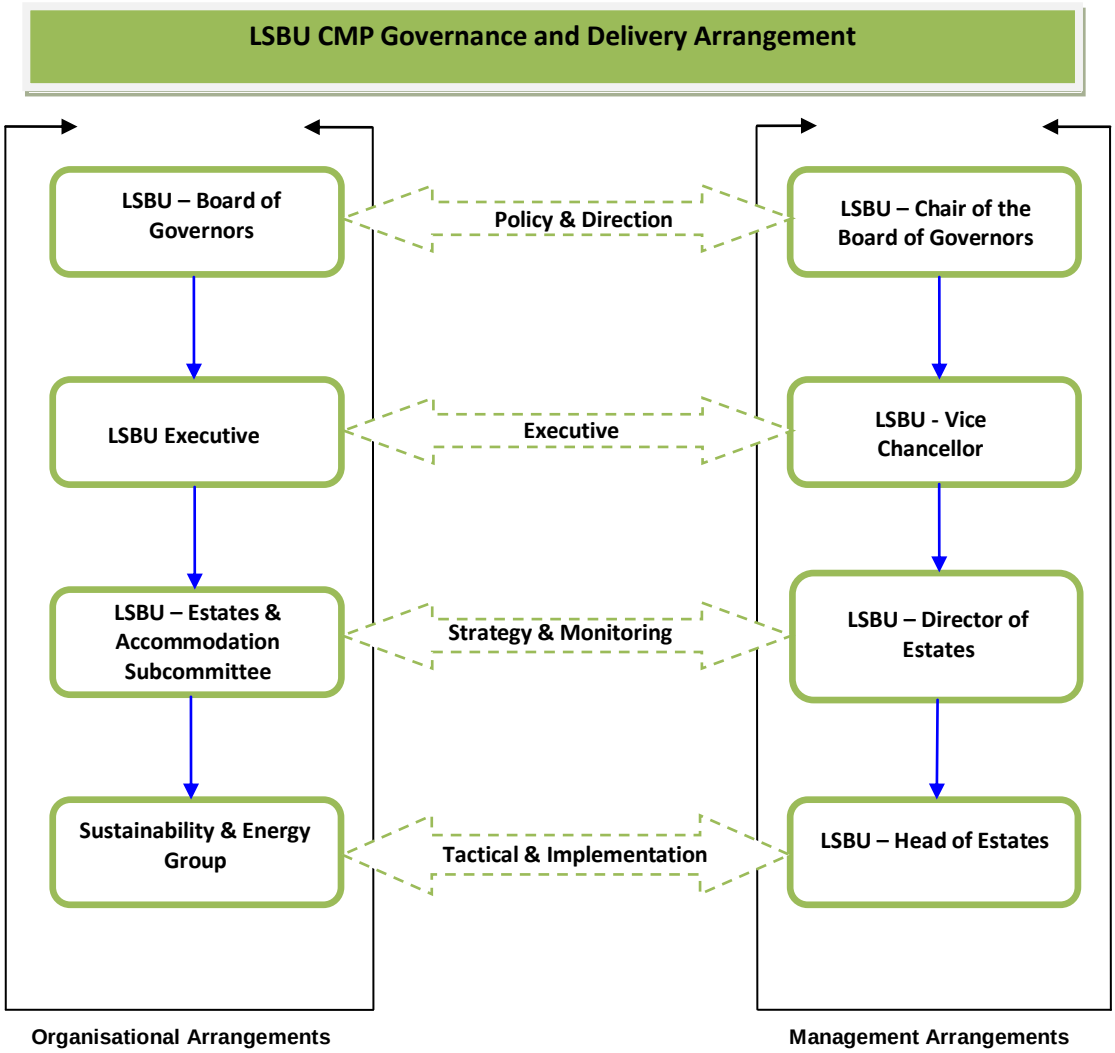
The installation of smart meters will also allow the Energy & Environment Manager to monitor the effects of new equipment installed within the University. This, coupled with a new space-charging

regime which the University is seeking to introduce, will encourage individual departments and faculties to make more efficient use of the space they occupy and be responsible for the energy they use.

8 Programme Management

8.1 Programme Board – strategic ownership and oversight

To ensure the effective and on-going ownership of the CMP, governance will be established through the existing University committee structure. As most of the key carbon abatement projects relate to energy use within buildings it is logical to report progress against the programme to the Sustainability & Energy Group and the Estates and Accommodation sub- committee.



8.2 Carbon management – project delivery team

8.2.1 Main roles and responsibilities

Professor Martin Earwicker, Vice Chancellor, will champion the carbon management programme and have ultimate responsibility for strategic direction and for agreeing budgets outside those already available to the EAF Directorate.

Project Sponsor: Stephen Wells, Director of Estates and Facilities, will oversee the delivery of the Carbon Management Programme and have strategic input into its development and review progress. Consequently, he will hold strategic responsibility for ensuring the integration of carbon abatement projects into the existing development and refurbishment programmes and be responsible for ensuring, in collaboration with the Director of Finance, that sufficient funds are identified and allocated to achieve the carbon management programme.

Project Leader: Anuj Saush, Energy and Environment Manager, will work closely with David Foreman, Senior Project Manager, to implement the carbon reduction projects and report on its progress to the project sponsor. Anuj will manage the technical aspects of the CMP and be responsible for data collection and reporting.

8.3 Annual progress review

Progress on the CMP will be reported quarterly to the Sustainability and Energy Group. A formal review of performance against the CMP will be undertaken annually and reported to the Estates and Accommodation sub-Committee, at the end of each academic year.

We believe that this will

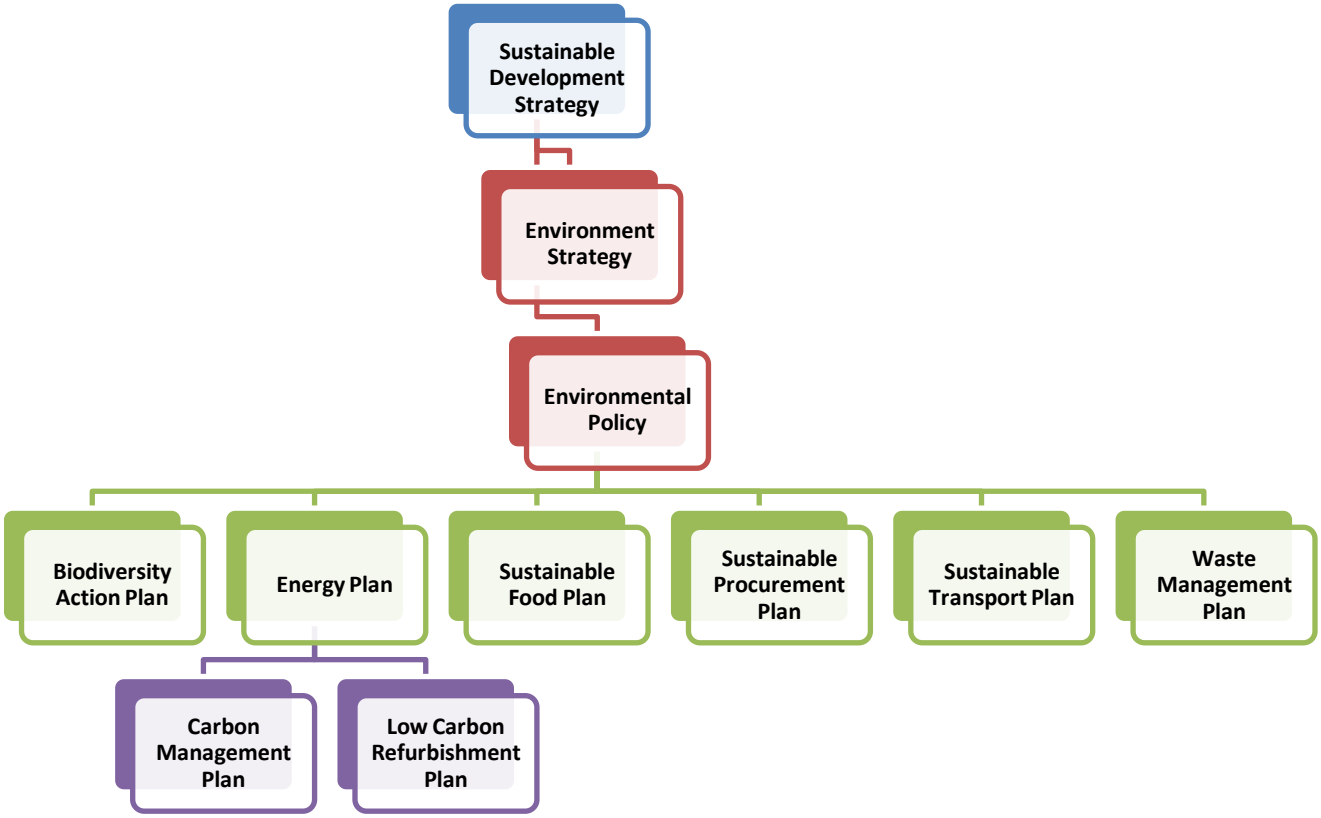
- ensure that carbon management is being implemented effectively
- enable management to be improved and optimised where appropriate
- provide data that can be used to update the emissions targets and Programme scheduling

An annual report featuring CMP targets, status of carbon reduction projects implemented and evaluation of the Programme status will be prepared. This report will include:

- CO_2e emissions for the previous academic year
- achievements from the past year
- recommendations and forward look for the following year; and
- targets and actions plans for the following year.

An annual review of the University's carbon footprint, using the same methodology as that used for the baseline data collection 2005/6, will be done in late summer of each year in time to contribute to the annual report.

Appendix 1: Sustainability Strategy/ Policy Structure



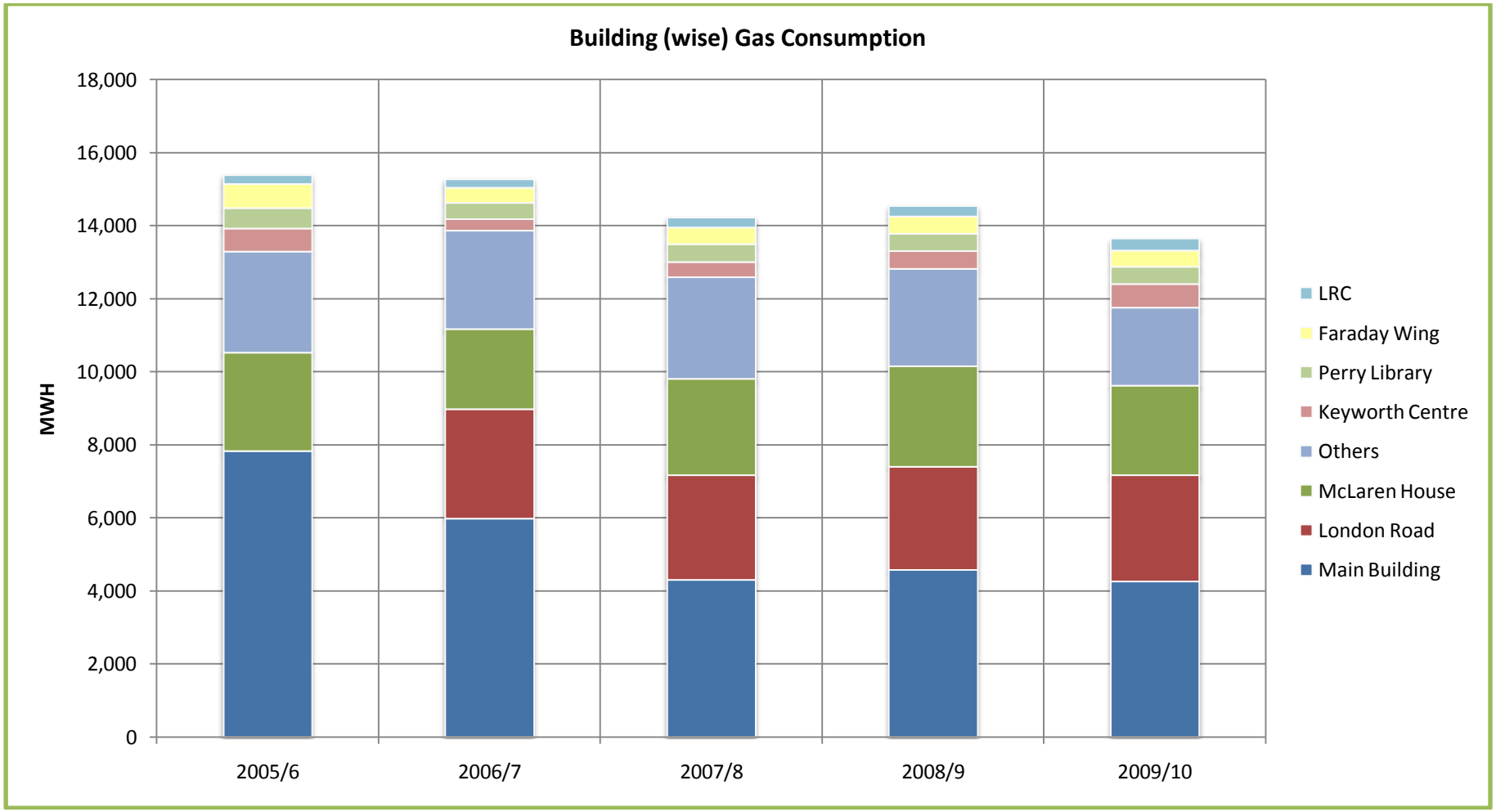
Appendix 2: Energy Management Matrix

This matrix shows an overall appreciation of energy management for the survey site. The shaded cells represent current achievement levels indicating key areas where improvement can be made.

Level	*Energy Policy*	*Organising*	*Training*	*Performance Measurement*	*Communication*	*Investment*
4	**Energy policy, Action Plan and regular review have active commitment of top management**	Fully integrated into management structure with clear accountability for energy consumption	Appropriate and comprehensive staff training tailored to identified needs, with evaluation	Comprehensive performance measurement against targets with effective management reporting	Extensive communication of energy issues within and outside of organisation	**Resources routinely committed to energy efficiency in support of business objectives**
3	Formal policy but no active commitment from top management	**Clear line management accountability for consumption and responsibility for improvement**	Energy training targeted at major users following training needs analysis	Weekly performance measurement for each process, unit, or building	**Regular staff briefings, performance reporting and energy promotion**	Same appraisal criteria used as for other cost reduction projects
2	Un-adopted Policy	**Some delegation of responsibility but line management and authority unclear**	**Ad hoc internal training for selected people as required**	**Monthly monitoring by fuel type**	**Some use of company communication mechanisms to promote energy efficiency**	Low or medium cost measures considered if short payback period
1	An unwritten set of guidelines	Informal, mostly focused on energy supply	**Technical staff occasionally attend specialist courses**	Invoice checking only	Ad-Hoc informal contacts used to promote energy efficiency	Only low or no cost measures taken
0	No explicit energy Policy	No delegation of responsibility for managing energy	No energy related staff training provided	No measurement of energy costs or consumptions	No communication or promotion of energy issues	No investment in improving energy efficiency

Appendix 3: Trend: Building (wise) Gas Consumption

- Main Building includes Borough Road, Tower Block, J Block, E Block and M Block.
- Others include Pocock House, Turney Road, Havering, Caxton House, Nursery, Erlang House and Technopark.



Appendix 4: Trend analysis - building (wise) Electricity Consumption