Annual Report 2010/11
Carbon Management

http://www.nottingham.ac.uk/about/values/environment/carbonmanagement.aspx

University of Nottingham

Annual Report 2010/11 Carbon Management

Contents

Executive Summary

This is the University's 2010/11 Carbon Management Plan (CMP) annual report. It is the first report and provides details on progress achieved and performance improvements made in reducing emissions of carbon dioxide (CO_2) against University targets.

The University's CMP was approved in December 2010 and can be found at www.nottingham.ac.uk/about/values/environment/carbonmanagement.aspx. The CMP includes targets for reductions in emissions of CO_2 from energy usage. It identifies the principal areas of energy use and investment programmes required to improve energy efficiency, reduce usage and generate energy from renewable energy sources.

In its first year the CMP developed 71 projects requiring a total investment of £1.59million. The overall benefits identified equate to 4,096 tonnes of CO_2 and £686k per annum. Scope 1 and 2 emissions of CO_2 have historically been seen to increase by an average of 2.25% per year, but this trend was reversed in 2010/11, with a reduction of 1,172 tonnes CO_2, a 1.7% reduction from 2009/10 totals. The investments have not shown full year effects, so the downward trend, coupled with the completion of further carbon saving projects, is expected to continue. However the commissioning of new buildings at University Park and Sutton Bonington will increase the overall Gross Internal Area by 17,676 m^2 with additional predicted increases in CO_2 emissions of 1,040 tonnes. There will be some offsetting of this due to the future demolition of the Archaeology and Classics building.

Emissions from both gas and electricity usage started to fall from the beginning of 2011. Electricity usage fell by 1.6%. Jubilee campus was the only main site to show an increase in electricity across the year – a rise of 4.4%. Fossil fuel consumption (primarily gas) fell by 1.1%, even though the weather was colder than the previous year. Jubilee campus gas usage increased by 7.7%, all other main sites' consumption fell. If all other things had remained equal, the effect of the weather would have resulted in a 0.4% increase in consumption.

The University has registered with the Environment Agency for the Carbon Reduction Commitment Energy Efficiency Scheme. Our carbon footprint report and first annual report were developed with internal audit and submitted in July 2011. The annual cost for our carbon footprint for the period April 2010 – March 2011, using emissions of 54,751 tonnes CO_2 and a price of £12/tonne CO_2, will be £657k. Costs will be incurred from 2012 onwards.

Planning applications were made for the construction of a wind farm at Grove Farm. This included details of environmental effects of the project and benefits of c. 7,000 tonnes CO_2 per annum. Decisions are expected late 2011.

A programme of building and high energy plant audits and strategic heating feasibility studies has commenced. The audits and studies will enable major investment in new and replacement high efficiency plant to be made. The programme findings and recommendations will be submitted to Environment Committee for approval.

1 Introduction

This is the University's first Carbon Management Plan (CMP) annual report 2010/11. It provides details on progress achieved and performance improvements made against targets.

The CMP was approved in December 2010, with target CO_2 reductions to be delivered against timescales. The first year's programme has invested £1,509k in projects across all areas of the CMP, with annual savings totalling £686k and 4,096 tonnes of CO_2.

The report provides an update on energy and carbon dioxide (CO_2) emissions arising from Scope 1 and 2 sources, CO_2 reduction projects approved and installed, CO_2 savings, financial performance and the programmes of work planned for the next 12 months.

The UK's Carbon Reduction Commitment energy efficiency scheme commenced in 2010. Details of the University's participation and reporting requirements are summarised in section 3 of this report.

The report includes information on engagement with staff and students to raise awareness of the CMP's objectives and provide knowledge to identify and implement energy saving initiatives.

2 Carbon Management Plan – objectives and targets

The CMP was approved by the University in December 2010, with the main areas of investment to be centred on:

1. improvements in energy efficiency of buildings, including insulation, heating & lighting
2. more efficient use of existing equipment including switching off when not in use
3. generation of energy from small/medium scale renewable energy systems
4. provision of information and training to staff and students to engage them with the objectives of the Plan

The programme includes a number of specific investment projects and more generic programmes to deliver CO_2 reductions but require further detailed design to ensure maximum value for money is obtained. These focus on the areas of energy saving and energy efficiency for Scope 1 (predominantly gas combustion in boilers) and Scope 2 (electricity use) emissions. CO_2 reductions from travel, procurement and waste (Scope 3) are not included and will be assessed separately as required by any future legislation and sector guidance.

The CMP provides a baseline of CO_2 emissions, sets emission reduction targets and maps out a new 5 year investment programme to be implemented to deliver environmental performance improvements and carbon & financial savings[1]. The CMP targets and objectives included in the University Plan 2010-15 are as follows:

	Baseline 2009/10	Objective 2014/15
Total energy consumption p.a.	198 GWh	168 GWh
Total CO_2 emissions p.a.	68,000 tonnes	54,000 tonnes

These represent reductions from the 2009/10 usage of 15% on energy and 20% on CO_2 emissions by 2014/15. The targets require average annual reductions in energy consumption of 6GWh and CO_2 emissions of 2,800 tonnes; these are fundamental departures from historic rises seen in energy usage. The CMP will be used as the blueprint to develop carbon baselines for our overseas campuses by 2012, a requirement of the University Plan, and subsequent carbon reduction strategies for all campuses for the period 2015-20.

[1] www.nottingham.ac.uk/about/documents/carbonmanagementplan2011.pdf

3 UK's Carbon Reduction Commitment Energy Efficiency scheme

The Carbon Reduction Commitment Energy Efficiency Scheme (CRC) is a mandatory carbon emissions reporting and pricing scheme to cover all organisations using more than 6,000MWh per year of electricity (equivalent to an annual electricity bill of about £500,000). The CRC came into force in April 2010 to significantly reduce UK carbon emissions in non-energy intensive sectors in the UK. The sectors targeted by the CRC generate over 10% of UK CO_2 emissions, around 55 $MtCO_2$, and the scheme aims to reduce emissions from these organisations by at least 4 million tonnes CO_2 per year by 2020. It comprises three elements:

1. Participants measure and report carbon emissions annually – the first annual report is due in July 2011.
2. Starting in 2012, participants buy allowances from Government each year to cover emissions in the previous year. Government confirmed changes about buying allowances:

   — money raised from the sale of allowances will be retained by Government rather than recycled back to participants.
   — the first sale of allowances to cover emissions in 2011/12 will be in 2012 rather than 2011.
   — the price of allowances was set at £12 per tonne of CO_2 in the 2011 Budget.

3. A publicly available CRC performance league table will show how participants are performing compared to others in the scheme. There will be no direct financial benefit under the CRC from an improved position in the league table. Organisations' league table positions each year will be determined by performance in three metrics:

   — **Early action metric:** 50% of score is based on % of electricity and gas supplies covered by voluntary automatic meter readings (AMR) in the year to 31 March 2011. The other half is based on the proportion of CRC emissions certified under the Carbon Trust Standard or an equivalent scheme.
   — **Absolute metric:** The percentage change in organisation's emissions, compared to the average of the previous five years (or number of years available until 2014/15).
   — **Growth metric:** the percentage change in emissions per unit turnover, compared to the average of the previous five years (or number of years available until 2014/15).

The weighting of these three metrics will change over time. In the first year, early action will count for 100% of league table scores. Over the first few years of the scheme, the early action metric will gradually fade in importance until the absolute and growth metrics receive 75% and 25% weightings respectively in 2014/15 and thereafter.

The University registered as a participant in the CRC in August 2010. There are three main differences in the requirements compared to the University's EMS reports:

— The CRC reporting period uses data from 1 April to 31 March
— CRC's definitions of building ownership result in the Medical School being excluded in the CRC carbon footprint
— Different emission factors, particularly of gas, are used by Defra to calculate CO_2 totals

The CRC Footprint report and first Annual report were submitted to the Environment Agency in July 2011. University emissions for the period April 2010 – March 2011 are given below.

Core supplies (this excludes core supplies of gas to an EU ETS installation and CCA facility and core supplies of electricity to a CCA facility)				
Fuel source	Actual supply	Estimated supply	Measurement unit	Calculated emissions (tonnes CO_2)
Core electricity not covered by a CCA	67,436,269	0	kWh	36,483
Core gas not covered by EU ETS or by a CCA	100,509,167	0	kWh	18,453

Electricity Generating Credits		
	kilowatt hours	Tonnes of CO_2
Electricity Generating Credits	343,332	185
Emissions for annual reporting year 2010/2011		
Total CRC Emissions (tonnes of CO_2):	54,751	

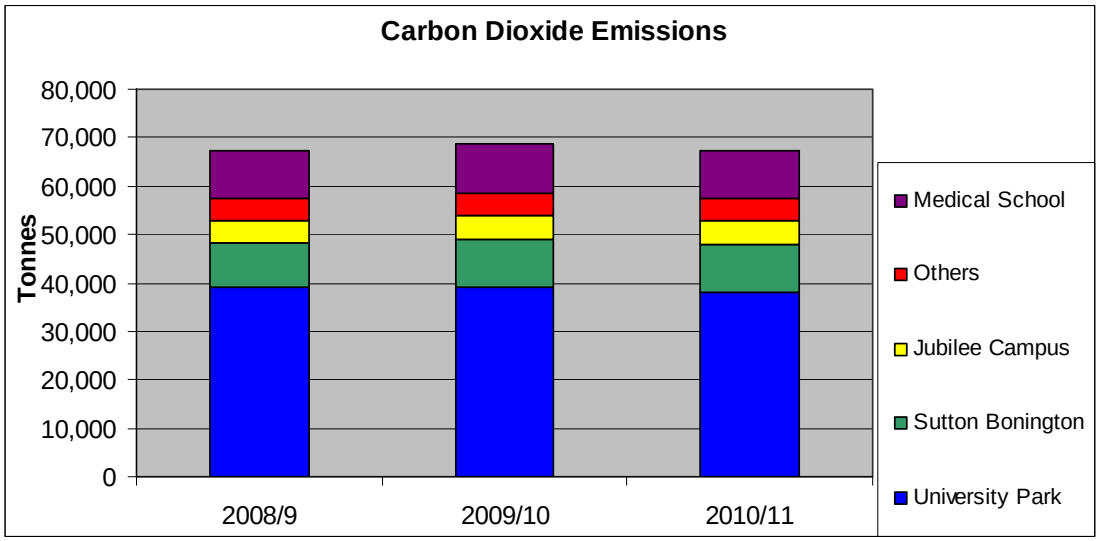
Under the scheme, certain energy management initiatives are credited and the University has claimed for installing new gas metering, with an effective coverage of 55%.

The annual cost to the University of CRC participation will be £657k, based on emissions of 54,751 tonnes of CO_2 priced at £12 per tonne and this will commence April 2012.

4 Performance achieved

4.1 Carbon dioxide emissions (Scope 1 and 2)

Details of the University's Scope 1 and 2 CO_2 emissions for the period August 2010 – July 2011 are summarised below. These are provided by energy source and also by campus and use emission factors issued by Hefce. 2010/11 emissions have fallen from 68,626 to 67,454 tonnes, a 1.7% reduction of 1,172 tonnes from 2009/10 totals. This contrasts with an increase in the previous 12 months of 1,458 tonnes. In line with the electricity and gas usage, emissions at most campuses started to fall since the start of 2011. Jubilee campus showed a 4.9% increase, a rise of 143 tonnes; part of this is likely to be from the completion of the Geospatial building.

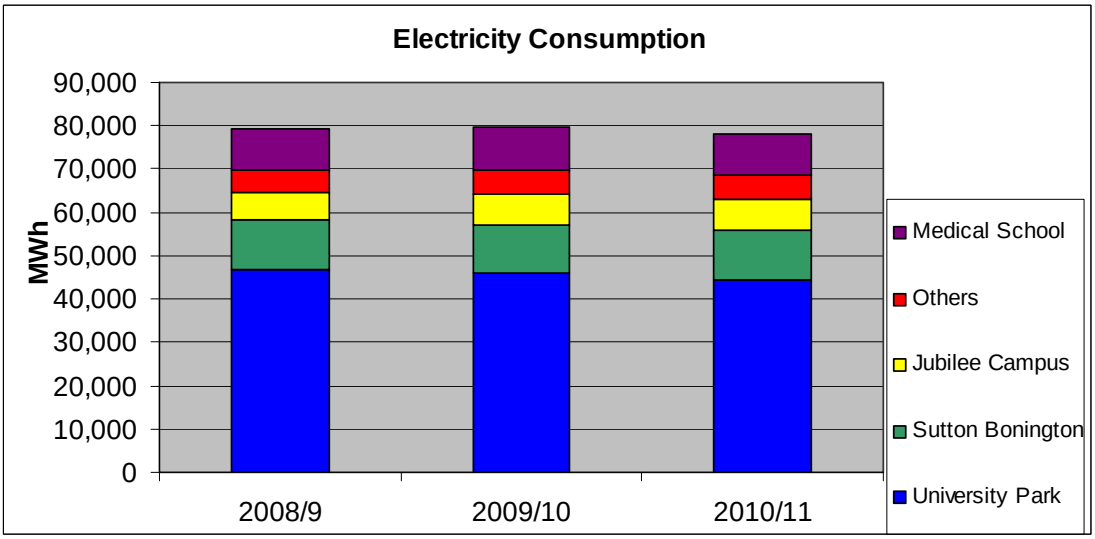


CO_2 Emission Factors	2008/9	2009/10	2010/11
Electricity kg/kWh	0.541	0.542	0.541
Gas kg/kWh	0.204	0.205	0.204

CO_2 Emissions	Tonnes 2008/9	Tonnes 2009/10	Tonnes 2010/11	Change '9/10 to'10/11
University Park	39,087	39,194	38,007	-3.0%
Sutton Bonington	9,231	9,854	9,804	-0.5%
Jubilee Campus	4,637	4,949	5,192	4.9%
Others	4,323	4,568	4,586	0.4%
Medical School	9,890	10,061	9,865	-1.9%
Total	67,168	68,626	67,454	-1.7%

4.2 Electricity

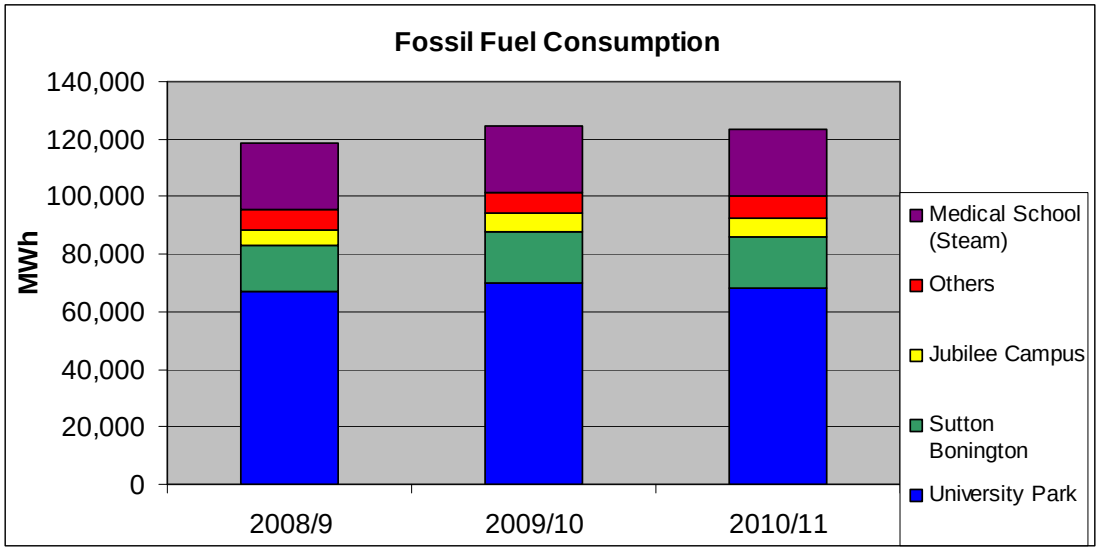
Electricity usage has shown an encouraging downward trend on most sites from the start of 2011. Around a third of the total savings are attributable to the CHP unit at King's Meadow Campus, which generated 400MWh between January and April 2011.



Electricity Consumption	MWh 2008/9	MWh 2009/10	MWh 2010/11	Change '9/10 to'10/11
University Park	46,862	45,867	44,487	-3.0%
Sutton Bonington	11,229	11,339	11,516	1.6%
Jubilee Campus	6,447	6,854	7,153	4.4%
Others	5,291	5,709	5,514	-3.4%
Medical School	9,571	9,758	9,587	-1.8%
Total	79,401	79,527	78,258	-1.6%

4.3 Fossil Fuels

Fossil fuel consumption (primarily gas) fell by 1.1%, even though the weather was colder than the previous year. If all other things had remained equal, the effect of the weather would have led us to expect a 0.4% increase in consumption. Note that we have now experienced three relatively cold years in succession, all colder than the 20 year average. The fossil fuel consumption figures have not been adjusted for weather.



Fossil Fuel Consumption	MWh	MWh	MWh	Change
	2008/9	2009/10	2010/11	'9/10 to'10/11
University Park	67,324	69,923	68,331	-2.3%
Sutton Bonington	15,473	18,089	17,516	-3.2%
Jubilee Campus	5,632	6,020	6,482	7.7%
Others	7,159	7,190	7,860	9.3%
Medical School (Steam)	23,100	23,279	22,933	-1.5%
Total	118,688	124,501	123,122	-1.1%

4.4 Targets

The targets set in the CMP require annual CO_2 emissions to fall from 67,998 tonnes to 54,398 tonnes by 2015, a reduction of 13,600 tonnes. The programme includes a reduction in emissions from the proposed Grove Farm wind farm of 6,200 tonnes per year. The remaining programmes would need to deliver savings of 7,400 tonnes – this would equate to providing savings on average of 1,480 tonnes each year throughout the five year period. The 1,172 tonnes of savings delivered were achieved from projects being implemented from late 2010 to the end of July 2011.

5 Carbon projects

5.1 CMP projects

A summary of carbon saving projects installed in 2010/11 is given below. Projects are grouped into the main CMP themes together with their financial and carbon performances.

Project theme	Project description	Investment cost £	Estimated annual savings	
			Financial £	CO_2 tonnes
Improvements to building fabric, glazing and insulation	Roof insulation installed in 15 buildings, including 7 halls of residence on University Park. This supplemented any existing insulation and installed where none previously existed to a total thickness of 300mm, in line with current building regulations. Cavity wall insulation installed in 8 halls of residence and 3 academic buildings.	579,866	132,932	916
Fume cupboards	Reduce air volume and face velocity supplied to fume cupboards by 25%. Install night setback control systems on heating to laboratories.	145,500	194,052	1,250
Lighting upgrades	Lighting controls (motion and daylight sensors) installed in 7 buildings.	130,788	17,244	96
Building energy management	Recommission and operate Combined Heat and Power unit at King's Meadow campus, boiler replacement	76,200	60,518	340
Transformer voltage reduction	Reduce overvoltages of main transformers.	0	36,383	204
Building Management Systems	Install new and refurbished heating control systems in 7 buildings.	123,928	29,217	236
Green IT	Implement system to automatically powerdown computers each evening, with a facility to remotely restart.	30,474	164,938	988
Renewable energy	Install photovoltaic (PV) panels to Derby and Lincoln halls of residence roofs.	356,769	42,750	57
	Install solar thermal (hot water) panels to Sherwood hall of residence roof.	65,836	8,390	9

5.2 Project summary

A full schedule of projects is included in appendix 1 and provides details of type, location, capital spend and calculated annual energy, financial and carbon savings.

The building insulation and control system projects have delivered significant carbon savings with short payback periods and will improve the working environments of staff and students. Fume cupboard efficiency gains include reduced electricity from lower fan power and reduced gas from space heating. Further savings can be achieved through operation of the fume cupboards; these include closing sashes and switching off when not in use and will be led by the lab managers and school Environmental Champions.

The CHP system at King's Meadow was brought back into operation and has proven to be reliable and effective in reducing emissions (280 tonnes CO_2) – its operation and maintenance has been carried out by an external contractor.

Lighting improvements were based on new controls to ensure lights switch on only when necessary. These are based on motion and, where appropriate, daylight sensors.

Free air cooling (FAC) has been installed in the King's Meadow data centre. This space and the installed air conditioning units are now under the control of the building management system (BMS). Currently the cold aisle set point is 22^{o}C. Before the FAC and BMS control were installed and configured the set point on the units was 18^{o}C, and the plan is to raise this slowly to 25^{o}C over the next two years.

Hot aisle containment has been installed at the King's Meadow data centre and initially this is showing about a 5% energy saving (estimated annual saving is over 55MWh, 30 tonnes CO_2).

Data Centre electrical metering to measure improvements was installed late summer 2011 and upgrades to the current air conditioning installation are planned for this session.

PowerMAN/WakeMyPC was launched across the University on 17 March 2011. PowerMAN, which reduces energy usage by hibernating inactive PCs at 10 pm, was activated across all staff PCs following a trial across IS and student PCs in computer rooms. At the same time as PowerMAN, the University also introduced the WakeMyPC service which allows staff to switch on their PCs remotely. Only 4% of PCs opted out of the service (including essential and experimental equipment) which demonstrates widespread support for the University's commitment to reducing the amount of energy we use.

PowerMAN has delivered savings of around 600 tonnes of CO_2 per year. Refinements planned for 2012 will further increase energy savings, and version 5.2 will be tested and implemented gradually over the next few months, allowing an earlier switch off time, with a snooze feature.

5.3 Renewable energy projects

Low and medium scale renewables are financially supported by UK legislation – the Feed in Tariffs (FITs) and Renewable Heat Incentive (RHI). These are new programmes that promote widespread uptake and provide income from generation to accredited technologies including photovoltaics (PV), wind, biomass, solar thermal and ground source heat pumps (GSHP). The University has installed a number of insitu projects as part of energy requirements to new buildings. In addition two large scale PV projects were installed on Derby and Lincoln halls of residence and one solar thermal project to provide domestic hot water preheating for Rutland and Sherwood halls – details are given below.

Renewable energy technology	Location	Size
PV	Derby Hall	66 kW_p
	Lincoln Hall	57 kW_p
Solar Thermal	Rutland & Sherwood Halls	60.21 m^2
GSHP	Mathematics	50 kW
GSHP	Humanities	146 kW
Biomass	Bioenergy, Sutton Bonington	120 kW

5.4 Grove Farm wind farm

The University has applied for planning permission to construct three wind turbines at Grove Farm, adjacent to the River Trent near Clifton Bridge. The turbines would be up to 125m high, with a hub height of approximately 80 m and supply electricity directly to the University Park campus. This would meet a third of the campus electricity needs and reduce our CO_2 emissions by c. 7,000 tonnes per year equating to 40% of the target reductions required by 2015.

The University first announced the scheme in October 2010. A public meeting was held in Beeston in November 2010, at which residents were able to direct questions to senior University staff. Councillors and community representatives were also able to quiz staff at a Nottingham City Council area committee meeting in Clifton. In March 2011, a coach visit was arranged for 50 interested residents from Beeston and Clifton to a wind farm at Lindhurst Farm in Rainworth, Nottinghamshire, so they could see modern turbines in action.

In April 2011, further public meetings and exhibitions were held in Clifton and Beeston so that residents could find out more about the proposal and raise concerns with members of University staff. The exhibitions included detailed maps and plans, artists' impressions of what the proposed turbines might look like in situ, a summary of progress to date and work to meet stringent requirements in terms of environmental impact, wildlife, noise and other considerations. Planning applications were made in July 2011 to both Nottingham City Council (2 wind turbines) and Broxtowe Borough Council (1 wind turbine), as the site crosses the boundary between the two authorities.

6 Future carbon investment programmes

6.1 Audits and feasibility studies

The CMP includes a schedule of buildings with high usage of electricity and gas, both in total quantity and per unit area. Energy audits have been carried out in the Plant Sciences, Boots Science, Swimming Pool and Sports buildings to identify opportunities to reduce energy use and provide investment cases. These are the first phase of an audit programme that will continue over the next few years.

Schedules of high energy usage plant are being drawn up to develop replacement programmes based on efficiency improvements, energy savings and financial payback. These include transformers, boilers and chillers.

A large scale PV installation at Sutton Bonington would act as a technology demonstration and help with the staff/student engagement programme. Due to the changes in FITs, this would be sized at less than 50kWp and installed before April 2012 to provide the best financial return on capital investment.

6.2 CHP

Two large scale strategic heating/CHP studies have commenced for Sutton Bonington and University Park. These are examining historic electricity and gas usage in buildings, and also the existing heating pipework and power cabling infrastructure. The Sutton Bonington study will be completed autumn 2011 and will provide options including:

- centralising or decentralising heating generation systems
- upgrading / extending existing heating mains' infrastructure
- CHP feasibility for heat and power generation
- use of renewable energy fuels for proportions of fuel supplies e.g. biomass pellets or chips

Investment costs of the main scenarios together with financial and carbon savings will be provided to allow the University to choose the preferred routes and detailed designs to be completed. Tenders for construction and plant replacement will be obtained for approval.

6.3 Investment areas for 2011/12

The initial projects identified from the first phase of audits and surveys will form part of the 2011/12 CMP overall programme. The programme is being developed to continue the focus on investment in the CMP's main areas and this will be based on:

- energy plant audit recommendations
- transformer performance improvements
- boiler replacements
- building fabric improvements
- lighting controls and LED demonstration projects
- heating controls and additional sensors
- renewable energy installations

The heating and energy strategies for Sutton Bonington and University Park will be developed to provide options for:

- more efficient use of energy
- reduced demand due to building fabric improvements
- use of renewable energy fuels to provide proportions of the fuel requirements

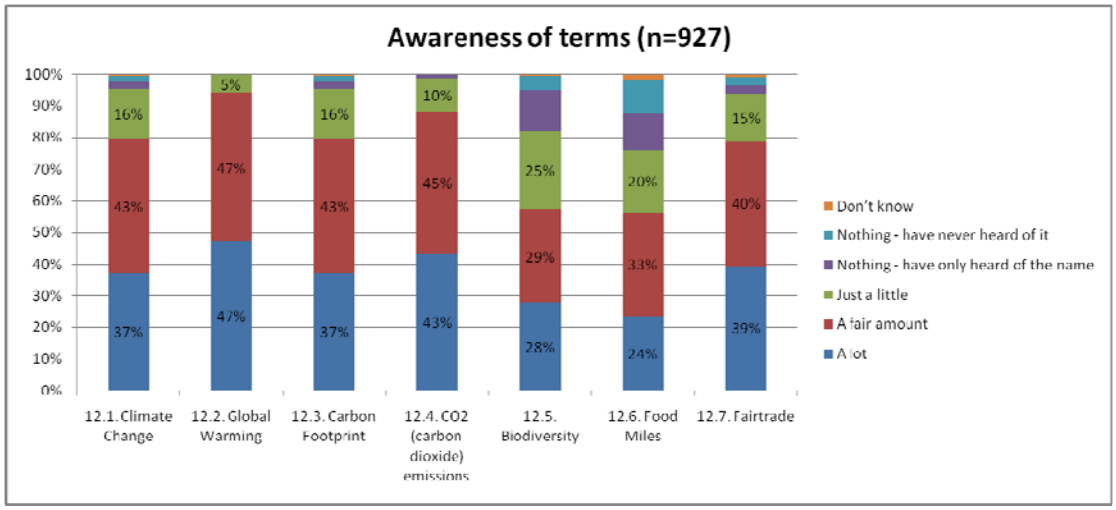
7 Staff and student engagement and awareness

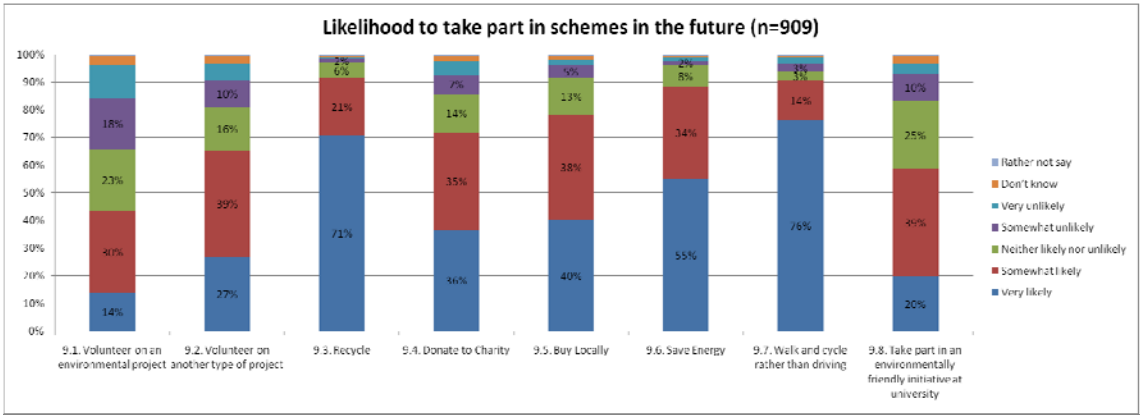
Key to achieving success in the CMP's objectives is to inform and engage staff and students in the programmes. A range of awareness activities have been carried out, such as Go Greener Week in March 2011 and participation in stalls fairs. In addition, seminars and presentations have been given to engage different sections of the University community including:

- Welcome event for new staff
- Sustaining Excellence conference
- School Managers' meeting
- Staff Environmental Champions Network
- School board and admin committees
- Hall JCR committees
- Freshers' Fair.

The University facilitated a National Union of Students survey on environmental issues for students in first semester. 932 students participated and results are summarised in the two graphs below and confirmed:

- a high awareness of terms and behaviours, especially in global warming and carbon related areas.
- intentions to continue / improve sustainable behaviours are high, with 89% stating they would take part in energy saving initiatives. Saving money, helping the environment and preventing waste were the 3 main reasons given.





The annual Halls environmental competition was based on electricity savings and waste recycled. Halls account for around 10% of total electricity usage and an overall decrease of 8% in electricity usage, representing 44 tonnes of CO_2, was achieved compared to the corresponding period in 2009/10.

The engagement programmes have resulted in improvements in our carbon management and are likely to show higher scores in national and international surveys and in University rankings. The University did not score any points in the 2010 People & Planet Green League or BitC's environmental index for carbon reductions, as historic trends showed year on year increases, but the reversal of this trend will improve our position. The University was placed second in the international Green Metric assessment carried out by the University of Indonesia. The ranking has been set based on the information provided by Universities around the world on commitment on 'going green' and sustainability development, such as space, energy efficiency, water usage, waste management, and transport system. Energy and climate change issues account for 28% of the total score.

8 Financial requirements

The University's projected additional capital investment in CMP is summarised below.

	Total capex plan	Capital spend 2010/11	Capital spend 2011/12	Capital spend 2012/13	Capital spend 2013/14	Capital spend 2014/15
Carbon Management Plan 2010/12	2.0	0.5	1.5			
Carbon Management Plan 2012/15	19.6		0.4	11.0	3.6	4.6
	21.6	0.5	1.9	11.0	3.6	4.6

CMP projects are assessed for financial and carbon performance and submitted for approval. Funding is provided from CMP capital, revenue expenditure and grant contributions.

8.1 Salix Finance

The University secured a £300k loan in 2007 from Salix Finance to invest in energy saving projects which provides an interest free loan to finance projects, with the University recycling payments back into the fund – these equate to calculated savings included in the project approvals. Recent projects have included lighting controls, BMS replacement and controls and roof insulation.

A successful application was made to Salix's ICT Consultancy Support initiative to provide 50% of a £1,000 audit of our data centre, with the University providing the matched funding. The audit was carried out March 2011 by Future Tech, who have extensive experience in auditing IT systems and providing recommendations for cost effective CO_2 reductions.

A successful application was made to Salix's SEELS fund. This provided an interest free loan, value £231k, repayable over 4 years, for the installation of cavity wall and roof insulation to university buildings.

9 New construction projects

The five new buildings – Sutton Bonington Bioenergy, Sutton Bonington Gateway, Mathematics, Humanities and Engineering & Science Learning Centre – will be completed in 2011 and the projected effects of CO_2 emissions from their building services, occupants and equipment are summarised below.

		Anticipated annual carbon dioxide emissions		
Building	Gross internal area	Gas - building services	Electricity - total	Carbon emissions
	m^2	tonnes CO_2 yr^{-1}	tonnes CO_2 yr^{-1}	CO_2 kg m^{-2}
Sutton Bonington Bioenergy	3,493	18.0	165.2	52
Sutton Bonington Gateway	3,253	31.6	332.9	112
Mathematics	3,518	16.4	85.6	29
Humanities	4,102	0.8	189.2	46
Engineering & Science Learning Centre	3,310		200	60
Totals	17,676	66.8	972.9	(avg) 56

Appendix 1 – Carbon Management Plan Projects 2010/11

Project	Location	Technology description	Investment cost (incl VAT)	Estimated Annual Savings			Payback period
				Financial	CO_2	Energy	
			£	£	tonnes	kWh	years
Improvements to building fabric and insulation							
Insulation phase 1							
Gleeds works	Lenton & Wortley Hall	Roof insulation	25,849	6,130	42	206,958	4.2
Wellwarm	Lincoln Hall	Roof insulation	27,726	6,478	45	218,718	4.3
	Biology/Estates	Roof insulation	20,710	10,849	75	366,297	1.9
Mark Group proposals	Sherwood	Roof Insulation	17,254	5,274	36	178,055	3.3
	Rutland	Roof Insulation	18,835	4,562	31	154,039	4.1
	Derby Hall (incl Matlock Hall)	Cavity wall insulation	4,997	1,788	12	60,377	2.8
	Derby Hall	Roof & pipe insulation	47,112	8,067	56	272,383	5.8
	Sherwood	Cavity wall insulation	18,637	8,057	55	272,031	2.3
	Rutland	Cavity wall insulation	14,930	2,235	15	75,472	6.7
Insulation phase 2							
Pitched roofs	Cavendish	Roof insulation	4,951	1,168	8	39,432	4.2
	Law and Social Sciences	Roof insulation	10,820	2,654	18	89,602	4.1
	Pharmacy	Roof insulation	10,427	7,366	51	248,711	1.4
	Psychology	Roof insulation	10,104	7,137	49	240,971	1.4
	Cripps	Roof insulation	16,138	8,780	60	296,459	1.8
	History	Roof insulation	3,278	3,497	24	118,059	0.9
	Paton House	Roof insulation	1,496	1,321	9	44,600	1.1
	Staff Club	Roof insulation	2,512	2,370	16	80,018	1.1
	Main Building SB	Roof insulation	5,298	3,497	24	118,059	1.5
Insulation phase 3							
Cavity walls	Ancaster	Cavity wall insulation	11,220	3,614	25	122,018	3.1
	Cavendish	Cavity wall insulation	12,352	4,362	30	147,286	2.8
	Psychology	Cavity wall insulation	7,039	4,664	32	157,460	1.5
	Pharmacy	Cavity wall insulation	7,328	5,262	36	177,675	1.4
	Florence Boot Hall	Cavity wall insulation	5,507	1,044	7	35,242	5.3
	Cripps Hall	Cavity wall insulation	5,613	9,485	65	320,240	0.6
	Willoughby Hall	Cavity wall insulation	48,930	9,256	64	312,527	5.3
	History	Cavity wall insulation	1,474	315	2	10,639	4.7
Double Glazing							
	Maths & Physics	Window replacement	219,330	£3,702	25.5	125,000	59.2
Fume cupboards							
	University labs	Reduce face velocity	57,600	128,476	792	2,668,846	0.4
Control/refurb of fume cupboards, more stringent policy on use, to prevent all night running for chemical storage		Night setback	9900	65,576	459	2,337,219	0.2
		Chemical storage	78,000				

Lighting upgrades							
Hugh Stewart LED demo corridors Z block		Lighting	5,000	213	1	2,200	23.4
Corridor lighting controls	Coates	Lighting	8,197	2,711	15	27,938	
Portland LED corridors demo		Lighting	12,000	679	4	7,000	17.7
LASS corridors		Lighting	9,800	1,455	8	15,000	6.7
Florence Boot bathroom & toilet PIRs		Lighting	5,604	781	4	8,048	7.2
Clive Grainger corridors		Lighting	8,014	2,598	14	26,781	3.1
LED lighting - Demonstration	Trent VC corridor	Lighting	10,974	534	3	5,500	20.6
Corridor lighting controls	Chemistry	Lighting	7,592	2,479	14	25,550	3.1
Corridor lighting controls	Physics	Lighting	14,114	3,175	18	32,721	4.4
Great Hall lighting upgrade	Great Hall	Lighting	49,493	2,620	15	27,000	18.9
Building energy/carbon management							
Voltage optimisation - Powerperfector	ITRC	Voltage Optimisation	25,200	2,084	22	39,614	12.1
Recommission CHP unit at KMC	KMC	CHP	15,000	40,000	280	-1,700,000	0.4
Transformer voltage reduction	Various	Tap downs Chemistry					
Secondary voltages > 250 volts	SS - UP1 - TF1	Tap downs Tower					
	SS - UP1 - TF2	Tap downs Cripps North					
	SS - UP7	Tap downs Cripps South					
	SS - UP8 - TF1	Tap downs MathsPhys1					
	SS - UP8 - TF2	Tap downs MathsPhys2					
	SS - UP9 - TF2	Tap downs Derby Hall					
	SS - UP10	Tap downs Cavendish Hall					
	SS - UP10	Tap downs Willoughby Hall					
	SS - UP10	Tap downs Florence Boot Hall		36,383	204	375,000	
Boiler replacement programme							
	Derby Hall	High efficiency gas boilers	36,000	18,434	39	190,000	2
Heating energy strategy							
CHP / Energy strategy	University Park	Study					
CHP / Energy strategy	Sutton Bonington	Study					
Building energy audits							
Detailed carbon/energy audits of buildings with highest carbon usage per m2. Audits include plant, pumps drives and well as more visible elements	Plant Sciences	Audit					
	Boots Science	Audit					
	Swimming Pool - UP	Audit - to include CHP option					
	Grove Farm	Audit					
BMS & metering							
	Production Engineering	Production Engineering Controls Salix	29,578	6,250	51	250,000	4.7
	Sutton Bonington Library	Sutton Bonington Library Controls Salix	11,297	2,500	20	100,000	4.5
	MRI	MRI BMS Salix	22,925	5,829	46	157,250	3.9
	Law & Soc, Sci Lecture Theatre	Law & Soc, Sci Lecture Theatre BMS Salix	5,164	1,391	4	21,900	3.7

	Sports Centre UP	Sports Centre UP BMS Salix	8,672	1,890	25	84,000	4.6
	Staff Club BMS (Hemsley)	Staff Club BMS (Hemsley) BMS Salix	16,290	3,578	32	159,000	4.6
	Hugh Stewart House	Hugh Stewart House Controls	8,000	375	5	25,000	21.3
Additional sensors	2No Halls of Residence (10No more to complete 2011/12)	BMS	22,002	7,404	51	250,000	3
Green IT							
Powerman (Phase 1)	Student Computer Room	Green IT	30,474	57,137	388	714,209	0.5
Powerman (Phase 2)	General Deployment	Green IT		107,801	600	1,111,111	N/a
Renewable energy							
Mark Group projects	Sherwood Hall, Rutland Hall	Renewable energy: solar thermal	65,836	8,390	9	44,160	7.8
	Derby Hall	Renewable energy: large scale PV	195,885	23,127	31	57,243	8.5
	Lincoln Hall	Renewable energy: large scale PV	160,884	19,623	26	48,569	8.2
Sub totals - CO2 savings			**1,509,361**	**686,424**	**4,096**	**11,599,189**	**2.2**

The University of Nottingham

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