

Carbon Management and Implementation Plan

1. Background

Energy security and the increasing concentration of greenhouse gases which contribute to climate change are one of the biggest challenges facing us today.

The UK Climate Change Act (2008) sets legally binding targets to reduce greenhouse gas emissions by at least 80% by 2050 and at least 34% by 2020 from 1990 levels. In order to meet its international obligations on climate change the United Kingdom Government has sought to ensure that universities play their part in this and set a carbon target to deliver a 43% reduction in carbon emissions on 2005 levels across the sector by 2020. This target is being implemented through the Higher Education Funding Council for England (HEFCE) and compliance with the target has been linked to the funding grant under the Capital Investment Framework (CIF2). It was announced on 14 March 2011 that £11M of capital funding is available to the College if it meets the requirements of CIF2 of which delivering carbon reductions through a carbon management and implementation plan represents a significant milestone. HEFCE is requiring all universities to set their own targets up to 2020 for reducing scope 1 & 2 emissions¹ based on their own circumstances and to agree carbon management plans as to how they will achieve this². This must be submitted as part of CIF2 requirements by 31 March 2011.

The College is also legally required to reduce its carbon emissions by the Carbon Reduction Commitment Energy Efficiency Scheme³ (CRC EES) and the EU Energy Performance of Buildings Directive⁴ as well as through taxation e.g. landfill tax associated with CRC EES and the Climate Change Levy. Other issues include corporate and social responsibility, reputation and image as well as the escalating costs of energy and the security of supply.

It should be noted that reducing carbon emissions equates to reducing energy consumption. This report considers the phasing of work on the basis of interventions that can be implemented that will achieve carbon reduction and reduce the College's energy costs in the most cost effective manner on an invest to save basis. Energy costs are projected to rise significantly during the life of this Plan⁵ and therefore the cost savings may manifest themselves by limiting operational cost increases as opposed to delivering reductions in revenue expenditure (see also Section 4 and Figure 5).

It is the aim of the Estates Directorate to ensure that the College is regarded as a centre of excellence in carbon management. In addition to achieving full statutory compliance it aims to improve the College's energy efficiency and use of resources by integrating sustainability with corporate strategies, policies and operational procedures. By successfully implementing all of the Phase 1 interventions, the College will achieve the 2020 target by 2015. This will ensure that the College is ahead of the requirements set by HEFCE and will put it in a fantastic position to achieve further carbon and cost savings. The Plan seeks to embed good practice within the organisation by encouraging and supporting all sectors of the College to take ownership and responsibility for projects and initiatives to reduce carbon emissions. It will also contribute to improved results in the People & Planet Green League survey and student surveys.

¹ Refer to Section 2 for an explanation of scope emissions.

² HEFCE (2010) *Carbon Reduction Target and Strategy for HE in England* http://www.hefce.ac.uk/pubs/hefce/2010/10_01/

³ For further details: http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/crc/crc.aspx

⁴ For further details: <http://www.diag.org.uk/>

⁵ The Energy Consortium is projecting a 15% rise in electricity costs and a 50% rise in gas costs at the time contracts are due to be renewed in July 2012.

This report has been prepared by the Director of Estates who is responsible for the implementation of the Plan.

2. Introduction

In order to meet the sector target and lead by example, the College engaged Ove Arup & Partners Ltd ('Arup') in 2010 to assist in the preparation of a Carbon Management Plan for both residential and non-residential buildings. The Plan details scope 1 and 2 emissions (refer to Table 1 below for inclusions) and sets a carbon reduction target of 34% on a 2005/6 baseline by 2020.

	HEFCE Requirement	Status
Scope 1 (Building fuels)	Required	Gas – Included
Scope 1 (Transport fuels)	Required	Negligible usage (0.01% of Estate emissions)
Scope 2 (electricity)	Required	Included
Scope 3 (water, waste, procurement, land use, business travel and commuting)	Optional	Excluded To be included from 2011

Table 1: Scope of Emissions Baseline

The draft Carbon Management Plan was presented to the Estates and Services Committee at its meeting on 23 November 2010 where it was requested that the next phase of work was commissioned to produce an implementation plan for carbon reduction.

This report forms the College Carbon Management and Implementation Plan (the "Plan"), and has been developed from the study of the College Estate prepared by Arup, dated March 2011⁶. The Arup study sets out the proposed measures to reduce carbon, the anticipated costs of implementation and the predicted cost savings which this Plan summarises. The Plan will be updated annually with the 2011-12 update broadened to include baseline and target reductions for scope 3 emissions (water, waste, commuting and air travel) which will put the College ahead of the HEFCE requirement for "...the measurement of a baseline of carbon emission from procurement by December 2012 and setting target(s) for scope 3 emissions by December 2013"⁷

The College Strategic Plan 2010-2015 (CSP) requires that 30% of the overall carbon reduction target should be delivered by 2015. The Plan has identified that this would place the Institution at risk and is therefore proposing that the College should target completing the Phase 1 works by 2015 which will deliver up to 35% carbon reduction. If achieved this will firstly ensure that the financial benefits of reducing energy consumption are delivered to the College at the earliest opportunity and secondly remove a significant amount of risk of not meeting the HEFCE targets by 2020. The risk arises due to the range of outcomes that can be achieved through the implementation of measures, which will be referred to in section 3.

⁶ A copy of the Arup study is available on request from the Director of Estates.

⁷ "Carbon Reduction Target and Strategy for Higher Education in England", HEFCE January 2010.

3. Baseline, Target and Scope

Through this Plan the College commits to a target of reducing scope 1 and 2 carbon emissions by **34% against the 2005/6 baseline** in line with the HEFCE sector target for HEIs. The baseline was established by analysing the College's consumption data for electricity and gas. Carbon dioxide is considered to be the most important greenhouse gas produced by humans, primarily through the combustion of fossil fuels. Carbon dioxide is expressed in tonnes of carbon (tCO₂). To put it into perspective, approximately 1850kWh of electricity use in the UK creates one tonne of CO₂ which is equivalent to:

- 10 x 60 watt light bulbs that are on for 3,000 hours, or 125 days,
- a medium sized coffee machine in a café running for a year; or
- a standard sized domestic electric oven running for an hour a day each year⁸

The College's scope 1 and 2 emissions for 2005/06 totalled **25,255tCO₂**. This cost the College approximately £1.88M⁹. By 2008/09 the College's emissions had risen slightly to 25,714tCO₂ at a significantly elevated cost of approximately £4.72M¹⁰. This clearly demonstrates the impact of rising tariffs on the College and supports the objectives of the Plan to reduce carbon emissions and limit its exposure to further increases in utility costs.

In order to meet the carbon reduction target of 34% as identified above, the College must **cap its carbon emissions at 16,009tCO₂/year by 2020** as outlined in Table 2.

	2005/6 Baseline Emissions	2008/9 Emissions	2012/13 Emissions Business as Usual Scenario (i.e. no interventions as outlined in the Plan)	2020 Target Emissions
Total (tCO₂/yr)	24,255	25,714	27,000	16,009
% change from 2005/6		+6%	+11%	-34%
% change from 2012/13			+5%	-41%

Table 2: Carbon Emissions Baseline and Target

As demonstrated above, 2012/13 is considered to be the peak year for carbon emissions (as a result of expansion of the Estate of approximately 5% or 18,043 m²). The reduction in carbon emissions required by 2020 from this anticipated peak (approximately 11,000 tCO₂) is equivalent to the energy used at present by the following buildings combined: Francis Bancroft, Joseph Priestley, Blizzard Institute, Wolfson Institute, John Vane Science Centre and the Queens Building.

⁸ Retrieved from <http://www.energiseconsulting.com/component/content/article/56-general/87-onetonne> on 17 March 2011.

⁹ Figure retrieved from the 2005/06 EMS Return which was derived from utility bills.

¹⁰ Figures retrieved from the 2008/09 EMS Return which was derived from utility bills.

In addition to the expansion of the Estate, the College has forecast student numbers to grow by an average of 1.7% per annum to 2015 (equivalent to approximately 17,900 FTE students). It is prudent to assume that this trend will continue until 2020 (Figure 1).

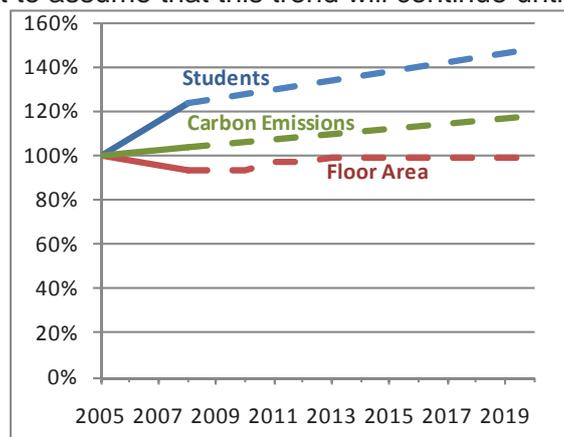


Figure 1 - Growth Predictions to 2020

Although the carbon reduction targets relate to absolute carbon emissions the per capita carbon emissions indicate relative levels of efficiency in the use of the Estate. In this case the per capita carbon, emissions have fallen significantly since 2005/06 due to the increases in student numbers which have largely been accommodated within the existing College buildings (see Table 3). There does need to be recognition that the CSP is promoting expansion of the College in order to deliver the strategic aims relating to creation and dissemination of knowledge.

	2005/06 adjusted	2008/09	
Carbon Emissions Per Head	1850	1580	kgCO ₂ per staff and student FTE
Carbon Emissions Per £ Income	0.127	0.097	kgCO ₂ per £ of income

Table 3: Carbon Emissions per Head and per £ of Income

The Plan takes into account predicted changes to baseline carbon emissions to 2020 resulting from:

- increases in students (based on forecast growth of between 1800-2200 FTE students per annum);
- increases in the size of the estate (forecast to grow approximately 18,043m² to 2020); and
- reductions in carbon emissions from UK electricity generation resulting from future changes to the generating mix¹¹ which applies to all HEIs equally and is out of the control of the College

A rise in baseline carbon emissions of 18% by 2020 is forecast as a result of increases in student numbers and the size of the Estate, as illustrated in Figure 1. This follows the trend from 2005 to 2008. When the predicted change in electricity carbon emission factors is accounted for, the result is a net fall in baseline emissions of 2% by 2020, as illustrated in Figure 2.

¹¹ The "Low Carbon Transition Plan", Government White Paper, 2008 forecasts a 22% reduction in carbon emissions associated with electricity generation by 2020.

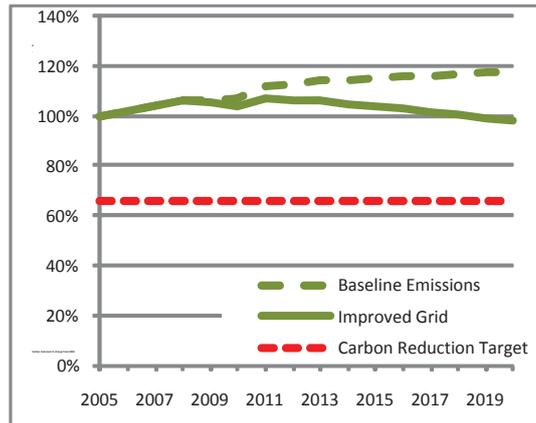


Figure 2: Carbon Baseline Adjusted for Electricity Grid Improvements

Overall, the main factors which will influence changes in baseline carbon emissions between now and 2020 are growth in student numbers, expansion of the built estate and changes in carbon conversion factors (which are used to calculate the carbon emissions from the actual consumption).

There are no published forecasts for future changes in carbon emission factors, however, the Low Carbon Transition Plan¹² targets a reduction in carbon emissions from electricity consumption of 22% by 2020 from 2008 levels through the increased use alternative energy sources and from improvements in the grid to prevent transmission losses.

4. Implementation Plan

This Plan and the Long Term Maintenance Plan (LTMP) will be ‘married’ to ensure that the objectives of this Plan are met. It is expected that many of the upgrades required by this Plan will be addressed within the LTMP and that these will be undertaken as a part of the normal cycle of replacement and refurbishment. There is no intention to replace plant that has recently been procured unless it can be effectively demonstrated that this will yield a benefit in both cost and carbon savings. Both plans will be developed together to provide consistent outcomes for the College, with the LTMP being guided by the recently completed NIFES Consulting Group surveys of the condition of the fabric and infrastructure of all buildings on the Estate (completed 7 March 2011).

The Estate consists of 92 buildings across 3 main campuses and several satellite sites. The buildings have been analysed in terms of their carbon performance and their key characteristics with two main aims:

- to establish the highest carbon emitter (or energy users) – these will be the priority buildings for the Plan; and
- to categorise these buildings in terms of their primary function and their age.

Of the 92 buildings, the 33 largest emitters account for 95% of the emissions from the Estate. It is proposed to target these in Phase 1 of the Plan and they have been categorised into Priority Groups 1, 2 and 3 as illustrated in Figure 3.

¹² Department of Environment and Climate Change:
http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/lc_trans_plan/lc_trans_plan.aspx,(2009)

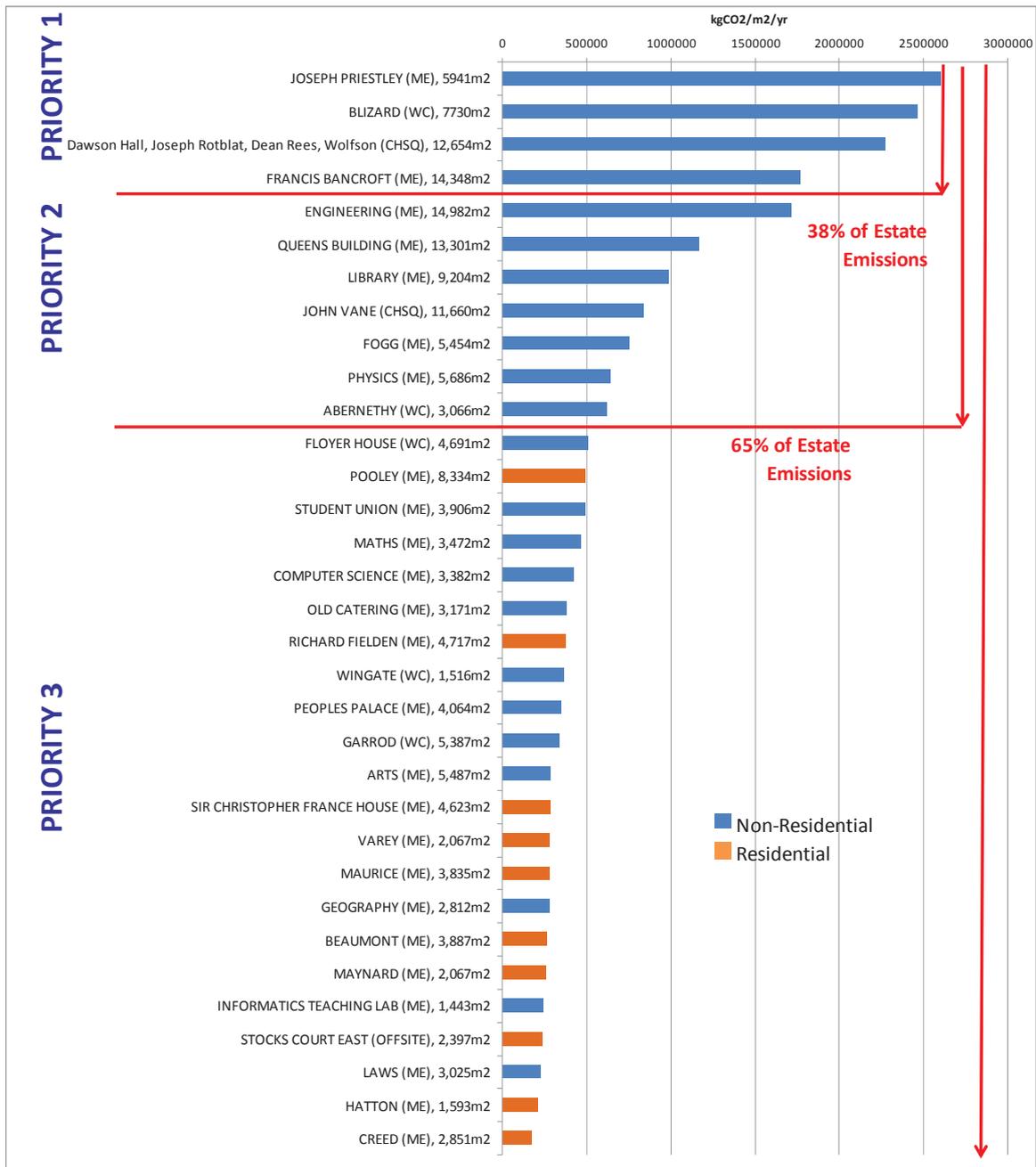


Figure 3: Relative Carbon Performance of 33 Largest Emitting Buildings

In order to determine the measures and costs for reducing carbon emissions across the Estate a representative sample of residential and non-residential buildings were assessed including:

- Joseph Priestly
- Francis Bancroft
- John Vane Science Centre
- Mile End Library
- Joseph Rotblat
- Queens
- Richard Fielden House
- Maynard House
- Dawson Hall

The detailed results of the assessment of these buildings is contained in the study prepared by Arup (available on request from the Director of Estates).

By taking account of the above and incorporating the objectives and key actions of the ICT Strategy and Estates Strategy which relate to energy efficiency and thus carbon reduction, the Plan to 2020 has been divided into two phases:

- **Phase 1: 2011-2015**

- Implementation of ICT Strategy which includes carbon reduction actions as a result of the CM&IP (expenditure required has not been included in overall expenditure figures as it is considered that the major improvements within the new ICT Strategy will incorporate measures that would be undertaken to reduce carbon emissions from ICT. Based on previous experience Arup have advised that the College can expect to easily achieve a saving of approximately 8% of total carbon emissions).
- Major refurbishments to Maths, Physics and Engineering buildings.
- Implementation of desirable cost-effective interventions (see below for details of proposed interventions) for all priority 1, 2 and 3 buildings. This includes both enabling (i.e. behavioural change) and systems interventions.
- Implementation of identified Combined Heat Power (CHP) opportunity at Charterhouse Square and District Energy/CHP opportunity at Mile End (initial feasibility undertaken).

- **Phase 2: 2015-2020**

- Completion of Phase 1 interventions if it was not possible to complete all within the timeframe (e.g. due to insufficient funding it is not possible to completely refurbish and implement carbon reduction measures in Engineering)
- Implementation of additional interventions as required based on the outcome of Phase 1.
- Any other corrective action required in due course to provide additional savings and efficiencies. This will be influenced by the savings achieved by the Phase 1 and 2 interventions.

A summary of the implementation plan for Phase 1 projects is contained in Appendix 1. Details of the carbon reduction projects (including dates for implementation, expenditure required, cost savings and carbon savings) are detailed within the study prepared by Arup. An overall picture of the costs, dates, expenditure, savings and timetable for payback period is contained in Section 5 of this report.

The approach to achieving the carbon reduction target is to identify and implement carbon reduction projects that maximise both the direct (financial) and indirect benefits, whilst minimising the capital and operational costs. In order to ensure that the outcomes of the Plan are optimised, the following process is proposed:

1. Identify and maximise opportunities for carbon reduction through business-as-usual works (e.g. lifecycle plant replacement, refurbishments and construction of new facilities).
2. Identify a broad range of specific carbon reduction projects across ICT, buildings and infrastructure.
3. Assess these for cost and benefits. Where relevant, include an assessment of indirect benefits.
4. Implement the identified measures in order of the best value derived through savings.
5. Evaluate the benefits delivered by the implemented projects.
6. Review and reassess the Plan on an annual basis.

A detailed schedule of all proposed carbon reduction projects with estimates of costs and benefits, along with a detailed programme for Phase 1, is provided in the study prepared by Arup.

Implementation measures are broken down into enabling interventions and system interventions. Enabling interventions are required to ensure that systems interventions are successfully implemented and managed and in some instances can provide significant carbon savings. They are essentially the bedrock on which all other interventions follow and are contained within 'Building Upgrade' projects. The enabling interventions that have been identified include:

- **Management and information** – establishing data sets for each building (i.e. main operating zones, operating hours and requirements, key plant etc) and reviewing building operation to identify operational improvements that can be made to reduce carbon.
- **Sub-metering and automatic metering and targeting (AMT)** – installation of end use sub-metering on electricity and gas distribution, central monitoring and targeting software to automatically collate meter readings and deliver in a useable format via a web interface which allows for management review and corrective action.
- **Building Management System (BMS)** – review and expansion of the existing system including better controls integration and all to report back to a central point in the Maintenance Office.
- **Feasibility studies** - undertaken for each building in order of priority to examine the operation and control of all building systems and set a detailed upgrade strategy. Detailed costs and benefits will be identified at this stage for each intervention and interventions will be staged based on their cost-benefit characteristics. The feasibility studies will also identify building-specific risks and will provide a mitigation strategy for the identified risks. Implementation of the recommendations of the studies will either be via further specific interventions (with their own costs and benefits) or through changes in on-going maintenance (e.g. minor changes to time schedules, set-points etc). It is assumed that this would be achieved with no change to business-as-usual costs of maintenance.
- **Behavioural change** - building-specific strategy to engage with occupants to both feed into building upgrade strategies and educate individuals on how they can influence energy consumption. A communications and engagement strategy will be developed and departmental and student champions sought to embed the need for energy saving to become part of the routine operation of the Estate.

There are a variety of systems interventions (i.e. replacement/optimisation of plant) that will be installed across the buildings to reduce carbon emissions across the Estate. These include, but are not limited to, the following (ranked in order of magnitude and importance):

- Optimisation of all heating, cooling and ventilation systems and plant which will include improvements to ventilation systems including high efficiency air filters, ventilation fans, air handling units (AHUs) and rationalisation of ventilation zoning and variable flow ventilation (VFV).
- Establishment of site-wide controls.
- Installation of automatic lighting control (e.g. passive infrared (PIR)/Daylight) and the replacement of light fittings.

- Improvements to cooling including higher efficiency direct expansion (local air-conditioning unit)/variable refrigerant volume (multiple local air-conditioning units on a single circuit), local control interface to BMS, high efficiency chillers, pumps and variable flow chilled water system.
- Improvements to domestic hot water including low flow showers and taps, direct gas fired water heaters and installing localised electric hot water heaters.
- Equipment e.g. smart socket outlets which allow automatic control and monitoring of peripherals. Assumed savings are derived from automatic switch-off of equipment that would otherwise continue in standby mode when not in use/out of hours.
- Improvements to thermal efficiency through glazing replacement, insulation and draught proofing (walls and roof), external door lobbies, high efficiency boilers, variable flow low temperature hot water (LTHW) system (i.e. conventional wet radiator heating system), thermostatic radiator valves on radiator heating, heating/cooling circulation pumps.
- Investigating and implementing opportunities for renewable energy sources e.g. arrays of photovoltaic panels mounted on roofs, geothermal.

5. Finance

To implement this Plan the College needs to allocate a capital investment of approximately £12.94M as detailed in Table 4. The total investment is divided between Phase 1 and Phase 2 projects totalling £7.82M and £5.12M respectively.

It is important to recognise that the costs identified are, in some instances, 'top-ups' to projects (additional capital allocations i.e. Maths, Physics and Engineering) to deliver carbon reduction and some are stand alone projects. A contingency (as a percentage of the overall cost for each project) has also been included as it is difficult to predict future prices.

The total investment is projected to yield approximately £997K worth of savings per annum by 2020. It is important to emphasise, however, that this saving will be absorbed into rising utility costs. It is proposed that any savings realised out of the energy budget be invested in additional carbon reduction projects and programs which may not have been allocated funding. An investment appraisal for the programme has been undertaken and is contained within Appendix 2. The appraisal supports the calculations contained within Table 4 and identifies the periods at which the investments in the carbon reduction projects will take place and the year at which the savings will be realised as a result of the successful completion of the projects. The figures in red indicate where the project has been effectively 'paid-off' and from this point on these are actually monetary savings which will be realised by the College.

The proposed threshold cost-benefit for projects to be deemed cost-effective is a net lifecycle cost-benefit of £50/tCO₂. The limit correlates to a simple payback period of 8-12 years. It has been shown elsewhere that substantial carbon reductions through infrastructure projects can be achieved at around this level of cost-benefit, so significant carbon savings should be achievable within this limit.

Estate Carbon Reduction Projects	Completion Date	Additional Capital Expenditure (£'000)/Year	Operational Cost Saving (£'000)/Year	Estimated Carbon Saving (% of Estate)	Simple Payback (Yrs)
Phase 1					
ICT Carbon Reductions	2011-14	Not currently available (see section 4).	Not currently available (see section 4).	8%	
Major Refurbishment¹³					
Maths	2014	£347	£33	1%	10
Engineering	2014	£1,490	£108	3%	14
Physics	2014	£587	£40	1%	15
Building Upgrades					
Pilot (Francis Bancroft)	2011		£23	1.10%	8
Enabling Systems		£190			
		£0			
Priority 1	2012-13		£187	7.30%	6
Enabling Systems		£835			
		£210			
Priority 2	2014		£61	1.60%	8
Enabling Systems		£367			
		£112			
Priority 3	2015		£111	3.20%	11
Enabling Systems		£1,060			
		£198			
Infrastructure					
CHSQ CHP	2011	£275	£46	1.20%	6
Mile End CHP	2013	£2,150	£196	7.70%	11
Phase 1 Total		£7,82	£805	35.10%¹⁵	8.9
Phase 2					
John Vane, Queens, Library	2016-17	£3,000	£105	1.30%	29
Fogg, Student Union, Old Catering	2018	£1,160	£48	0.40%	24
People's Palace, Geography, Laws	2019	£962	£39	0.40%	25
Phase 2 Total		£5,12	£192	2.10%	26
Plan Total		£12,940	£997	37.20%	14

Table 4: Summary of Estate Interventions, Costs and Impacts

¹³ Estimated extra-over costs for achieving target carbon reductions.

¹⁴ Behavioural change is allowed for in the enabling works.

¹⁵ Note that this is the reduction from 2008-9 consumption through carbon reduction measures. It does not take account of changes in baseline emissions.

The 'Additional Capital Expenditure' column above represents the additional costs that are required (above those required to upgrade plant as a part of the LTMP) to produce the carbon savings. The 'Operational Cost Savings' identified are savings derived from implementing both the interventions within the Plan and any savings generated from the lifecycle replacement of plant (from the LTMP). For example in the case of the Maths Building, the LTMP identifies a requirement for approximately £1.2M of expenditure on basic infrastructure replacement, the £347k in this Plan is therefore for specific carbon reduction measures in addition to the replacement of the base infrastructure. In the case of the CHP proposal for Charterhouse Square the figure includes the estimated total cost of delivering the project.

Figure 4 illustrates the predicted financial outcome in terms of cumulative net cash flow (undiscounted) to 2020. The target outcome shows a net cash flow over the period of £5.7M (equivalent to an NPV of £7.0M over the same period). The upper and lower bands show the range of possible outcomes based on the range of outcomes resulting from the implementation of the measures scheduled in Table 4.

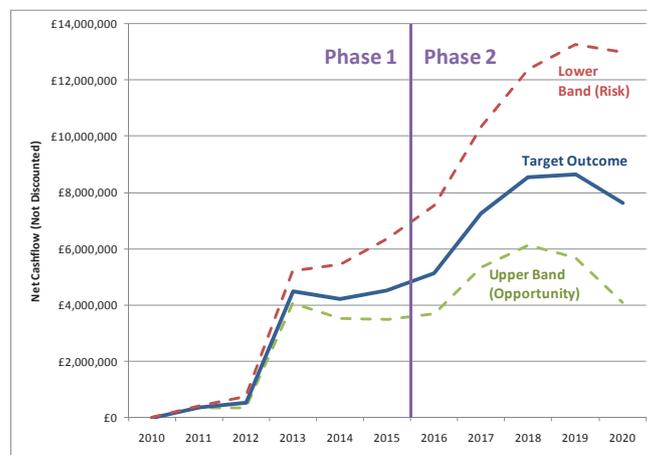


Figure 4: Cash flow (undiscounted) to 2020

Works proposed in Phase 2 are significantly less cost-effective than those in Phase 1. If outcomes exceed the target at Phase 1, then some or all of the expenditure on non-cost-effective interventions (for example, double glazing at Mile End library or loft insulation at Maynard House) in Phase 2 may not be necessary. If outcomes fall significantly short of target, then additional carbon reduction measures would need to be added to the Plan to achieve the target, adding significantly to the overall cost.

It is proposed that each project will have a simple business plan developed as a part of the governance process which will confirm costs, implementation measures and timeframes for completion.

The financial assessment supporting the implementation plan assumes zero real-terms increases in either utility or carbon (CRC) costs. Whilst real-terms reductions in energy and carbon prices over the plan period is a very unlikely scenario, real-terms price rises are considered likely over the period. Figure 5 illustrates potential trends in overall utility prices to 2020, assuming a constant 2% RPI, and either zero or 2% net inflation (above RPI) for utility costs (including CRC). By 2020 carbon reduction measures are projected to save £1.21M in annual operating costs, rising to £1.45M if a 2% annual net rise in utility costs is assumed.

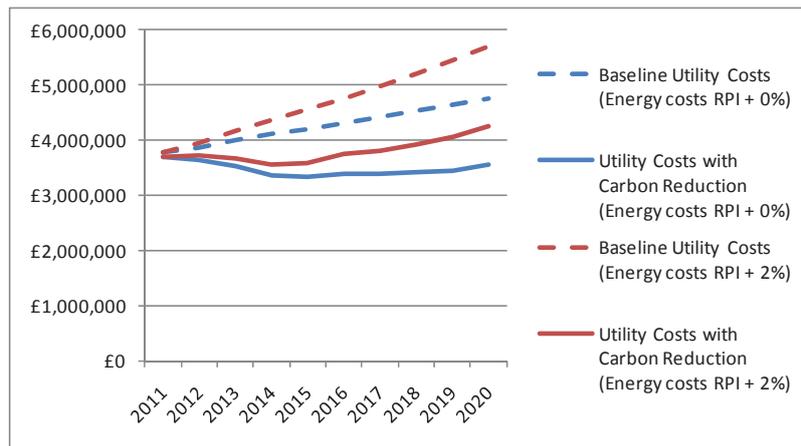


Figure 5 - Impact of Energy and Carbon Prices on Utility Costs to 2020

The costs of administering the site-wide carbon reduction programme on an annual basis are also included. These costs are broken down as follows:

- Carbon Management Software
- Awareness Campaigns
- Staff to manage the Plan within the portfolio of the Head of Energy and Environment. (1.1 FTE).

In addition, it has been identified that there may be some additional costs in the following areas:

- Project Management – cost unknown at this stage, however, up-skilling of staff will be required and involvement of the Assistant Director of Estates – Projects will be required (level of involvement has not been determined as yet).
- Procurement – it is unknown as to whether this work will result in an increased workload on the Procurement Team (outside of what is already expected). This will be monitored.
- Maintenance - cost unknown at this stage, however, up-skilling of staff will be required and involvement of the Assistant Director of Estates – Infrastructure and Maintenance will be required (level of involvement has not been determined as yet).

At this stage we are not asking for additional human resources to deliver the plan however the resources required to implement the Plan will be evaluated within the annual review to confirm that the resources allocated are adequate to effectively implement the Plan and meet the targets set.

6. Risks and Opportunities

There is a high level of uncertainty associated with implementation of carbon reduction measures, as a result of the broad range of factors that will influence the outcome. Specific risks and recommended mitigation strategies are identified throughout the document, and in the risk schedule within the study prepared by Arup. The key issues are:

- Operation – coordination between user groups and estates to generate optimised operational strategies for buildings.
- Maintenance – proactive maintenance strategies are essential to ensure that savings are achieved.
- Procurement and delivery – setting carbon reduction at the heart of procurement and delivery strategies.

- User engagement – effective engagement at all levels from College Council to individual staff and students.

Figure 6 shows the target carbon trajectory to 2020, as well as the estimated upper and lower band outcomes. The target carbon trajectory shows the College target of 34% carbon reduction achieved by 2015, with a total 38% reduction achieved by 2020. The upper band line indicates that if all Phase 1 interventions are fully exploited and risks are well mitigated there is the opportunity to achieve the carbon reduction target at the completion of Phase 1. This would deliver a carbon reduction of 35% at a cost of £7.45M and would negate the need to continue with the less cost effective Phase 2 interventions. Conversely, the lower band line indicates risking not being able to achieve the full benefits of the carbon reduction measures either through not being able to deliver all of the cultural changes or technical factors leading to a shortfall on the 2020 target. The carbon project governance team will monitor the progress of the Plan regularly to mitigate these risks.

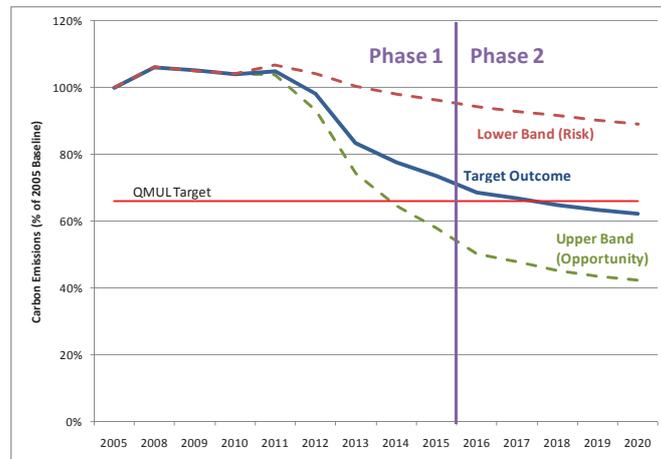


Figure 6 - Carbon Emissions to 2020

By effectively identifying and managing risks and opportunities, the College will be in a position to realise its carbon reduction targets. The link between carbon reduction and funding means that the success of the Plan will be an important part of the success of the College as a whole over the period.

7. Monitoring and Reporting

The College currently reports on Scope 1 and 2 greenhouse gas emissions and will be required to report on Scope 3 emissions in accordance with HEFCE requirements (i.e. measurement of a baseline of carbon emission from procurement by December 2012 and setting target(s) for scope 3 emissions by December 2013).

Effective monitoring and reporting of energy consumption is an essential step to understanding how and where energy is being used and to identifying opportunities to achieve reductions. Implementation of operational carbon reduction measures will be very difficult without detailed and easily accessible data on building energy usage.

Installation of an Automatic Metering and Targeting (AMT) devices will be installed to facilitate the accurate monitoring and benchmarking of energy consumption. This consists of a network of energy sub-meters and central software to automatically collect consumption data and issue reports. An AMT system would separate out energy consumption by end use (e.g. lighting, small power, main plant, local process plant) as well as by zone (e.g. by floor or by department/group depending on the context). This does not deliver a direct cost-saving in itself but it is an essential enabling project to allow energy consumption to be pinpointed accurately, significantly increasing and improving

the development and monitoring of operational and maintenance relating to carbon management.

It is important to have milestones in order to monitor progress against the aforementioned target. Table 5 lists the key annual activities from now until 2020.

Activities	Year
Annual reporting	Annually until 2019/2020
Review scope of Plan to include scope 3 emissions	2011/12
Review of Plan	2019/20
Production of Plan for 2020-2030	2019/20

Table 5: Key Activities of the Plan

8. Governance

The responsibility for monitoring the Carbon Management & Implementation Plan will rest with the Director of Estates whilst the Head of Energy and Environment will lead on the delivery of the Plan.

The implementation plan is ambitious, and whilst it is achievable, can only be realised by putting carbon management at the heart of the College’s operational and decision-making processes. As such it is essential that an appropriate carbon governance structure is set up to allow this to happen. It is essential that all faculties and departments play an active role in supporting various carbon reduction initiatives. The key recommendation is the establishment of a Carbon Management Team, headed by the Director of Estates which has representation from all key stakeholder groups, to oversee the implementation of the Plan.

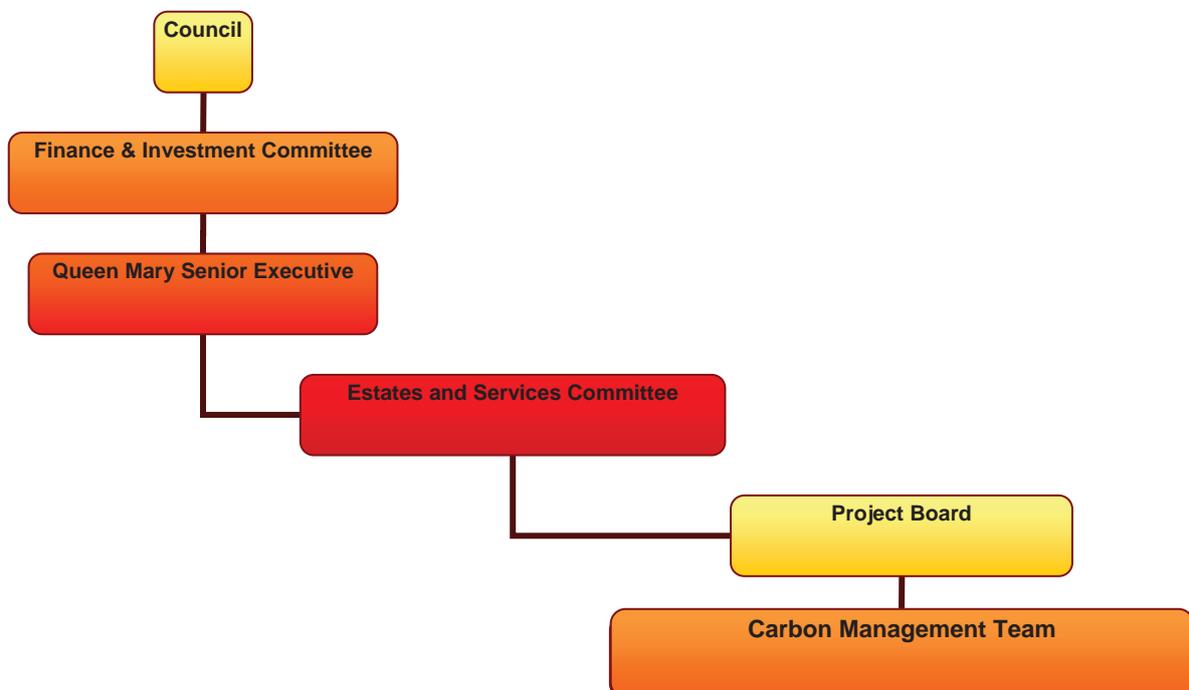


Figure 9: Reporting Structure of the Plan

9. Conclusion

This Programme however is only the start of the journey. We will be reviewing the scope of the Plan in 2011/12 to include scope 3 emissions. We will also include the progress made towards our Plan in an annual report to the Queen Mary Senior Executive (QMSE) and the Estates and Services Committee (E&SC). Additionally it is proposed that the E&SC monitor progress against the delivery program each semester.

There are significant benefits to be gained through the successful implementation of the proposed carbon reduction measures. Not only will utility cost savings be achieved, thereby reducing the College's exposure to increases in utility and carbon taxes but also significant improvements will be made in the operation and maintenance of the Estate.

The production of the Plan, and its endorsement by the College, will help raise the profile of energy conservation across the College, whilst the effective delivery of projects identified in the Plan will lend support to the need for continued funding approval. Implementation of the Plan is considered to be a significant reputational issue for the College with Central Government and HEFCE (and will significantly influence our access to CIF funding) and our stakeholders, including peers and, most importantly, the student body.

We are confident that with the implementation of the projects outlined in the Plan and the ongoing behaviour change initiative coupled with the Estates Strategy 2011-2020 will help us achieve our carbon reduction target. The Plan prepared is compliant with HEFCE's requirements for HEI's to set their own targets for 2020 for scope 1 and scope 2 emissions against a 2005/6 baseline.

Simon Neale
Director of Estates
April 2011

