CARBON MANAGEMENT IMPLEMENTATION PLAN

Update and Review of Progress.

April 2014

ABSTRACT

Since 2005/06 the University has reduced its carbon footprint by 17%, almost reaching its 2020 target of 20%. This report reviews how this has been achieved, presents a strategy for delivering the 20% target with the expansion of research activity and the provision of 1,000 additional bed spaces on campus. Progress is also reported in reducing and quantifying scope 3 emissions.

1 TABLE OF CONTENTS

Executive Summary

The University's Strategic plan *Shaping our Future*[1] established our carbon reduction target, for scope 1 and 2 emissions as 20% by 2020, compared to 2005/06[2], and our *Carbon Management Implementation Plan*[3] set out how it will be achieved. This update explains how the target has almost been reached and will be delivered with the expansion of energy intensive research and the provision of accommodation for an additional 1,000 students.

We also detail the carbon footprint from scope 3 emissions, together with the approach being taken to improve measurement and reduce them.

1 INTRODUCTION

We produced our first carbon management plan in 2006 in the first phase of the Carbon Trust's *Higher Education Carbon Management Programme* which was revised in 2010 to support HEFCE's undertaking to reduce the carbon footprint of the higher education sector by 43% by 2020. This update to our 2010 plan reports on progress towards our 2020 target (section 2) and how the target will be delivered with expansion of activities (section 3).

1.1 BACKGROUND AND STRUCTURE OF THE UNIVERSITY

The University of Birmingham has 30,000 staff and students[4] and an annual turnover approaching £0.5 billion. Activity is concentrated on the Edgbaston Campus with additional facilities in Selly Oak, Stratford-upon-Avon, Worcester, Coniston and a major flagship research facility near Coventry will be constructed. We are a member of the Russell Group of research led Universities; as such many activities are energy intensive with an increasing focus on reducing global emissions and understanding the challenges of climate change.

The University is composed of five Colleges[5] and Corporate Services. Corporate Services includes Hospitality and Accommodation Services; the provider of over 4,100 bed spaces, together with onsite sport, hotel, conference and catering. To support this plan each of the colleges produced their own Carbon Management Plan as have the significant emitters within Corporate Services[6], and the Guild of Students.

1.2 DRIVERS FOR A CARBON PLAN AND KEY PRINCIPLES

In May 2013 the concentration of carbon dioxide in the atmosphere exceeded 400ppm for the first time in human history[7] confirming the importance of continued action to limit emissions of greenhouse gasses and adapt to a world with a changing climate. Our Carbon Management Plan is part of our wider sustainability framework and in addition to social and environmental benefits brings direct benefit via:-

[1] http://www.birmingham.ac.uk/university/about/2015.aspx
[2] The base year for all reduction targets stated is 2005/06 in accordance with reporting to HEFCE.
[3] http://www.birmingham.ac.uk/Documents/university/environment/carbon-plan.pdf
[4] Full time equivalents (FTE)
[5] The five Colleges are; Arts & Law, Social Sciences, Medical & Dental Sciences, Life & Environmental Sciences, and Engineering & Physical Sciences.
[6] https://intranet.birmingham.ac.uk/collaboration/environment/carbon/CollegeCorporatePlans.aspx
[7] http://www.esrl.noaa.gov/gmd/ccgg/trends/

Core Mission and resource efficiency: Shrinking our carbon footprint results in the efficient use of scarce resources and reduces our need to purchase energy, and carbon allowances. The efficient use of energy is a cost effective methods of realising this objective.

Managing Demand: Reducing our use of energy and being mindful of when consumption is occurring will increase energy security and reduce our exposure to energy price volatility.

Reputation: Our reputation is enhanced by demonstrating that we deliver world class research and education in a carbon constrained world. We have an increasing number of research initiatives examining and reducing the impact of climate change, improving utilization of existing fuels, exploring future fuels, energy storage and smart grids.

Reduce our carbon footprint is ***good business*** and increases resources for core activities.

Actions undertaken will be prioritised as described below and their wider sustainability aspects will be considered, this includes:-

- Measures with a lower cost per tonne of carbon saved will be prioritised.
- Life cycle costing methods are used for larger schemes.
- Due diligence will be undertaken to ensure that the carbon reduction measures do not have adverse environmental, social or economic impacts, for example with the use of some sources of biofuels.
- The general priority order for implementing carbon reduction projects are:-
  - Reduce energy consumption by:-
    - Promoting good housekeeping in the use of energy and water.
    - Improve building fabric (reducing heat loss and unwanted solar gain).
    - Ensure efficient equipment.
    - Ensure efficient operation of buildings and equipment.
    - Reduce emissions from university vehicles.
  - Reducing scope 3 emissions and improved measurement methodologies.
  - Develop onsite renewables, accepting opportunities are limited.
  - Develop offsite renewables.
- Carbon offsetting, is not part of the strategy, in line with HEFCE recommendations.

1.3 KEY CHALLENGES

The key challenge to reduce our carbon footprint is successes in obtaining research funding, especially in areas related to energy storage, energy utilisation and the impact of increasing levels of carbon dioxide on ecosystems. This is illustrated by the imminent construction of the High Temperature Research Centre that will examine how to enhance the efficiency of gas turbines. This facility could add 8% to our carbon footprint which would be significantly offset by a fractional improvement in the efficiency of gas turbines.

We are constructing accommodation for an additional 1,000 students in University owned and operated facilities will add to our carbon footprint and be absorbed in our target.

1.4 CHANGE TO BASELINE DATA

The carbon emissions presented in this report have been updated from those previously reported to reflect the revised DECC/Defra[8], (in Appendix 1).

[8] https://www.gov.uk/government/publications/green-house-gas-conversion-factors-for-company-reporting-2013-methodology-paper-for-emission-factors and http://www.ukconversionfactorscarbonsmart.co.uk/

2 REVIEW OF PROGRESS

2.1 TOTAL CARBON FOOTPRINT

Our total carbon footprint for 2012/13 was 133,227 tonnes CO_{2e} figure 1 and appendix 3. The majority of emissions (62%) are due to scope 3 sources, particularly goods and services we procure, with almost all the remainder being emissions from the use of energy. The scope of emissions included in the footprint is presented in Appendix 2.

How we reduced scope 1 and 2 emissions by 17% since 2005/06 is explained further in this section together with measures to monitor and reduce scope 3 emissions. Section 3 summaries the actions that will deliver further reductions to our carbon footprint.

Definition of Scope of Emissions

Scope 1: Direct emissions produced from sources under our control. This includes the combustion of fuels in boilers, engines and fugitive emissions such as leaks from refrigeration systems.

Scope 2: Emissions resulting from our purchases of electricity.

Scope 3: are emissions that occur as a direct consequence of our actions but are from sources we do not own or control. They include emissions from the transportation and distribution of electricity to our sites, waste disposal, water, goods and services procured and business travel.

Scope 4: Emissions resulting from the products and services we produce once it is outside our direct control. This includes the impact of research and teaching, innovation and knowledge transfer. For example successful research that enhances efficiency of energy use would have a positive impact on overall emissions well in excess of any emissions attributed to the University in conducting

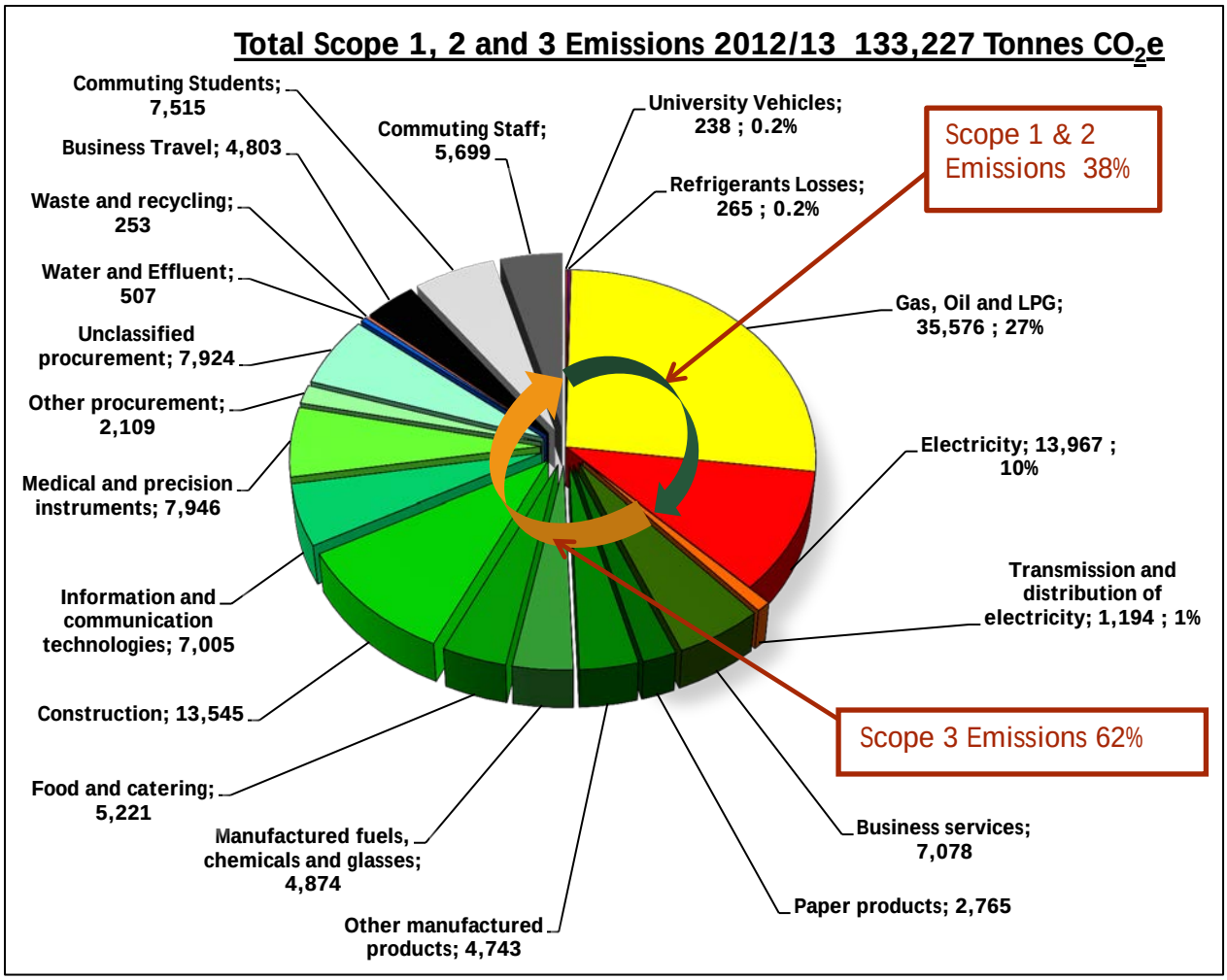

Figure 1 Total Carbon Footprint 2012/13.

2.2 SCOPE 1 AND 2 EMISSIONS

As of 2012/13 our emissions had reduced by 17% (figure 2 and Appendix 1), from 61,890 tonnes CO_{2e} in 05/06 to 51,240 tonnes CO_2 in 12/13. We have contained emissions at 1990 levels while increasing student numbers by 2.5 times and trebling inflation adjusted turnover.

With the planned increase in activities our emissions are predicted to increase to over 57,000 tonnes CO_{2e} in 2020, the business as usual scenario, Figure 2, below. However with planned mitigation measures emissions will be contained within the 2020 target.

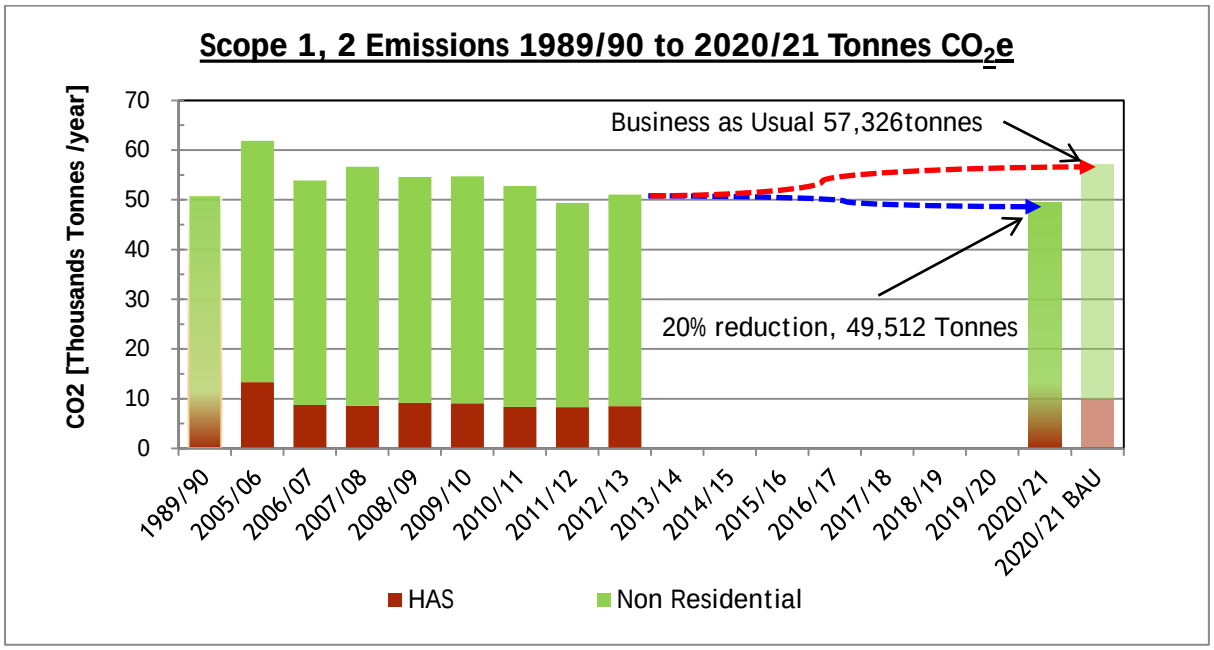

Figure 2 Scope 1 and 2 CO_{2e} Emissions 1989/90 to 2020/21

As illustrated in *figure 3* emissions are concentrated in the engineering and science based Colleges, due to their size and intensity of activities. Hospitality and Accommodation Services (HAS) account for a quarter of emissions of which 16% is from residences. Data centres accounts for 5% and it is estimated that a further 5% is distributed across the University.

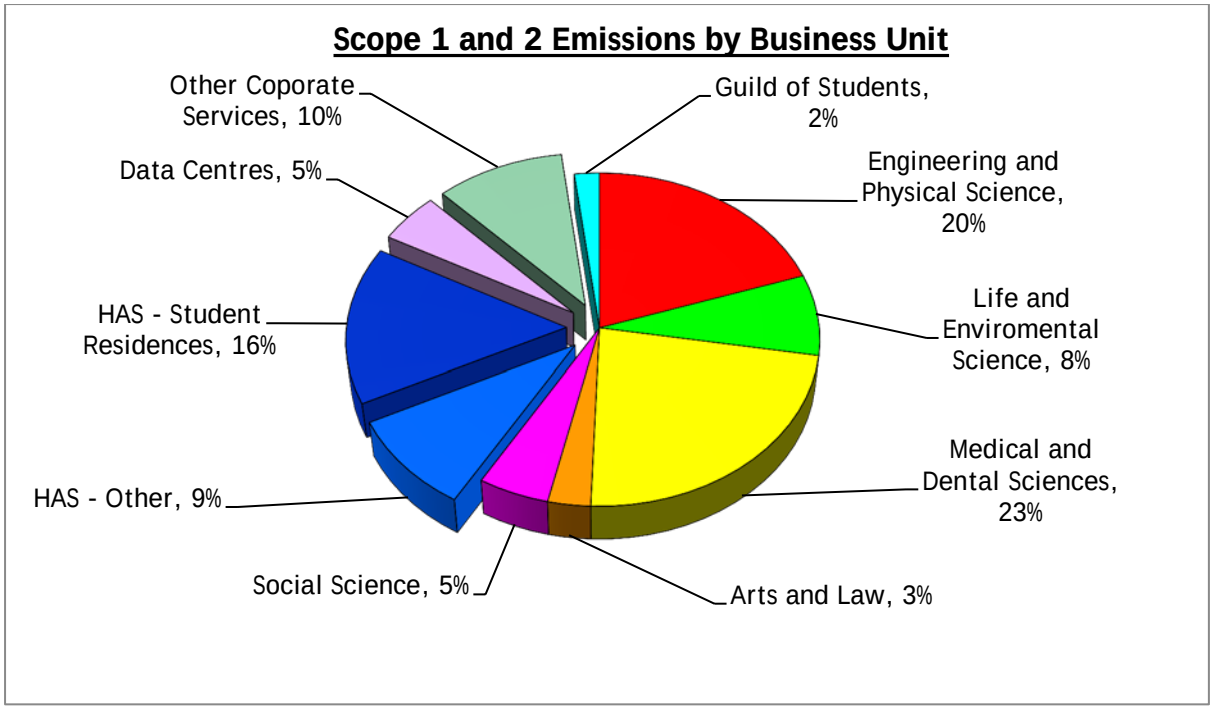

Figure 3 Scope 1 and 2 Carbon Emissions (energy related) by Business Unit

2.2.1 Carbon Intensity Ratio's

While our carbon reduction target is absolute it is illustrative to examine how the carbon footprint changes with activity. Figure 4, presents the relationship with income (adjusted for inflation) and head count since 1989/90.

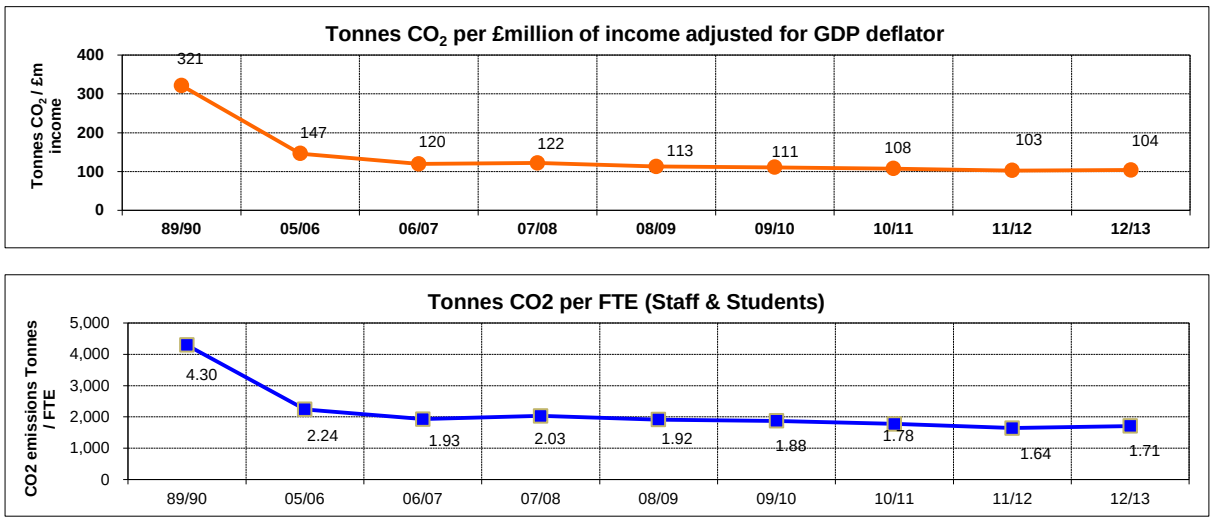

Figure 4 Carbon Intensity Ratios

Figure 4 shows that since 1989/90 emissions:-

- per £m of income reduced by a factor of three.
- per FTE decreased by a factor of 2.5.

and since 2005/06 reductions were:-

- per £m of income, 30%.
- and per FTE, 23%.

With the planned increase in student residences reducing emissions per bed space is vital to absorb this increase in our reduction target. Since 2005/06 emissions per bed space has reduced by 18% (figure 5 below).

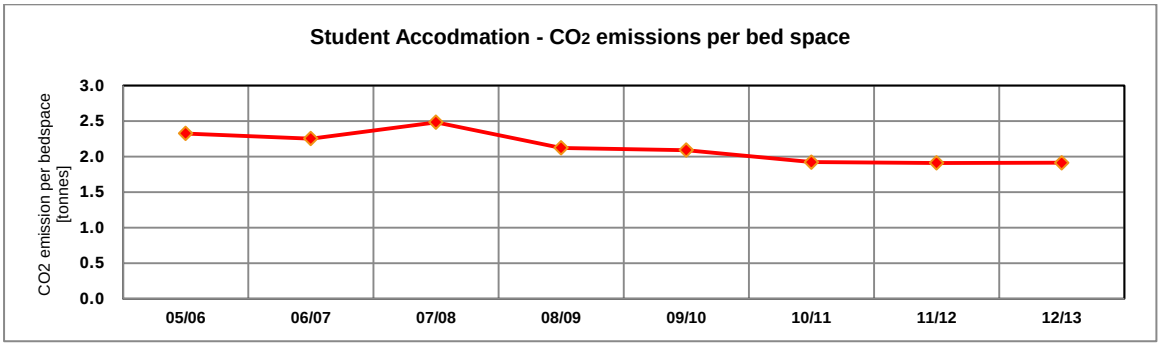

Figure 5 CO_2 emissions per bed space 2005/06 to 2012/13

2.2.2 Interventions to reduce emissions.

Reductions in our carbon footprint are summarised in table 1 and have been achieved by:-

- Replacing coal fired boilers with a 6MW_e gas turbine CHP plant in 1990, generating our own electricity and heat produced.
- Selling off campus university owned student residences and rebuilding others.
- Expanding the district heating system fed by the CHP to supply our Medical School.
- A programme of retrofit energy reduction measures which has included:-
  - Improving controls and increasing the number of buildings connected to the Building Management System.
  - Regular adjustments to time and temperatures settings particularly areas with variable occupancy patterns.
  - Improving insulation of roofs, walls, pipework and draft stripping windows.
  - Replacement of inefficient plant, including boilers, fans, chillers, ultra-low temperature freezers.
  - Installation of free cooling where cooling is required during the winter period.
  - Upgrading of lighting and controls (including installation of LEDs).
- Establishment and maintenance of a system of monitoring and targeting energy use.
- Increasing awareness amongst staff and students of actions they can take to reduce energy consumption including the Green Impact.
- Internal standards and specification for new projects including:-
  - Achieving an 'A' rated Energy Performance Certificate[9] where possible.
  - Internal standards such as the use of low loss transformers, specifications for lecture spaces, lighting and our Mechanical and Electrical specifications.
- Upgrading ICT including:-
  - Replacement of research computers with high efficiency ones whose power requirements varies with demand for service.
  - Virtualisation of servers, thus reducing the number of servers required.
  - Improvement of cooling systems for servers, including free cooling.
- Reduction in the carbon intensity of grid supplied electricity has reduced since 2005/06 with the decrease in coal and increase in gas and wind generation.

The impact on our carbon footprint is as stated in table 1 overleaf:-

[9] This is challenging with some of our buildings especially theses that are listed.

Action	CO_2 [Tonnes/ year]
2005/06 Footprint	**61,890**
Sale of student accommodation; The Beeches, Hunter Court and Queens Hospital Close	-1,885
Demolition of Mason Residence	-1,208
Closure of Chamberlain Residences	-810
Construction of new Mason Residences	1,615
Refurbishment of student residences and other energy reduction actions (e.g. student switch off)	-2,062
Construction of Bramall Music Building	302
Construction of Advance Therapy Unit	200
Refurbishment of Gisbert Kapp and 52 Pritchatts Road	-535
Refurbishment of Materials and Metallurgy	-50
Retrofit Energy Reduction Projects	-1,200
Replacement of high performance computers and virtualization	-300
Extension of district heating system (Steam bridge)	-1,800
Reduction in activity at Selly Oak Campus	-800
Residential buildings upgrades	-200
Staff and student engagement	-330
Fugitive emissions	-80
Reduction in carbon intensity of grid electricity	-1,083
Unaccounted/other	-424
2012/13 Foorprint	**51,240**

Table 1 Summary of Carbon Reduction Measures Related to Energy

2.3 INITIATIVES TO MEASURE AND REDUCE SCOPE 3 EMISSIONS

Scope 3 accounts for 62% of total emissions (section 2.1) the majority of which are due to good and services procured. These have been calculated from fiscal data in accordance with sector guidance. As this gives an indicative figure alternative approaches are used where we better quality information is available, namely for waste and recycling, commuting, business travel, water/effluent and the transmission and distribution of electricity.

2.3.1 Waste and recycling

Regular greenhouse gas reports are received as part of the contract, an initiative that was highlighted in the HEFCE consultation on scope 3 emissions of 2012. This includes general waste, paper, cardboard, glass and mixed recycling in addition accurate weight data is obtained for waste streams such as skip waste. Waste is collected from student residences by Birmingham City Council and weight data is not available, thus the carbon footprint is derived from average figures for the City of Birmingham.

There has been a continual focus on mixed recycling schemes which has helped increase recycling rates from 20% in 2006 to 45% in 2012, with the remainder being sent to a local energy from waste facility rather than landfill. Further segregation of waste streams has resulted in a recent pilot being established for food waste being sent to an anaerobic digester plant that produces electricity and fertilizer.

We have received awards from Birmingham City Council for the best waste reduction scheme and for our community/neighbourhood project and Recycling.

2.3.2 Business Travel

We have an internal travel management system, developed in collaboration with the University's suppliers, for staff to book all business travel which provides a report on the carbon emissions for air and rail travel bookings.

2.3.3 Commuting

A staff and student travel survey was undertaken in 2013, providing a fair representation of travel behaviour. Respondents were asked to input the distance from home to University and main mode of travel, enabling a calculation of the carbon footprint to be made. Initiatives related to commuting are being implemented via the University's 'Smartmover' Sustainable Travel[10] plan. There are particular initiatives to encourage cycling, public transport use and car sharing. The results of the survey are being used to target initiatives.

2.3.4 Water

Water and the disposal of effluent accounts for 0.4% of total emissions. Following action to half the water consumption on the non-residential estate pre 2005 the approach to reducing water consumption follows that of energy.

2.3.5 Procurement

Scope 3 supply chain emissions uses fiscal spend data from which carbon emissions are calculated. However as recognised in HEFCE's consultation (2013/31) on sustainable development in higher education this approach is of limited use as an improvement method.

2.3.6 Transportation and distribution of electricity.

This aspect of our emissions is directly related to our consumption of electricity, thus the measures to reduce consumption presented in section 3 will also reduce these emissions.

3 CARBON REDUCTIONS PLAN 2013 TO 2020

This section explains how we plan to contain our carbon footprint within the 20% target while expanding our research activities and constructing additional student accommodation.

3.1 SCOPE 1 AND 2 EMISSIONS

3.1.1 Significant Estate Changes

Our campus is in a state of continual development to meet business needs and over the coming years the following are planned.

A number of key buildings are being replaced including:-

- The construction of a new Library, replacing the original 1959 building, enabling consolidation of satellite libraries and meeting the increasing role ICT has in learning.

[10] https://intranet.birmingham.ac.uk/has/sustainable-travel/index.aspx

- The replacement of the Munrow Sports Centre, constructed in 1968, with a new building that will be one of the UK's leading sports centres including the provision of a 50m pool and facilities for the wider community.
- The Construction of the University Training School at our Selly Oak Campus which will be run by the University of Birmingham School and Sixth Form Trust.
- The construction of new buildings and facilities to accommodate:-
    - The High Temperature Research Facility at Ansty Park, Coventry, in collaboration with Rolls-Royce to deliver a unique casting, design, simulation and advanced manufacturing research facility that will initially focus on the key design and manufacturing aspects of investment casting. This facility will be energy intensive, albeit that one of the benefits of the research is improved efficiency in gas turbines.
    - Cryogenic energy storage research.
    - The Biomedical Innovation Hub, a collaboration between Birmingham Research and Development Ltd and the University's Medical School that will provide facilities for entrepreneurs in Life Sciences.
    - A Postgraduate Teaching Centre for the Business School.
    - Refurbishment of C Block, part of the 1905 grade 2* listed Aston Webb building to provide a student hub and lecture theatre accommodation.
- The provision of additional University owned and operated student residences on campus, namely the construction of:-
    - Jarratt Hall Annex (opened 2014) 120 beds
    - Grange Road residences and sports pavilion 120 beds
    - Rebuild of Chamberlain Hall 850 beds
- In addition there will be the construction of a new Dental School as part of the Dental Hospital on the site previously occupied by the BBC at Pebble Mill.

Possible future developments include further upgrades to the existing buildings, enhanced data centre provision and further enhancements to the CHP based energy centre.

3.1.2 Capital and Retrofit Projects

While the developments described above will be designed to minimise energy consumption, they result in an overall expansion of activities and thus challenges to accommodate them within our constrained 2020 carbon footprint.

To meet our 2020 target the following work is being implemented or planned.

- Replacement of the CHP[11] installed in 1990 with a new gas turbine that better fits our heat and power demands together with efficiency enhancements to the energy centre, due for completion in October 2014.
- The new sports centre and student accommodation (apart from Chamberlain Residences) are located on the University's southern boundary close to the CHP station. In the summer of 2013 the district heating system was extended to enable these buildings to be supplied with heat from the CHP station. This can be enhanced by installing an additional CHP unit proposed for 2016/17.
- The ongoing programme of refurbishing student accommodation is resulting in enhancement of thermal properties, the installation of higher efficiency boilers, lighting and white goods. In addition:-
    - The electrical heating in Jarratt Hall will be replaced with a radiator system supplied with heat produced from the CHP station.

[11] Combined Heat and Power

- The new Chamberlain Residences will include its own CHP engine that will also provide heat and power to the refurbished Aitken residences when the electric heating is replaced with a radiator system.
- Electrical heating was removed from Oakley Court and replaced with gas boilers in the summer of 2013.
- The operation of a standalone CHP unit for Mason Residences commenced in September 2013.

- An ongoing programme of retrofit energy reduction measures including:-
  - Installing high efficiency lighting with controls, including LED lighting especially in corridors and as replacement for dichroic lamps.
  - High efficiency filters, motors and fans in air handling units
  - Demand control of fans in kitchens
  - Upgrade to lecture theatres and monitoring the use of the space.
  - Improvements to roof insulation when flat roofs are being replaced
  - Replacing old ultralow temperature freezers with modern freezers.
  - Examining the need and benefits of 24/7 access to facilities.
  - Continue to introduce free cooling to meet winter cooling requirements.

3.1.3 Student and Staff Engagement

An extensive programme of improving metering has been undertaken. This includes a smart metering system that displays information on web pages in near real time and regular reporting to key staff of their use of energy against carbon and fiscal targets. Support is given to staff, especially those with responsibility for energy activities to understand and reduce their consumption. Inter-residence competition are organised to promote carbon reduction in student residences backed up with energy reductions projects.

3.1.4 Fugitive Emissions

Fugitive emissions arise from the accidental release of greenhouse gasses the key sources being refrigeration systems and a limited number of HV switchgear that contain SF_6[12]. These are being mitigated by the replacement/removal of old systems air conditioning particularly environmental harmful refrigerants.

3.1.5 University Vehicles

The carbon footprint from university vehicles is being reduced by the greater use of electrical vehicles on a replacement basis especially for applications that require short trips.

[12] Sulphur hexafluoride, a particularly potent greenhouse gas.

Action	Change in CO2e [Tonnes]	% change of 2005/06 footprint
2012/13 Footprint	**51,240**	
Construction of Jarratt Hall Annex	161	0.3%
Refurbish Jarratt Hall including removal of electric heating.	-663	-1.1%
Mason Residences CHP	-328	-0.5%
Refurbishment of Oakley Court including replacement of electric with gas heating	-109	-0.2%
Redevelopment of Chamberlain Residences	1,035	1.7%
Refurbishment of Aiken Wing	-163	-0.3%
CHP unit to supply Aiken and Chamberlain.	-240	-0.4%
Grange Road Student Residences (new build)	160	0.3%
Replacement of Main CHP	-2,732	-4.4%
Retrofit Energy Reduction Projects	-484	-0.8%
Saving energy through people programme	-218	-0.4%
Replacement of Main Library	-170	-0.3%
Replacement of Sports Centre	155	0.3%
Post Graduate Teaching Centre (new build)	63	0.1%
Biomedical Innovation Hub (new build)	200	0.3%
Increase in IT provision	350	0.6%
University Training School (new build)	225	0.4%
High Temperature Research Centre (new build)	4,000	6.5%
Reduction in fugitive emissions	-50	-0.1%
Further Projects - Funding Pending		
Additional CHP (Gas Engine)	-1,868	-3.0%
Further refurbishment and upgrades to Buildings	-1,051	-1.7%
2020/21 Footprint (20% Target)	**49,512**	20.0%

Table 2 Predicted and Possible changes to carbon footprint to 2020.

3.2 FUTURE INITIATIVES TO REDUCE SCOPE 3 EMISSIONS

This section briefly details initiatives to reduce scope 3 emissions.

3.2.1 Waste and Recycling

We will continue to measure waste produced and recyclates and examine how to better account for waste collected from residential accommodation. The efforts to reduce the impact and volume of the waste we produce will continue which has resulted in half of 'waste' being sent to recycling facilities and that which was sent to landfill now being directed to an energy from waste plant in Birmingham.

3.2.2 Business Travel

Increase uptake of the travel management system and present the carbon impact of alternative travel arrangements. Increased use of software and technology to undertake virtual meetings and reduce the need to travel.

3.2.3 Commuting

To build on the continuing success of the current sustainable travel initiatives, all future initiatives will be led by the Sustainable Travel Steering Group.

3.2.4 Water
Implement initiatives where appropriate.

3.2.5 Procurement
Continue to collect the relevant data whilst awaiting further guidance to improve methods of estimating the carbon emissions arising from the procurement of goods and services.

3.2.6 Transmission and Distribution of Electricity
A significant reduction has already been achieved by the onsite generation of electricity and further reductions are expected from the on-going actions to reduce energy consumption.

4 SCOPE 4 EMISSIONS

The University has a key role in promoting carbon reductions through our core activities of research, teaching, knowledge transfer and public communications which can be defined as scope 4 emissions. These are difficult to quantify and cannot be offset against scope 1, 2 and 3 emissions. Our increasing research efforts in addressing the challenges of climate change includes improving the efficiency and operation of engines in collaboration with Rolls-Royce[13], our work on future fuels[14], smart grids and research into the impact of enhanced levels of CO_2 in the atmosphere[15].

5 FUNDING

There are a number of funding sources for energy/carbon reduction including:-

- The Capital Programme, that funds measures associated with major developments, as projects have to meet required energy / carbon performance targets.
- The Revolving Green Fund established with support from Salix Finance Limited and HEFCE with a total value of £1.25m. To date £1m of projects has been funded and the fund is replenished with the savings made enhance by an additional £1m of funding for specific projects.
- Funding bids against the Capital Infrastructure Fund
- Internal budgets for energy reduction which results in an investment of *ca*£200k/year including, residences, Estates Office, Guild of Students.

6 GOVERNANCE

The Sustainability Task Group[16] chaired by the Pro-Vice Chancellor (Estates and Infrastructure) is responsible for delivering the reduction in carbon footprint and includes those with operational remits in the Colleges, business units and Guild of Students. It reports to the University Executive Board.

Each College has a committee with the responsibility for preparing a local carbon management plan.

[13] http://www.lowcarbonfutures.org/news/2013/07/17/university-birmingham-research-develop-technologies-which-could-transform
[14] http://www.birmingham.ac.uk/university/colleges/eps/research/resilience-energy/index.aspx
[15] http://www.birmingham.ac.uk/research/activity/bifor/index.aspx
[16] https://intranet.birmingham.ac.uk/collaboration/environment/policy/SustainabilityTaskGroup.aspx

APPENDIX 1 – ENERGY DATA AND CARBON EMISSIONS TO 2012/13

	CO_2 emissions Tonnes / year								
	89/90	**05/06**	**06/07**	**07/08**	**08/09**	**09/10**	**10/11**	**11/12**	**12/13**
Electricity (kWh)	33,717,783	45,194,179	33,499,672	43,586,827	37,923,315	38,550,689	39,958,199	33,507,385	31,352,551
Gas (kWh)	41,997,014	170,303,893	162,608,393	140,223,953	180,553,199	180,803,599	174,505,209	173,394,679	193,073,037
LPG (kWh)	0	51,000	51,008	51,008	51,171	51,000	47,985	40,271	33,103
Gas Oil (kWh)	4,657,605	598,561	795,212	1,727,740	1,782,781	2,062,644	1,356,800	258,078	132,267
Coal (kWh)	48,114,339	0	0	0	0	0	0	0	0
Steam (kWh)	8,169,278	23,552,506	23,460,190	24,780,439	0	0	0	0	0
Total (kWh)	**136,656,019**	**239,700,139**	**220,414,475**	**210,369,967**	**220,310,466**	**221,467,933**	**215,868,192**	**207,200,413**	**224,590,957**
CO_2 from Electricity	23,936	21,394	15,635	21,623	18,727	18,709	18,063	15,414	13,967
CO_2 from Gas	7,726	31,506	30,083	25,796	33,444	33,196	32,039	32,114	35,533
CO_2 from LPG	0	11	11	11	11	11	10	9	7
CO_2 from Gasoil	1,356	165	219	476	497	575	377	72	36
CO_2 from Coal	15,847	0	0	0	0	0	0	0	0
CO_2 from Steam	1,704	6,006	5,982	6319	0	0	0	0	0
CO_2 from Transport	357	423	367	347	274	278	248	239	238
CO_2 from Refrigerant Leakage	0	345	345	345	170	430	479	285	265
Total CO_2 (Scope 1 & 2)	**50,926**	**59,849**	**52,642**	**54,960**	**53,122**	**53,198**	**51,216**	**48,133**	**50,046**
Scope 3 CO_2 from electricity transmission & distribution	Included above	2,041	1,221	1,681	1,483	1,507	1,544	1,218	1,194
Total CO_2, Scope 1, 2 and transmission & distribution of energy.	**50,926**	**61,890**	**53,864**	**56,641**	**54,605**	**54,705**	**52,760**	**49,351**	**51,240**
% change on 05/06	-18%	0%	-13%	-8.5%	-12%	-12%	-15%	-20%	-17%
Total FTE (Staff and Students)	11,855	27,622	27,877	27,861	28,491	29,141	29,647	*30,007*	*29,928*
Income adjusted for GDP deflator £mn	£116	£422	£450	£465	£484	£494	£490	£480	£492

The emissions reported above have been updated from those previously reported to realign them with DEFRA/DECC revised greenhouse gas conversion factors. This includes revising the carbon factors for electricity and the transmission and distribution of electricity is now counted as scope 3 rather than scope 2. However the emissions from the transmission and distribution of electricity are directly related to our consumption of electricity and will be included with scope 1 and 2 for the purposes of our reporting our carbon reduction target.

APPENDIX 2 - SCOPE AND CARBON ACCOUNTING METHODOLOGY

University of Birmingham Carbon Footprint

Emissions Not Reported in Carbon Footprint

- Supplies to Tenants of the university that are recharged via a meter or paid directly by the tenant

Emissions Reported in Carbon Footprint

- University of Birmingham
- Alta Estates Services Limited (The company that operated the CHP scheme. Since December 2013 this has been dormant and activities merged with the University's Estates Office).
- Alta Cyclotron Limited
- University of Birmingham Guild of Students.

Scope 1 – *Direct Emissions from site*

- Combustion of gas and oil
- Use of fuels in non electric University Vehicles
- Fugetive emissions (i.e. Leakage of refrigents)

Scope 2 – *Direct emissions resulting from the consumption of purchase electricity.*

Scope 3 - *Emissions resulting from our activates but not under our direct control.*

- Transportation of electricity to site.
- Business Travel
- Procurement (Supply Chain)
- Consumption of water and disposal of effluent
- Production of waste and recycling.
- Commuting

APPENDIX 3 – SUMMARY OF EMISSIONS BY ACTIVITY 2013 SCOPE 1, 2 AND 3.

		Source	CO_2 Tonnes	%	
Scope 1 & 2		University Vehicles	238	0.2%	Carbon Reduction Target
		Refrigerants Losses	265	0.2%	
	Energy	Gas, Oil and LPG	35,576	26.7%	
		Electricity	13,967	10.5%	
		Transmission and distribution of electricity	1,194	0.9%	
Scope 3	Procurement	Business services	7,078	5.3%	
		Paper products	2,765	2.1%	
		Other manufactured products	4,743	3.6%	
		Manufactured fuels, chemicals and glasses	4,874	3.7%	
		Food and catering	5,221	3.9%	
		Construction	13,545	10.2%	
		Information and communication technologies	7,005	5.3%	
		Medical and precision instruments	7,946	6.0%	
		Other procurement	2,109	1.6%	
		Unclassified procurement	7,924	5.9%	
		Water and Effluent	507	0.4%	
		Waste and recycling	253	0.2%	
		Business Travel	4,803	3.6%	
		Commuting Students	7,515	5.6%	
		Commuting Staff	5,699	4.3%	
		Total	**133,227**	100.0%	

Scope 1, 2 & Transmission and distribution of electricity.	51,240	38.5%
Total Scope 1 and 2	50,046	37.6%
Total Scope 3	83,181	62.4%
Total Energy	50,737	38.1%
Total Procurement	63,210	47.4%
Total Commuting	13,214	9.9%