Department of Estates

UNIVERSITY OF BATH

Annual Energy and Environment Report 2017/18

The University Strategy to 2021 reaffirms that one of our core values is a commitment to environmental best practice. Our Environmental Policy can be found at http://www.bath.ac.uk/estates/docs/Environmental_Policy_2016.pdf. This report is prepared on behalf of the Sustainability & Carbon Management Steering Group (S&CMSG) and reports on our progress to Council via the University Executive Board (UEB). S&CMSG is currently reviewing our strategy, policy and targets and will present some options to UEB.

Summary

- Electricity use down 2% over last 2 years despite two major new buildings being built (4.5% or £160k worth of improvement if these are taken into account).

- Energy consumption and water usage lower than 12 years ago despite significant growth over that period. When growth taken into account:
  - Electricity use per m^2 floor area 26% lower
  - Gas use per m^2 floor area 28% lower
  - Water use per m^2 floor area 42% lower
  - Saving £1.5m annually

- Carbon emissions down 22% since 2005, a period of significant growth in the University's student population and physical infrastructure. Emissions per m^2 building floor area are down 42% over the same period. Review of carbon strategy and targets underway.

- Self-generated electricity now accounts for almost 9% of total use – CHP (Combined Heat and Power) plants generated £300k worth of electricity, enough to power 600 houses, while also recycling their waste heat on site.

- 4,724 bags of charity donations collected and donated to British Heart Foundation instead of going to landfill, raising £60k from 'end of term' unwanted food, clothing, crockery and appliances.

- Accommodation and Hospitality Services maintained certification to the ISO 14001 Environmental Management standard, and ran the 'Protecting What Matters', 'Leave No Trace', and 'Student Switch Off' campaigns.

- Electricity costs rising significantly; energy bills likely to increase by £1-2m over next 3-4 years due to price increases and planned University expansion.

- University continues to operate with 100% green renewable electricity supply, now across the whole estate.

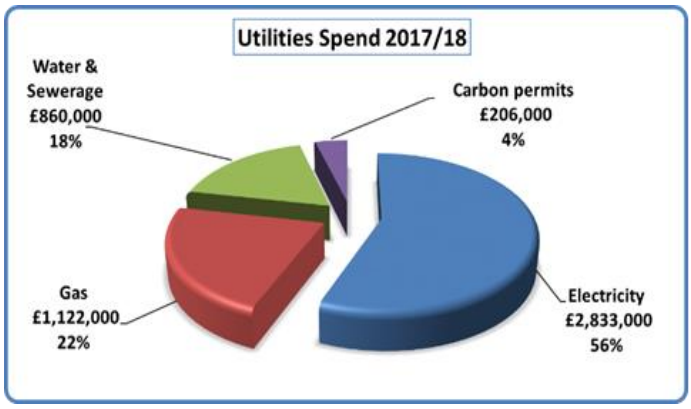
- A 'Fairtrade University' since 2009, and awarded Fairtrade Gold awards in 2018 and 2019.

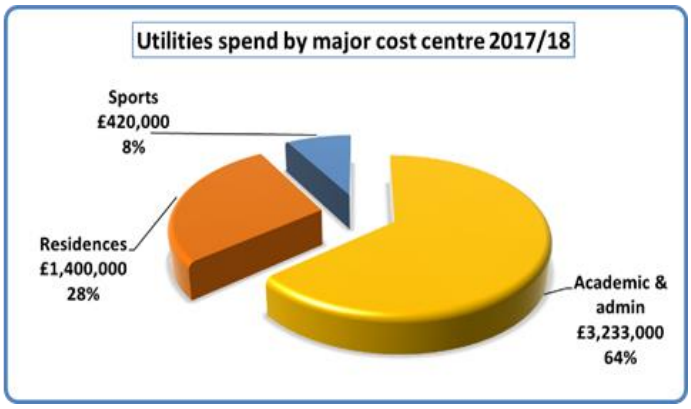
- Sustainability & Citizenship is a key theme of the Curriculum Transformation project

1.0 ENERGY AND WATER USE

1.1 Financial Impact

Spend on utilities was around £5 million in 2017/18. As can be seen this is dominated by electricity costs. Residential and sports spend is not insignificant, but the rest of the University dominates the picture.





1.2 **Consumptions** (See Appendix 1 for graphs)

Comparing 2017/18 with recent years:

- electricity imported (i.e. bought) down 2% in 2 years despite completion of two major new buildings (4ES and 10W)
- if taking new build into account then electricity 4.5% down in 2 years, saving £160k a year
- electricity per unit building floor area down by 7% in last 2 years
- self-generated electricity up 10% on last year - now at 8.5% of total University use (8% from combined heat & power and 0.5% from solar panels)
- gas use up 8% on last year but heavily weather-dependent (weather-corrected use down 3%)
- water use down by 3% on last year, saving £25k a year
- water use per unit building floor area 1,131 litres/m^2, down 3%

Electricity: Total electricity 'consumed' has been rising in recent years due to new buildings and growth in student numbers. An increase in self-generation and energy efficiency savings have partially offset this. 2016/17 saw an absolute fall in electricity use, despite two major new buildings coming on line (4 East South and 10 West) and in 17/18 this level was maintained.

Gas: Heavily dependent on weather, data is 'normalised' using statistical temperature records. Last year was the coldest winter since 2012/13 (a particularly cold winter) and hence have corrected for this. The long-term trend is a reduction in gas use, even with a significant expansion in the Estate. Gas use also increases as our electricity generation increases through gas-fired CHP. However, this rise is more than offset by the financial and carbon savings.

Water use was up in 2015/16 due to a major leak in the underground supply pipework, plant failure in two separate buildings, and refilling of the swimming pool after repairs. Since then, however, consumption has returned to previous levels, with an overall trend downwards.

Longer term trends:
Long term trends still tend downwards, with all utilities still below 2005/6 levels. The graphs in Appendix 1 also highlight the influence of recent new buildings on consumptions. Over the 12 year period the following buildings/facilities have been added (not all shown on graphs):

- 4 South Annexe
- Woodland Court
- 4 West
- 5 West server room
- East Building
- Student Centre
- 1 West phase 1 (extension)
- Chancellors' Building
- The Quads/Lime Tree
- The Edge
- Virgil Building
- 10 West
- 4 East South

This expansion continues apace, with Polden and Milner buildings recently completed. **Due to ongoing work on efficiency the annual usage of energy and water has actually reduced by around £0.5m-worth over this period, despite this significant growth**. Factoring in this growth, whilst also allowing for any old buildings/facilities that have been discontinued, **annual energy spend is £1.5m less than it would have been otherwise thanks to our efforts. This trend, however, is going to be harder to maintain as most of the 'easy wins' in energy efficiency have been completed. Much potential remains but will require significant investment with longer financial paybacks.**

Taking growth into account, consumption data per m^2 building floor area shows the efficiency of our built estate has significantly increased:

- Electricity use per m^2 floor area 26% down in 12 years
- Gas use per m^2 floor area 28% down in 12 years (weather-corrected)
- Water use per m^2 floor area 42% down in 12 years

2.0 IMPROVEMENTS MADE

2.1 Technical improvements

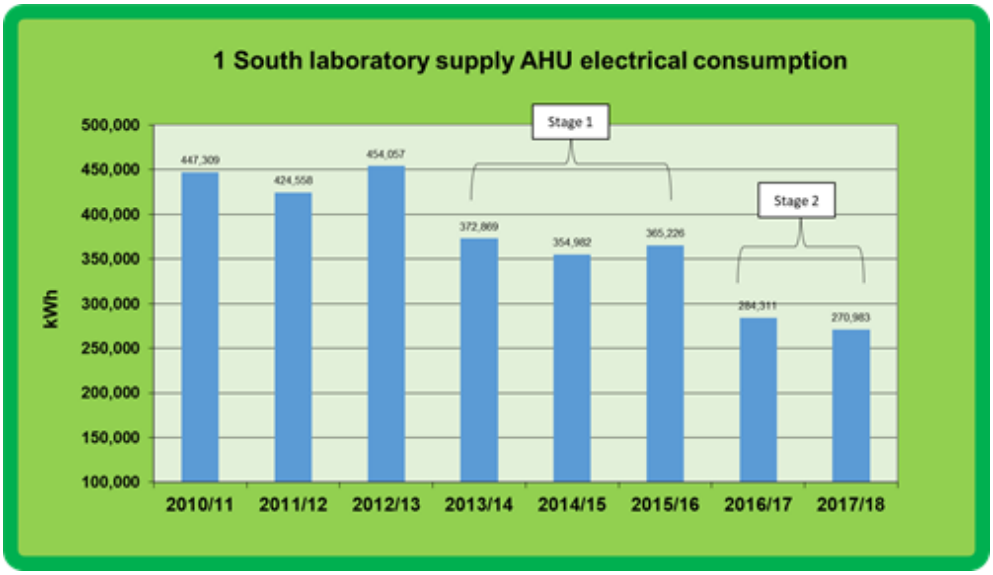
A number of improvements have been implemented since the last report. These include:

Main boiler house – a major £7m investment has been made to upgrade our district heating system that feeds the main Parade buildings. The boilers have been replaced by high efficiency units with improved controls. The whole network has been changed to a more flexible, reliable and effective method of heating these core buildings. The new system will save approx. 10% in gas use, saving £50k and 370 tCO_2 annually

Lighting upgrades to deploy the latest LED fittings with automatic controls and daylight dimming. LED fittings have an added benefit of a longer life and lower maintenance cost compared to standard lamps. Critically, these works also improve the appearance of the refurbished areas, enhancing the teaching and learning environment. Areas recently improved include: Library level 1, STV concourse, Sprint Track, Dojo, Eastwood housing, the Underdeck, Wessex House staircases, and 2 large lecture theatres in 5 West. The Library is now fully LED across all 5 floors – the lighting costs to this building have been cut by 70%, saving £35k a year and 100 tonnes CO_2, lowering maintenance costs and transforming the appearance of the area. Lighting upgrades have been carried out to a significant proportion of the estate

– although there is much still to do, the remaining areas will involve longer financial paybacks, typically 8-12 years.

In **1 South** a major water reduction was made in 2017, working with academics and technicians. New chillers for Chemistry lab equipment were bought; a £24k investment has led to the building's water use being more than halved, saving 11,000,000 litres/year, equivalent to £30k/year and 4% of the total University water use. Also in 1 South, an ongoing project to upgrade the fume cupboard ventilation systems is now showing good savings. Firstly the supply air control system was upgraded, and secondly, the three supply Air Handling Units (AHUs) had their belt driven fans replaced with more efficient direct mounted plug-fans. The graphs below shows how electricity use has reduced by 40% saving £25k and 75 tCO_2 every year, with further improvements to come.



2.2 Student Switch Off

The award-winning student residences energy-saving competition '[Student Switch Off](#)' has run for the 12th year and continues to deliver savings and raise awareness with new students. Last year nearly 2000 first year students signed up and pledged to behave in an energy efficient way, a record number. Students are provided with top tips on the web, competitions, quizzes, training, and regular updates including how much electricity they have been using. A 'Beer & Curry' prize is awarded to the winning hall, and there are a number of other prizes given away during the competition.

This campaign runs at over 40 universities in the UK; Bath continues to be a leader amongst these in implementation. Thanks to a combined effort between Estates, AHS staff, the SU, and student volunteers, higher levels of engagement are achieved than most other institutes. Last year 56 student 'ambassadors' were recruited and trained to undertake peer-to-peer promotions, with links to the SU's Bath Award scheme.

2.3 Metering

2,000 'smart' meters continuously monitor gas, electricity, water and heat usage across campus. Consumption data feeds back every half hour, creating a powerful information system collecting half a million data points every week. This data source is vital to allow our energy use to be managed in a

targeted manner. Analysis of the data highlights energy wastage, allows prioritisation of areas for improvement, and measures the impact of energy efficiency projects. It can also be used to flag up problems with buildings and plant, or with supplies (such as underground water leaks), and allow these to be fixed before they affect building users.

2.4 Self- generation

Renewables
Our solar photovoltaic (PV) generation capacity continues to grow with systems in place on:

- East building - 24kW (peak generation)
- Chancellors' Building - 50kW
- 10 West - 22kW
- 4 East South - 36kW

These systems generated 95,000 units of electricity (~£12k worth) in 2017/18.
(see http://www.bath.ac.uk/estates/docs/Chancellors_PV.pdf for more details).
A new system is currently being installed on the roof of Polden. This is our biggest system (70kW) and will generate approx. 63,000 units a year, worth £8.5k. There is some scope for further roof-mounted PV systems and plans are being developed to maximise our capacity, but the maximum will generate only 1-2% of our current annual demand,

Four blocks of the Westwood residences, Woodland Court and 4 West all benefit from solar thermal systems. Used to generate hot water they produce around 22,000kWh of heat each year.

Combined Heat & Power (CHP)
Gas-powered CHP is a particularly efficient form of generating electricity as it allows the waste heat to be 'recycled' locally on site. There are now 4 CHP engines on campus:

- CHP for Chancellors' Building and The Quads: installed 2013, with waste heat going to provide heating and hot water to both buildings, saving £85k and 350 tonnes CO_2 each year.
- CHP in Sports Training Village: installed in 1997, with waste heat going to heat the swimming pool. This typically saves £35k and 90 tCO_2 each year.
- 2 'mini' CHP engines supply electricity and hot water to the new Polden residences

These systems generated 2.2 million units of electricity in 2017/18, enough to power 600 houses and a financial value of around £300k. They also generated around 2.5 million units of heat that was captured and used on campus; this heat would have otherwise been wasted through conventional generation at a power station. (For more info see http://www.bath.ac.uk/estates/energy-sustainability-environment/The_University_Power_Stations.html)

2.5 New buildings

BREEAM (Building Research Establishment Environmental Assessment Methodology) is used on major new buildings as an 'eco-design' process. BREEAM is not always formally implemented but used in a pragmatic way, enhanced with specific targets for energy and carbon efficiency. Industry best practice around 'Soft Landings' is also implemented with new and refurbished buildings. This approach has been used on the newly built Milner Centre and Polden student residences. Both have been built with enhanced insulation, beyond the minimum required by building regulations, with excellent airtightness, sophisticated lighting and controls, and natural ventilation where possible. Polden also has a novel intelligent heating control system that allows user control of the electric heating with

automatic shut off when rooms are empty or windows open, combined with a pair of small CHPs to provide hot water to the building.

3.0 UTILITY FINANCIALS

3.1 Procurement

Flexible energy procurement contracts are used to procure electricity and gas rather than the traditional fixed price, fixed term contracts. This 'hedging' approach allows purchases up to 18 months in advance and responses to changing market conditions, capturing market falls, defending against market rises, and minimising risk.

The University collaborates with around 40 other universities and public sector bodies through a consortium which operates a framework contract and trading 'basket'. In 17/18 a saving of £563k was achieved through this method (£63k cashable, £96k cost avoidance, and £403k traded). This has been partly through trading strategy and through aggregation with other universities. Since the start of the flexible frameworks in 2011 a total saving of £4.68m has been achieved.

Electricity is bought on a 'green' renewables tariff; this applies to 100% of the campus electricity supply and all our off-campus supplies too. Long term Power Purchase Agreements are also being investigated for a portion of our supply direct from a renewables developer.

3.2 Longer term costs

Gas and power costs are subject to global markets and are heavily influenced by the international oil price. This commodity cost is only a proportion of the overall electricity price; non-commodity charges (Climate Change Levy, Renewables Obligation, distribution and transmission charges etc.) now make up over 60% of the price of electricity and are increasing significantly. This rise is in part to pay for UK investment in renewables, infrastructure, and other new generating plant (e.g. Hinkley Point C). These charges are set by government, OFGEM and the distribution companies and are set to increase significantly over the next few years. The impact of these are **a 30-40% cost increase over the next 3-4 years i.e. an extra £1.5m annual cost to the University, even without any growth in the Estate.**

The University has significant peak electricity charges during the winter weekday peak hours of 5-7pm. As well as reducing demand during this time, self-generation can be used to offset these costs, hence another significant benefit of CHP – our CHP systems are designed to run during this period every day. The use of battery storage to minimise these costs is being investigated, along with other demand side response approaches.

Competition in the commercial water market for commercial customers has recently been introduced via OFWAT, but so far this has had only a marginal financial effect, with no real benefit to the University. This will be kept under review.

3.3 Funds for investment

In 2015 the University successfully bid for £600k from a HEFCE/SALIX Revolving Green Fund for investment in efficiency projects adding to our existing £250k fund. These are both 'revolving' funds whereby energy savings are fed back into the fund for future use and hence are self-replenishing. Both funds continue to be re-invested in energy saving projects. The first revolving fund has now been spent 3 times over.

4.0 CARBON

4.1 Carbon Management Plan (CMP) and progress against targets

For 2017/18 our carbon emissions were

- 19,122 tCO_2, down 6% on last year
- 73 tCO_2/m^2 floor area, also down 6%

In April 2011 the University produced a Carbon Management Plan (CMP) including the following target for reducing emissions:

- To reduce our direct Scope 1 and 2 CO_2 emissions (due to electricity and gas use) by 43% by 2020 from a 2005 baseline

This target is an absolute target i.e. any growth will clearly make the targets even harder to achieve. The target was set before the major changes in funding in the UK HE sector and before major expansion in the University. It allowed for a degree of growth, but actual growth has been much greater than anticipated and hence our original carbon targets are increasingly challenging. A review of the University's carbon targets is underway

A 22% reduction has been achieved, and we expect to achieve a 34% reduction by 2020. If there had been no growth the target would have been achieved. The University is performing better than the sector average with 59% of universities projected to not meet their original 2020 emissions targets. In terms of relative carbon emissions, CO_2 per m^2 building floor area is 42% down since 2005. The relative CO_2 per student and CO_2 per £ financial turnover have fallen by similar amounts.

As well as the weather, a factor outside our control that has an effect on our carbon figures is the grid conversion rate from a unit of electricity to CO_2. These are set each year by government (DEFRA) and are calculated according to the changing UK electricity generation mix. These have been falling generally in recent years but the factor fell significantly last year and this is expected to continue as greater low carbon generation is used. There are also a number of differing interpretations of how carbon emissions should be calculated and reported. As an example, carbon accounting for green tariffs is complex and although all our electricity is certified as renewable supply this is not claimed as zero carbon. Actual energy use as well as carbon emissions will be continue to be reported using DEFRA guidance, being open and clear about any assumptions.

4.2 Carbon legislation

Carbon Reduction Commitment (CRC)
This legislation requires the University to purchase annual carbon emissions permits, with an annual cost of around £350k to the University. This legislation is to be replaced by a simpler carbon levy in April 2019. Under this legislation our emissions were 17,644 tCO_2 in the year to April 2018 (a different carbon accounting methodology is used by this legislation).

Display Energy Certificates (DECs)
This legislation requires all public-sector buildings to display a certificate showing the energy performance of a building based on actual consumption, and must be updated annually. It shows a rating based on a comparison with a theoretical benchmark building. Also shown on a DEC are the ratings for the previous two years showing if the energy performance of the building is improving.

The University has to provide 68 DECs. Many of our science/laboratory buildings are poorly rated due to the simplistic benchmark for laboratories, and due to the energy-intensive research equipment in the buildings concerned. Our ratings in all categories have improved with an overall improvement of 29%

for the campus since 2009. An interactive website showing all our DECs is at http://bathuni.energyprojects.net/

5.0 TRANSPORT

Our Environmental Policy includes a specific objective to minimise carbon emissions from regular commuting to and from campus by encouraging the use of car sharing, public transport, cycling or walking. It is estimated that in 2018, 55.4% of all staff and students trips to campus were by bus, with 7% on foot, and 2.6% by bicycle, despite the hilly topography from the city centre to campus.

The University monitors emissions associated with commuting travel using the biennial travel surveys and will, once baseline data has been established, calculate the same for business travel. The last travel survey was undertaken in 2014 and the emissions per annum for staff and student commuting (based on 2017/18 staff and student numbers) are:

- Staff 2,339 tCO_2 equivalent
- Student 2,123 tCO_2 equivalent
- 0.252 tCO_2 per FTE staff/student

The University has operated a travel plan for the campus since 2002. It has implemented a number of transport improvements in recent years.

- In 2016 the University updated its Travel Plan which included targets to reduce car trips to the Claverton Campus per staff/student head by 1% per annum for the next five years and provide 2,219 car parking spaces on campus by 2017, holding the number of spaces more or less stable compared with our 2209 spaces in 2003.
- The University Travel Plan was reaccredited with a Gold Award by Travelwest
- A number of promotional activities have taken place, including the Travelwest Roadshow, Bike Doctor and Bike To Work free breakfasts.
- The University continues to run a carshare scheme, cycle purchase scheme, electric bike trial scheme, walking network, and provides interest-free loans for public transport season tickets (see http://www.bath.ac.uk/estates/about/transport/ for further details)
- Further electric car charging points have been installed, taking the total to 14 on campus, plus 5 charging points for Estates electric vehicles. Additionally, the Virgil Building has also had an electric charging point installed.
- First Bus has upgraded its fleet to the University with new lower emissions vehicles.
- In 2018 Planning permission for improvements to the Arrivals Square were approved as part of the School of Management development along with provision of additional cycle parking on campus.

It should also be noted that, under a S106 agreement with BANES which ended in 2013, the University made an annual contribution to the Council which was used to subsidise the 20A/C bus that serves the University but also provides many other benefits to the wider community. However, the University has committed to an additional £400,000 (index linked) to be drawn down by the Council as required to continue to subsidise the provision of the 20A/C service up to 2027. Following changes to the 20A/C service the index linked subsidy has been made available to support the re-routed U2 service from the start of the 2018/19 academic year.

Set against the staff and student population increasing by around 46% between 2007/8 and 2017/18, the annual transport surveys indicate that in this period:

- Daily vehicle flows have decreased by 4%
- Car trips per FTE staff/student head have fallen 34%

- Bus trips per FTE staff/student head have risen 29%
- Cycle/Walk trips per FTE staff/student head have risen 62%

6.0 BIODIVERSITY

The University is responsible for the woodlands and parkland areas of the campus. It operates a LEMP (Landscape and Ecological Management Plan). The following recent improvements have been made:

- Work has continued to improve pathways through the wooded areas on campus to improve the social amenity as well as actively supporting bat life on campus by providing suitable flight routes.
- Removal of some non-native flora from woodland areas and ongoing replacement with native wildflower species.
- The pond created in 2014 has become well established.
- 350 tonnes of fallen leaves are collected each year, which after composting will be used to help grass and planting schemes.
- Waste coffee grounds from all coffee outlets on campus are mixed with leaf mulch to go back on flower borders and grassed areas, or used to feed the indoor plants.

A number of trees have been removed as a result of campus developments; in accordance with our tree strategy, each tree has been replaced with one or more saplings. In Limekiln Woodlands 90 native trees including silver birch, beech, hornbeam, mulberry, mountain ash and elm were planted to replace the trees lost in developing 4 East South building; the 10 West Planting Project used trees and plants of value for wildlife, particularly bees and birds.

As part of the Arrivals Square development, trees to the south of the Square will need to be removed. These will be replaced with 120-130 native trees, 1,700m² of mixed native shrubs and 690m of native mixed and single species hedges in locations on and off campus. An ecological consultant is also developing a campus-wide tree management plan to provide long term management and development of our campus green infrastructure. A hibernaculum will be installed in the woodland areas to encourage hedgehogs, and also some bug/insect hotels to increase the insect population generally.

7.0 SUSTAINABLE PROCUREMENT

In Sept 2018 the University's Sustainability and Carbon Management Steering Group approved a new 'Responsible Procurement Code of Practice'. This replaced the previous Sustainable Procurement Policy. The new Code of Practice acknowledges that over recent years there has been recognition across industry that previous definitions of Sustainable Procurement which encompass the traditional 'three pillars' of 'Environmental, Social, and Economical', do not stretch far enough to cover some of the more recent considerations that must be made when procuring the products and services that organisations require. Beyond the three pillars (and the standard price and quality considerations), this now includes broader ethical considerations such as bribery and corruption, fraud and human rights abuse as required under the Modern Slavery Act.

To support the practical implementation of the Responsible Procurement Code of Practice the University has developed a tool that will help identify the level of risk and/or potential opportunities that may exist when procuring goods and services across the full range of categories that the University procures. This new tool uses market knowledge to populate a category matrix and is updated as risk and opportunities change and emerge. This information is used to help manage each category of expenditure and inform how the University should approach individual procurement exercises.

The Fairtrade Foundation awarded the University of Bath Fairtrade Status in 2009. The University won a gold award for Best Fairtrade University at the South West Fairtrade Business Awards in both 2018 and 2019 in recognition of our commitment to ethical and responsible food sourcing. The University promotes the awareness and sale of Fairtrade products through promotional events during Fairtrade Fortnight, a range of Fairtrade products in eateries, including all tea and coffee, and information about Fairtrade products displayed in commercial outlets and online. In retail outlets are over 130 Fairtrade products and Fairtrade products are sold throughout our hospitality outlets across the University. Fairtrade tea, coffee and sugar is served as standard at all internal meetings, conferences and events and can be purchased through our in-house catering service, Food Direct.

In 2016/17 the regional purchasing consortium has estimated our indirect (Scope 3) carbon emissions due to our purchasing spend to be around 39,000 tonnes CO_2, with the following breakdown:

- Construction 18,600 (47%)
- Misc. manufactured products 6,250 (16%)
- Food and drink 5,500 (14%)
- IT 2,900 (7%)
- Business services 2,900 (7%)
- Paper products 1,500 (4%)
- Waste and water 700 (2%)

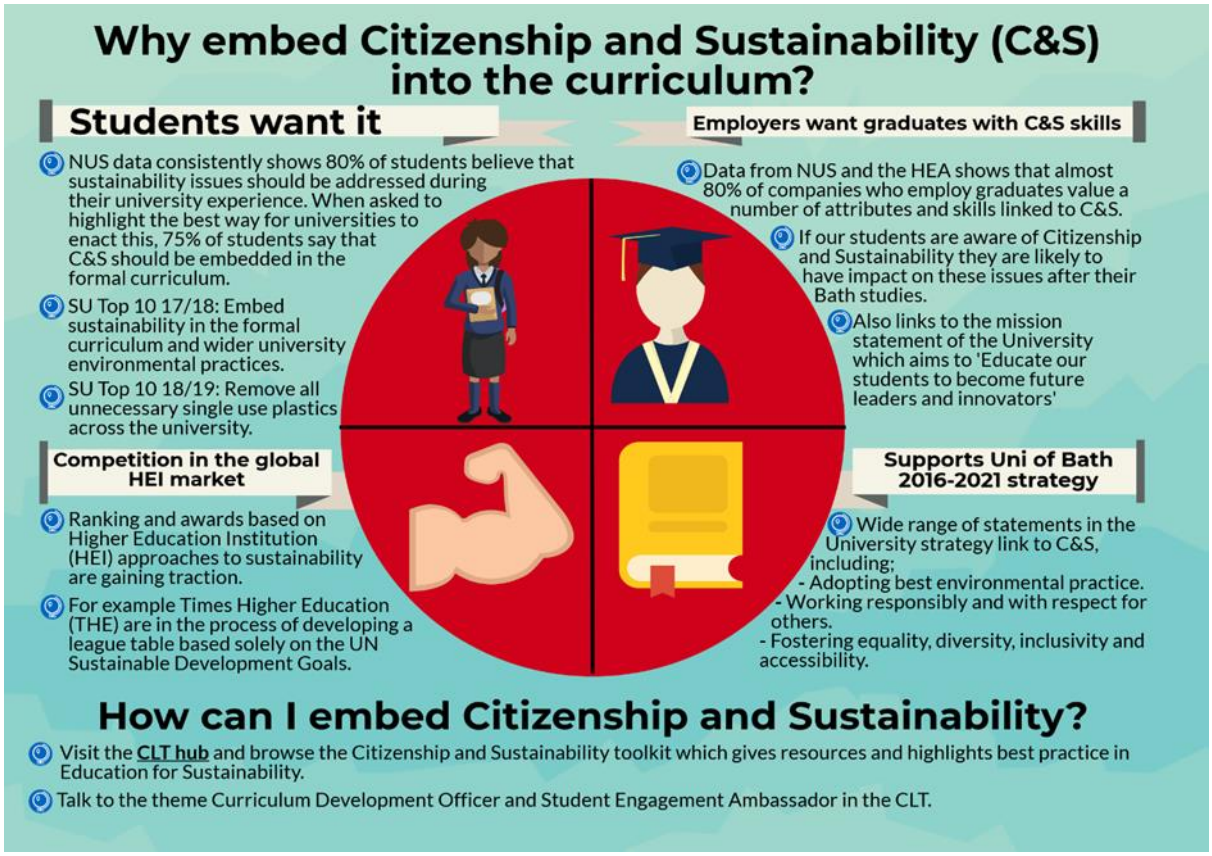
8.0 CURRICULUM

Citizenship and sustainability in the curriculum

In summer 2018, four Curriculum Development Officers (CDO) and four Student Engagement Ambassadors (SEA) joined the Centre for Learning & Teaching (CLT) to support the University's curriculum review project. One CDO and one SEA work collaboratively to, amongst other things, support the embedding of the principle of Citizenship & Sustainability into the University's curricula. Citizenship & Sustainability is one of 8 principles that underpin the curriculum review project.

Recognising the need for a shared understanding of the principle, guides have been created to inform staff and students what the principle of Citizenship & Sustainability means, and provide context as to why it should be embedded into curricula. Furthermore, the SEA has been engaging with University data and carrying out subsequent focus groups to determine the extent to which students understand the broad remit of the term sustainability. An 'off the shelf' workshop has been designed and created by the SEA in order to help staff to engage their students with the principle, identify where the principle is already embedded in their course and encourage students to suggest ways in which the principle could be further addressed in their studies. The guides and workshop are available on the CLT Hub Citizenship & Sustainability page.

The CLT hub page has been designed by the CDO and SEA to support staff, providing examples of where and how the principle is already embedded into courses at Bath, as well as external examples and highlighting of curriculum development resources and tools. Use of the NUS' Sustainability Skills infographic during curriculum review reflection workshops with the Faculty of Science has also aided staff to recognise where Citizenship & Sustainability is already embedded in their course, as well as identify opportunities for its further incorporation into their reviewed curricula. Support and guidance will continue to be provided to curriculum development teams as they progress towards the next, more detailed phase of the curriculum review and design project, requiring them to design courses that embed the 8 principles of the project.



9.0 OTHER

9.1 Accommodation & Hospitality Services (AHS)

AHS continue to be highly active operating under an ISO 14001 Environmental Management System across all their operations. The department runs a number of initiatives under the 'Protecting What Matters' and 'Leave No Trace' campaigns and supports initiatives such as 'Student Switch Off'.

The Leave No Trace initiative won the award for Best Marketing Campaign at the annual College and University Business Officers awards. The campaign launched in 2016 across the University's accommodation, hospitality and retail outlets. Leave No Trace encourages all University students, staff and visitors to reduce their environmental impact.

The Leave no Trace loyalty card scheme is run in all outlets to help reduce the number of disposable containers used. If a reusable mug or food container is used in place of a disposable alternative, a stamp on a loyalty card and a discount of 20p is received when someone buys a hot drink, soft drink or take away meal. Nine stamps results in £2 off a food or drink purchase. In 2017/18 **16%** of all AHS purchases were when someone brought their own container. In September 2018 a 10p charge for disposable coffee cups was introduced to further encourage people to bring their own mug and reduce the number of disposable cups used.

AHS has also been working on minimising unnecessary single use plastics. This started in September 2017 reducing straws, plastic cutlery, plastic cups, coffee cup lids and containers. In September 2018 the project expanded to all sections within AHS and has already had an impact, including drastically reducing the amount of cleaning bottles used each month and linen no longer being wrapped in plastic.

The end of term Leave no Trace campaign run in conjunction with the Students' Union, the Student Community Partnership, the local council and Bath Spa University has continued to be successful with 4,724 bags of charity donations given to the British Heart Foundation which has raised an estimated £59,836 for the charity, a record since the campaign began in 2013. A further 7 tonnes of items were collected for charity including 1 tonne of food for Foodbank.

9.2 Students' Union

Our students are increasingly aware of the environmental impacts of not only their own activities, but also the practices of the University, as evidenced by the latest SU Top 10. Particular areas of focus for campaigns have previously been divestment from fossil fuels and sustainability in the curriculum, with a focus currently on reducing plastic waste. Other activities have included:

- A number of Farmers' Markets have been run using local ethical suppliers.
- An 'Urban Beach Clean' litter-pick: the V Team, Bath Spa University, local residents and the charity Whale and Dolphin Conservation joined together to conduct the very first Urban Beach Clean in Bath starting from campus and covering routes around the city centre. A total of 50 bags of waste were collected in one area of Bath alone.
- Beach Cleans at Chesil Beach and Sand Bay, Weston Super Mare: the Marine Conservation Society organise regular beach clean/surveys and a total of 27 students took part in these events.
- SU/School of Management partnership event: The Big Picture Challenge was an extra-curricular enterprise activity run over five weeks in the first semester of the 18/19 academic year. Thirty-eight students from all disciplines and all levels of study (MBA to first year) worked in teams through a design-thinking process to generate and test ideas to tackle food waste.

9.3 School of Management – Principles of Responsible Management Education (PRME)

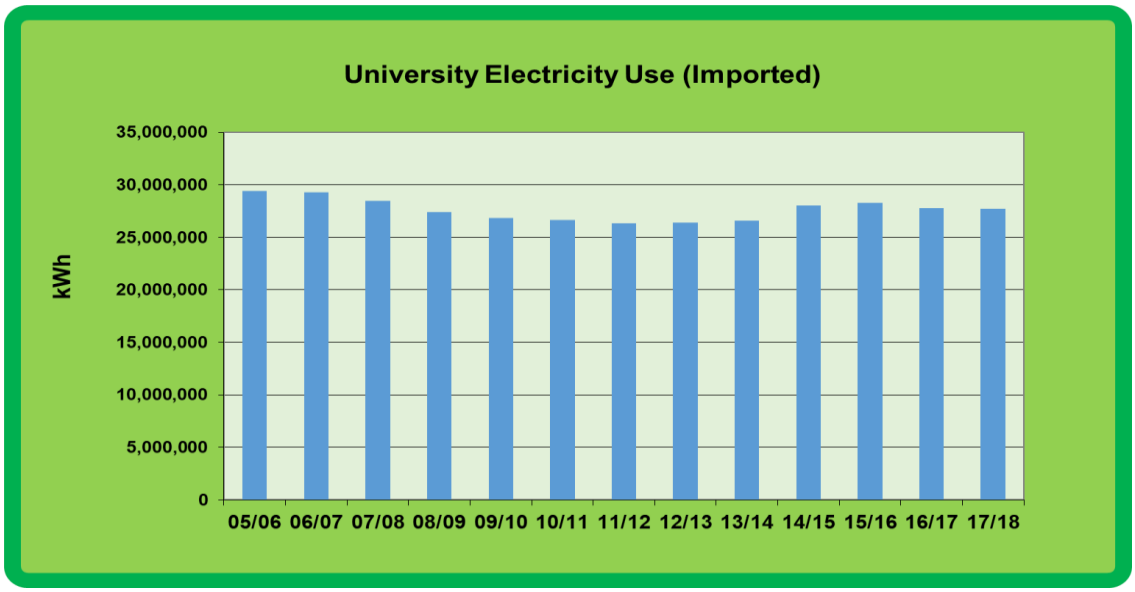
The School of Management has been recognised for its commitment to sustainability and has signed up to PRME, a United Nations-supported scheme founded in 2007. Its aim is to raise the profile of sustainability in business schools worldwide. As part of the process, institutions share information on progress reports every two years. PRME have formally recognised the University following our first submission. Reviewers assessed how sustainability and ethics was promoted through our courses and research. The School remains committed to sustainability, and will continue to work on improving sustainability-based teaching, increasing awareness of sustainability teaching, and furthering research in this area.

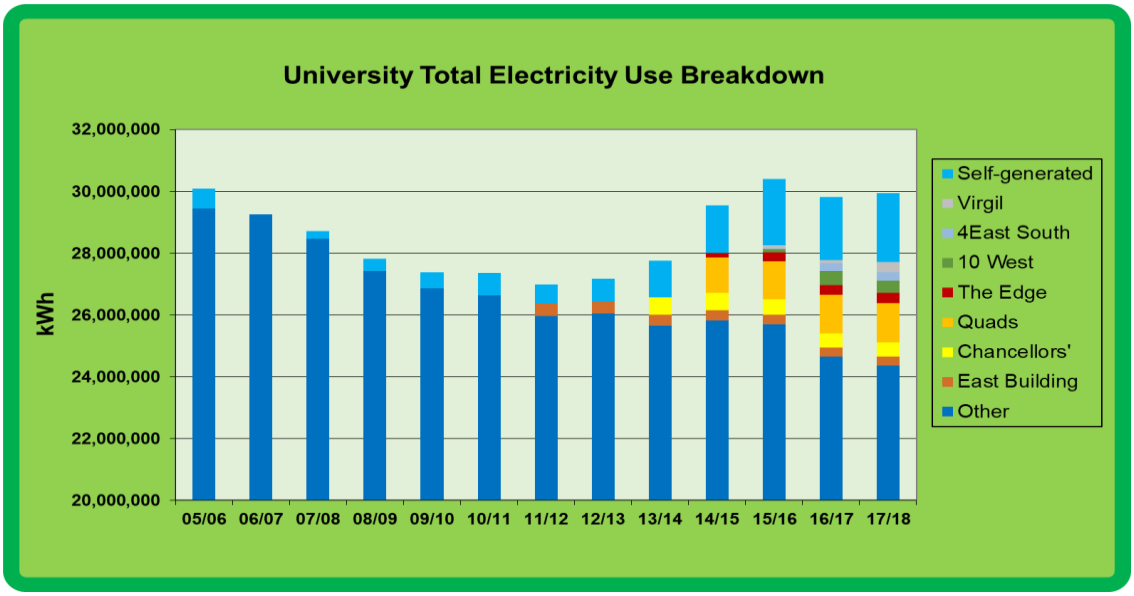
10.0 UNIVERSITY SUSTAINABILITY RESEARCH

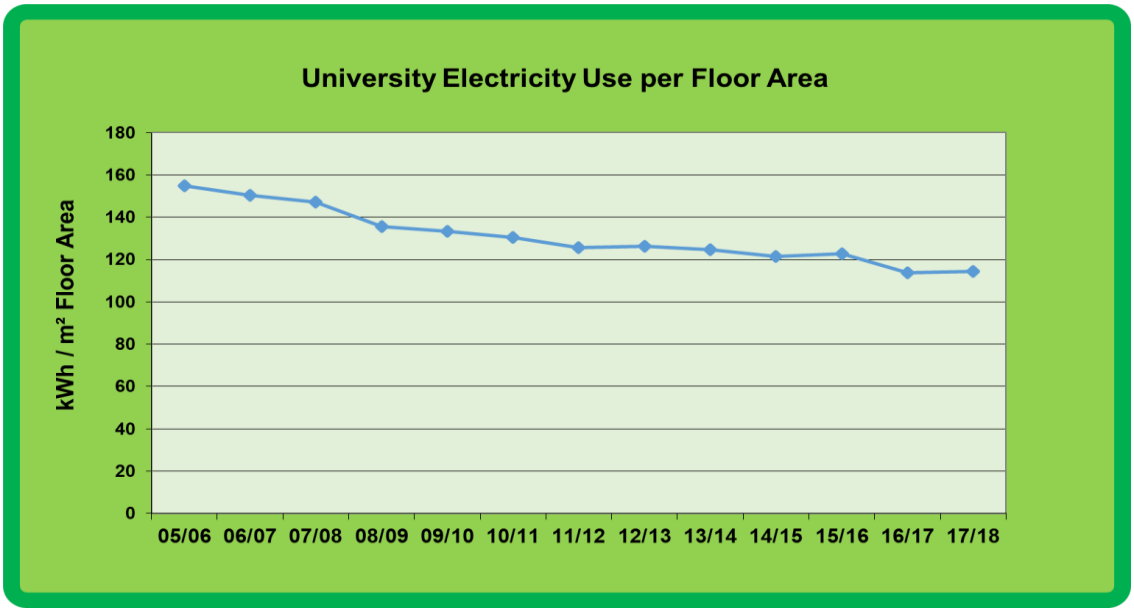
Although this report is predominantly focussed on 'operational' sustainability matters for the University, it should be highlighted that much of the research the University carries out also has significant positive environmental impact. For more details of our sustainability research see http://www.bath.ac.uk/research/ and http://www.bath.ac.uk/i-see/

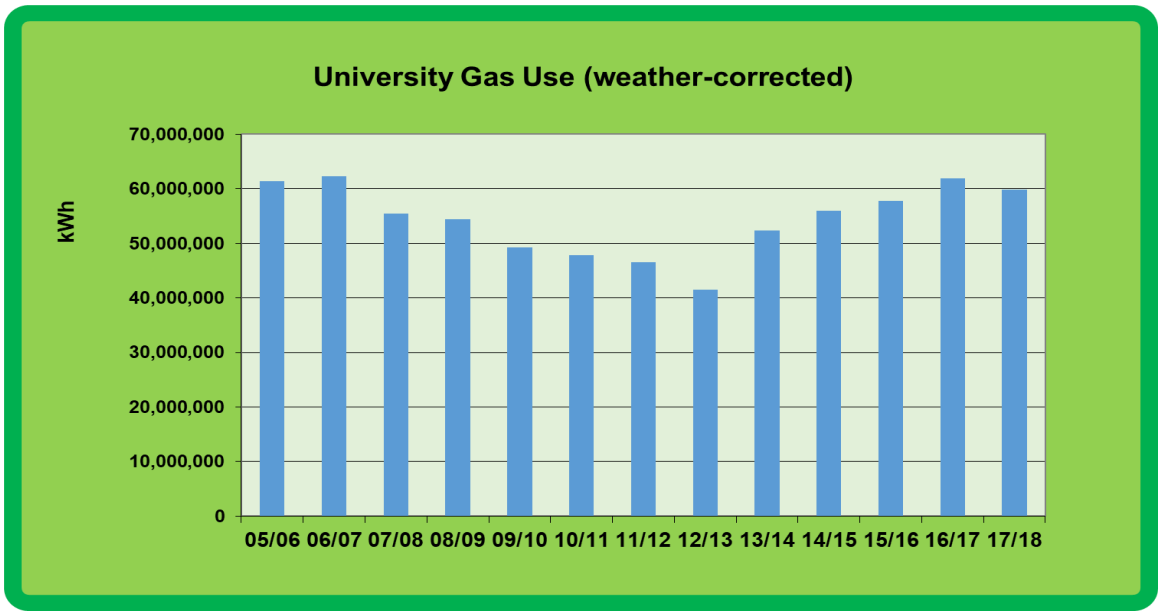
Peter Phelps - Energy and Environment Manager, on behalf of the Sustainability & Carbon Management Steering Group (S&CMSG)

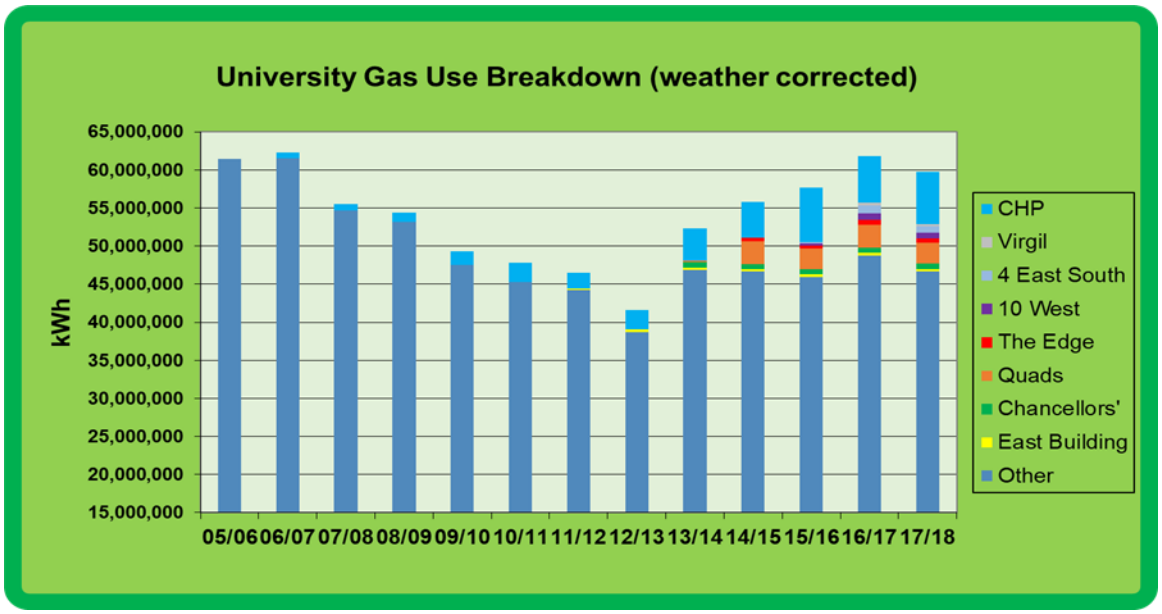
APPENDIX 1 – Energy and Carbon graphs

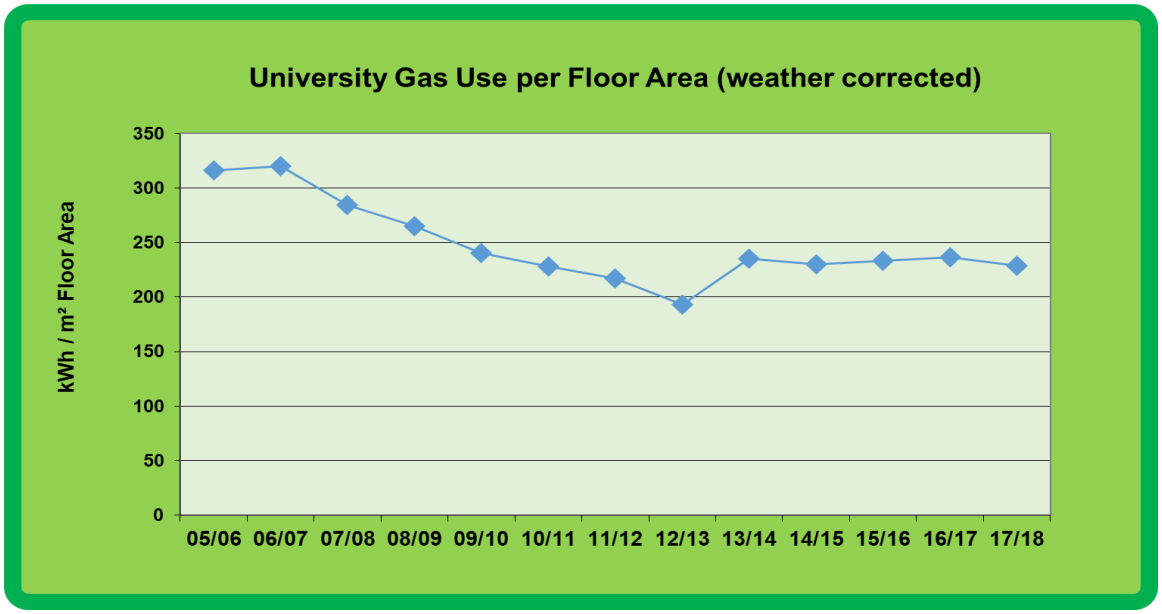


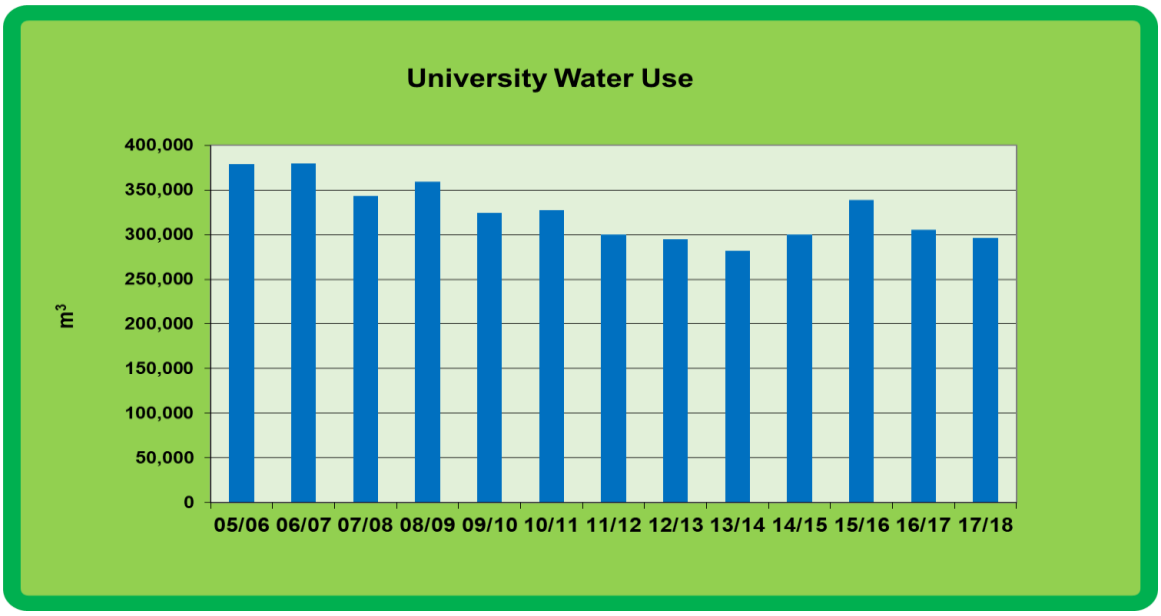


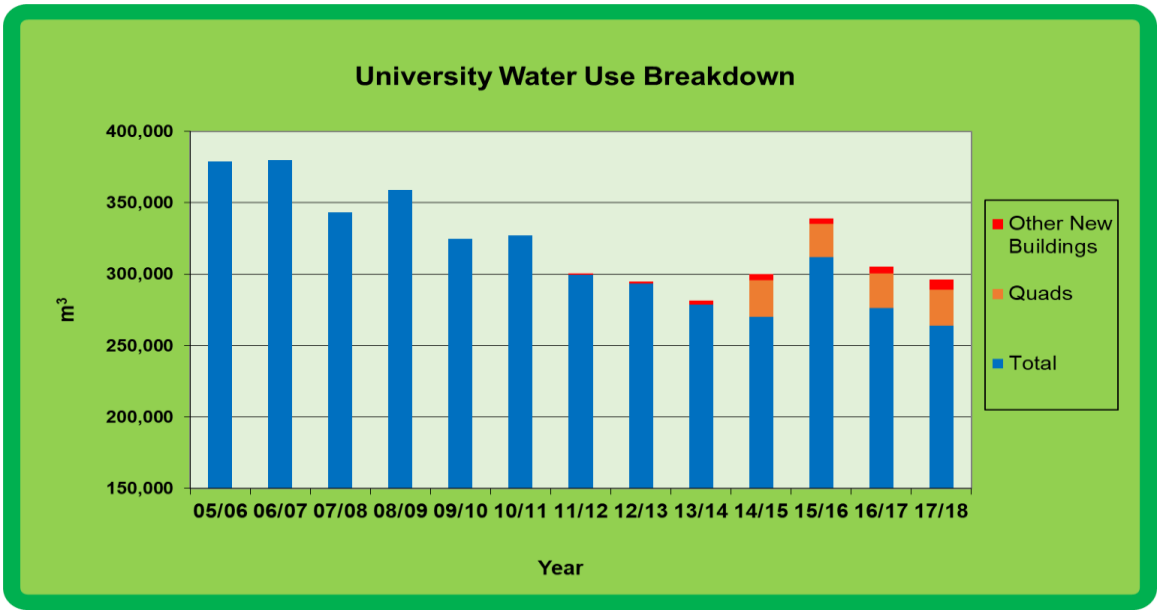


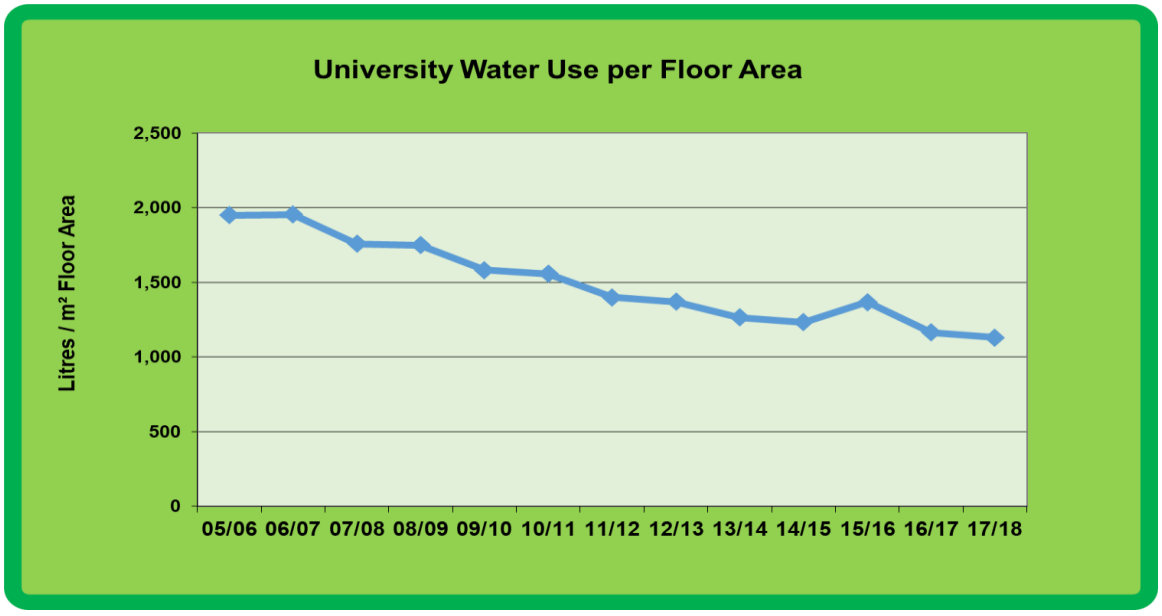

University Gas Use (weather-corrected)
kWh
70,000,000
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
10,000,000
0
05/06 06/07 07/08 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17 17/18

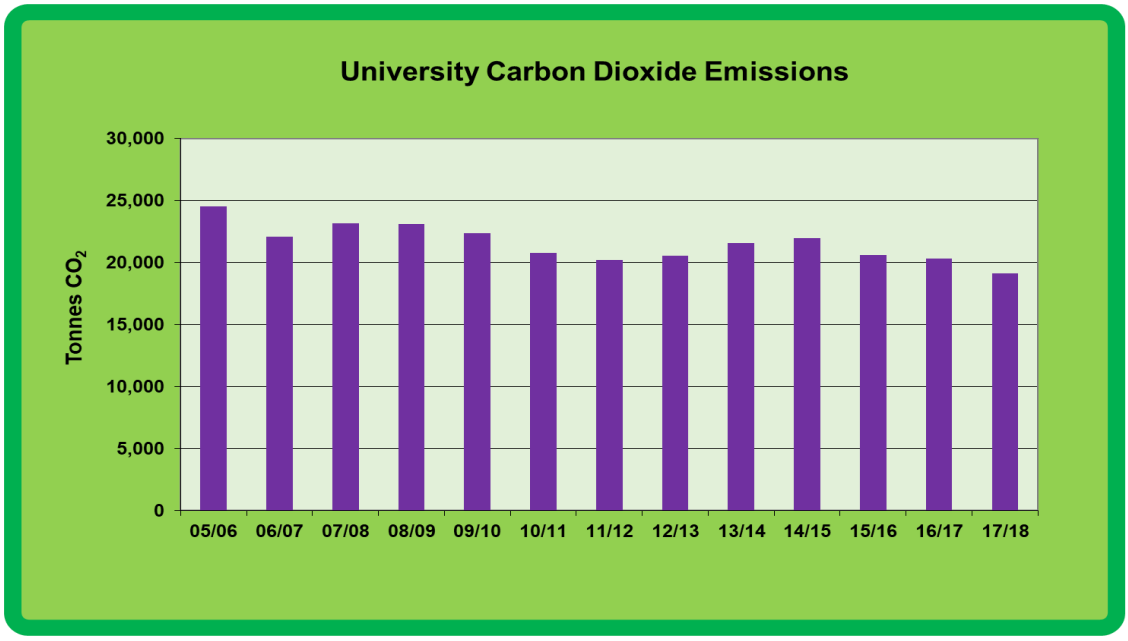

University Gas Use Breakdown (weather corrected)
kWh
65,000,000
60,000,000
55,000,000
50,000,000
45,000,000
40,000,000
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
05/06 06/07 07/08 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17 17/18
CHP
Virgil
4 East South
10 West
The Edge
Quads
Chancellors'
East Building
Other

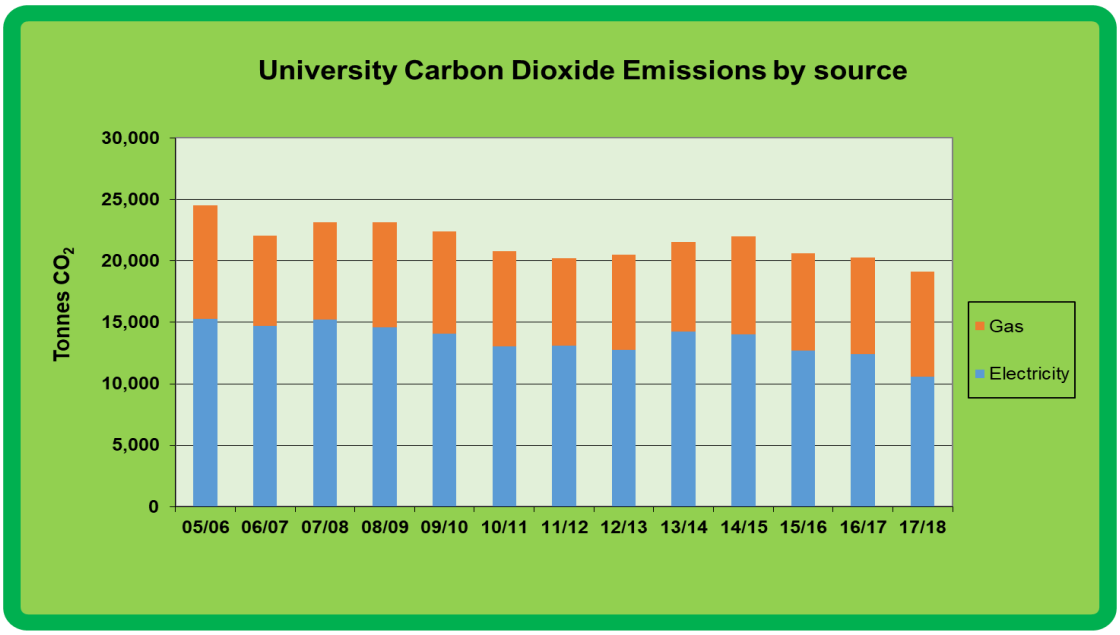

University Gas Use per Floor Area (weather corrected)
kWh / m² Floor Area
350
300
250
200
150
100
50
0
05/06 06/07 07/08 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17 17/18

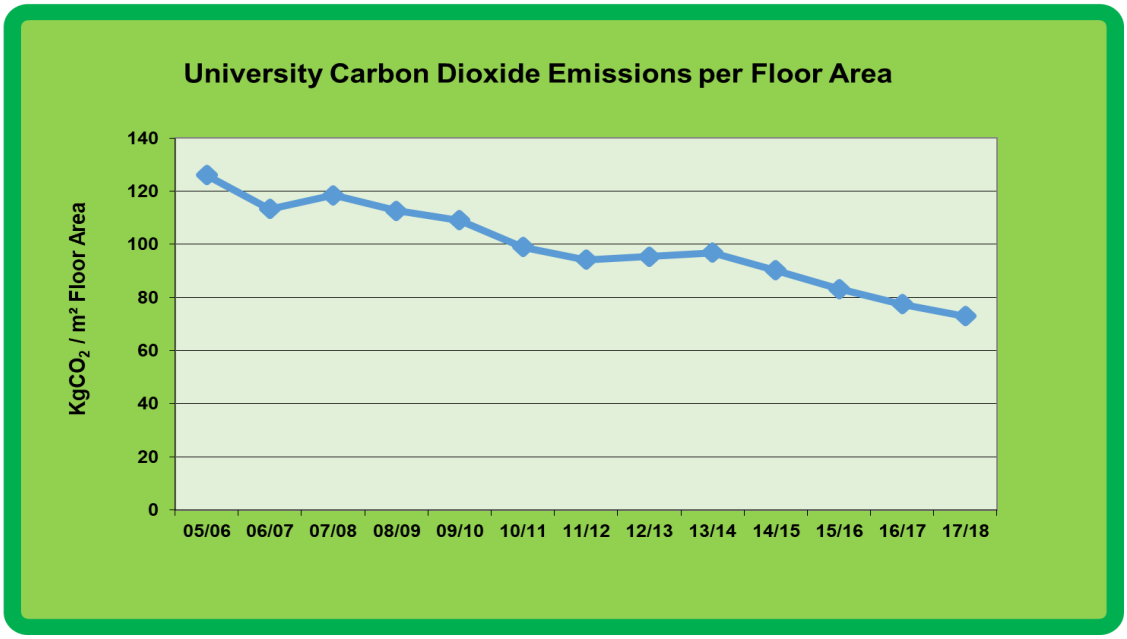

University Water Use
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
m3
05/06 06/07 07/08 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17 17/18


University Water Use Breakdown
400,000
350,000
300,000
250,000
200,000
150,000
m3
Other New Buildings
Quads
Total
05/06 06/07 07/08 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17 17/18
Year


University Water Use per Floor Area
2,500
2,000
1,500
1,000
500
0
Litres / m² Floor Area
05/06 06/07 07/08 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17 17/18


University Carbon Dioxide Emissions
Tonnes CO2
30,000
25,000
20,000
15,000
10,000
5,000
0
05/06 06/07 07/08 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17 17/18


University Carbon Dioxide Emissions by source
Tonnes CO2
30,000
25,000
20,000
15,000
10,000
5,000
0
05/06 06/07 07/08 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17 17/18
Gas
Electricity


University Carbon Dioxide Emissions per Floor Area
KgCO2 / m² Floor Area
140
120
100
80
60
40
20
0
05/06 06/07 07/08 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17 17/18