

Annual Energy and Environment Report: January 2017

The new University Strategy to 2021 reaffirms that one of our core values is a commitment to environmental best practice. Our latest 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 University Executive Committee and to Council.

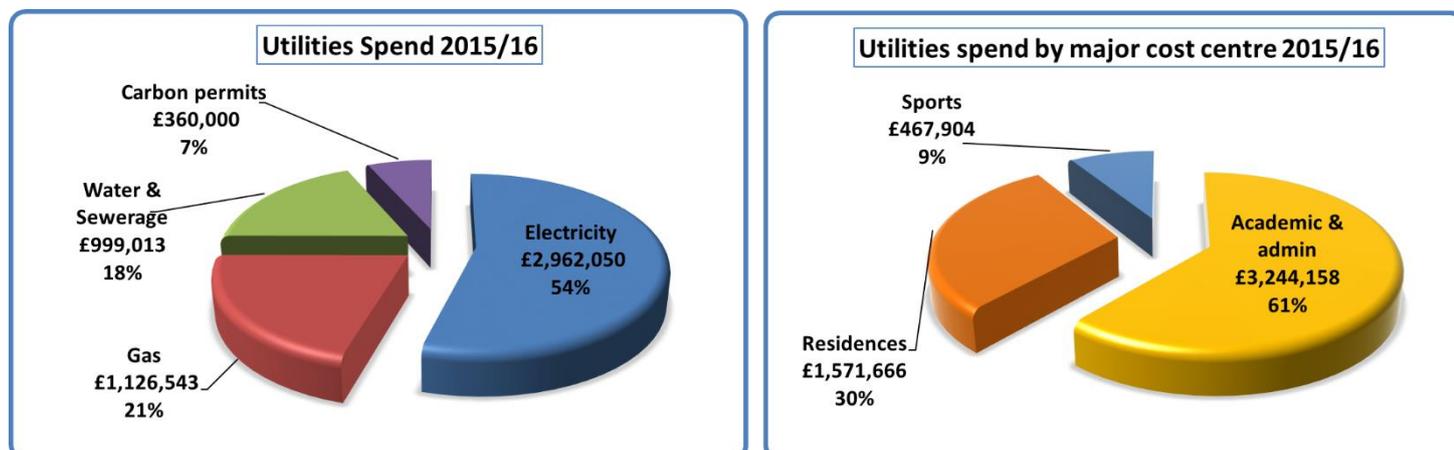
Summary of Achievements

- Energy consumption and water usage lower than 10 years ago despite significant growth:
 - Electricity use per m² floor area 25% lower
 - Gas use per m² floor area 29% lower
 - Water use per m² floor area 30% lower
 - Saving £0.6m annually, or £1.5m accounting for growthAbsolute energy consumption in 2015/16 comparable to that in 2014/15.
- Carbon emissions for 2015/16 are down 16% since 2005, a period that has seen significant growth in the University's student population and physical infrastructure. Emissions per m² building floor area are down 34%.
- Self-generation of electricity now accounts for 8% of our total electricity use – our CHP (Combined Heat and Power) plants have generated 2 million units of electricity this year, enough to power 600 houses, and have recycled over 2.5 million units of heat.
- Solar panels on our new 10 West and 4 East South buildings, opened in 2015/16, have almost doubled our total capacity.
- Investment of over £1m has been made in LED lighting improvements in the last 12 months.
- Recycling rates have increased from 36% to 54% in 2 years. Last summer the University collected 27 tonnes of 'end of term' unwanted food, clothing, crockery and appliances that were donated to charities instead of going to landfill.
- University of Bath became the first UK university to introduce large scale coffee cup recycling.
- Accommodation and Hospitality Services maintained certification to the ISO 14001 Environmental Management standard, and ran the 'Leave No Trace' and 'Student Switch Off' campaigns.
- Campus now operating with 100% green renewable electricity supply.
- Reaccredited with a Gold Award for the Travelwest Travel Plan Accreditation Scheme.

ENERGY AND WATER USE

1.1 Financial Impact

We spent around £5.4 million in 2015/16 on utilities:



1.2 Consumptions (See Appendix 1 for graphs showing 10-year trends.)

Comparing 2015/16 with the previous year:

- electricity imported (i.e. bought) up 1%
- electricity consumed up 3%
- self-generated electricity up 42% – now at 8% of total University use (7.5% from Combined Heat & Power and 0.5% from solar panels)
- gas held level, though up 1% taking weather into account
- water 12% up

Electricity: From the graphs it can be seen that the total electricity ‘consumed’ has been rising in recent years due to new buildings and other growth, but our increase in self-generation and efficiency savings have partially offset this.

Gas use is heavily dependent on weather so we ‘normalise’ our data using statistical temperature records. The long term trend is a reduction in gas use, even though we have delivered a significant expansion in the Estate. The last 2 years’ weather was statistically similar to 2007/8 but consumption was down 11% excluding new build. Gas use will also increase as we use CHP more, but this is more than offset in financial and carbon savings by the electricity produced.

Water use was up on last year due to a major leak in the underground supply pipework, plant failure in 2 separate buildings, and refilling of the swimming pool after repairs.

Longer term trends:

These are still downwards, with electricity, gas and water use still well below 2005/6 levels. The graphs also highlight the influence of recent new buildings on consumptions. Over the 10 year period the following buildings/facilities have been added: 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, and The Edge, with 10 West and 4 East South being added in 2016. We have reduced our annual usage of energy and water by around £0.6m-worth over this period, despite this significant growth. Factoring in this growth, whilst also allowing for any old buildings/facilities that have been discontinued, **we are spending about £1.5m less annually than we would have otherwise.**

To take growth into account consumption data per m² building floor area has also been presented.

- Electricity use per m² floor area 25% down in 10 years
- Gas use per m² floor area 29% down in 10 years (weather-corrected)
- Water use per m² floor area 30% down in 10 years

2.0 IMPROVEMENTS MADE

2.1 Technical improvements

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

Lighting upgrades to the latest high efficiency LED fittings with automatic controls and daylight dimming to various areas such as Library levels 2, 4 and 5, the swimming pool, the underdeck, and corridors in 1 South, 5 West, 7 West and 9 West. Two major areas in the Sports Training Village were also upgraded:

- Multi-purpose Sports Hall – £150k investment to save £16k and 70tCO₂/year
- Tennis Hall - £200k investment to replace over 400 fittings, halving the consumption and saving £22k and 95tCO₂/year

As part of general refurbishments to buildings we have also upgraded the lighting to LED fittings in large sections of 6 East, 4 East, 2 East, Pulteney Court and Eastwood residences. More efficient LED fittings have an added benefit of longer life and lower maintenance cost, as well as improving the appearance of the refurbished areas. We have invested well over £1m in lighting projects over the last 12 months alone.

IT projects – our Computing Services department has implemented auto-powerdown software on 300 more PCs taking the total to 1500 PCs across campus saving £90k and 390tCO₂ annually, with further roll-out to come. A process of server ‘virtualisation’ also continues with over 230 servers having been virtualised onto 10 physical servers, saving at least £15k and 65tCO₂.

Other recent technical improvements in other areas include:

- 1 South ventilation controls upgrade – now achieving £15k/year savings in electricity with more savings to come
- Boiler replacements for more efficient models in Estates, 5 West annexe, Pulteney Court and Eastwood residences

2.2 Student Switch Off

The student residences energy-saving competition ‘Student Switch Off’ has run for a 10th year and continues to deliver savings and raise awareness with new students. Over 1500 first year students have signed up and pledged to behave in an energy efficient way. 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, and we continue to be a leader amongst these in our implementation, with a high level of engagement. We are also part of a select group to access EU funds to extend Student Switch Off into Europe, and to add live data feedback to our competition. A web-based ‘dashboard’ has been developed which utilises live data from our ‘smart’ metering system to give students feedback on their consumption.

2.3 Metering

We now have close to 2000 meters for gas, electricity, water and heat across campus. The majority are automated i.e. they are ‘smart meters’ connected to our remote monitoring system. Consumption data feeds back every half hour, creating a sector-leading information system collecting half a million data points every week.

This data source is vital to allow our energy use to be managed and reduced as it highlights energy wastage, allows prioritisation of areas for improvement and measures the impact of improvements made, whether a lighting upgrade or a change to a heating control system. The number of meters continues to increase as the system is developed, and as new buildings are added – 4 East South has 43 new meters, and 10 West has 62. We have also made

substantial investment to improve resilience and future capacity in the network, and are trialling new web-based software that will be used to share the data via dashboards.

2.4 Self-generation

Renewables

We have solar thermal systems generating hot water on 4 student residence blocks in Westwood, and systems on Woodland Court and 4 West. These typically generate around 22,000kWh heat each year.

We now also have the following solar photovoltaic (PV) systems in place:

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

These systems will typically generate 115,000 units of electricity (~£14k worth) each year (see http://www.bath.ac.uk/estates/docs/Chancellors_PV.pdf for more details).

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. We have 2 CHP engines:

- CHP for Chancellors' Building/The Quads: installed 2013, with waste heat going to provide heating and hot water to both buildings. This makes £15 net saving for every hour it runs = £85k/year and 350 tonnes CO₂ saved.
- CHP in Sports Training Village: installed in 1997, with waste heat going to heat the swimming pool. £7/hour saving = £35k/year and 90tCO₂ saved.

These systems have generated over 2 million units of electricity in 2015/16, with a value of around £250k, enough to power 600 houses.

(For more info see http://www.bath.ac.uk/estates/energy-sustainability-environment/The_University_Power_Stations.html)

2.5 New buildings

We have used BREEAM (Building Research Establishment Environmental Assessment Methodology) as an 'eco-design' process for many years. We do not always formally implement BREEAM on new builds, but use the method in a pragmatic way, and have enhanced this with specific targets for energy and carbon efficiency. Both 10 West and 4 East South have been designed to a high EPC (Energy Performance Certificate) 'B' standard. We are also implementing much of the industry best practice 'Soft Landings' approach to new and refurbished buildings. We are using a similar approach on the Milner Centre and Polden student residences.

10 West and 4 East South have both been built to high energy standards, with excellent levels of insulation and airtightness 4 times better than the normal building regulations demand. They have sophisticated heating and ventilation controls, and high efficiency automated lighting. As with all new buildings there is settling down period, with ongoing work to optimise these buildings for maximum efficiency.

3.0 UTILITY FINANCIALS

3.1 Energy Procurement

We operate on flexible energy procurement contracts rather than the traditional fixed price, fixed term contracts, which allow any market falls to be captured, while defending against market rises. The key advantage is to allow a budget figure to be better 'defended' and the risk to be spread across several separate purchasing decisions. The supplier 'risk margin' will also be lower, and in a falling market the savings can be locked in. In a rising market a variety of trigger mechanisms and a risk framework allow protection of the budgeted spend. This

'hedging' approach allows us to purchase up to 18 months in advance and respond rapidly to changing market conditions.

We collaborate with around 40 universities and other public sector bodies by taking part in a framework contract and trading 'basket' operated by The Energy Consortium. This year we have achieved a saving of £907k through this method (£152k cashable, £78k cost avoidance, and £677k traded). This has been partly through trading strategy and through aggregation with other universities in the trading 'basket'. We have also successfully managed the transition to new suppliers within this framework contract.

We have always bought as high a proportion as possible of our electricity on a 'green' renewables tariff; changes to the rules governing renewables and the Climate Change Levy have allowed us to now make this apply to 100% of the campus electricity supply.

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 to pay for UK investment in renewables, infrastructure, and new generating plant. These are set by government, OFGEM and the distribution companies and are continuing to increase significantly by around 5-10% each year.

We are also subject to stringent peak electricity charges: a unit of electricity during the winter weekday peak hours of 5-7pm costs over twice that of a normal unit, and this peak period premium is set to continue to increase as a reflection of the national 'supply gap'. 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.

Competition in the commercial water market is being introduced this year but it is expected this will have only a marginal effect on prices.

3.3 Funds for investment

In 2015 we successfully bid for £600k from a new HEFCE/SALIX Revolving Green Fund for investment in efficiency projects. This has been fully spent on lighting projects, and adds 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 until no further suitable projects can be found.

4.0 CARBON

4.1 Carbon Management Plan (CMP) and progress against targets

We are continuing to make progress but our carbon targets are increasingly challenging given the scale of recent and planned campus growth, and hence a review of these targets is currently underway. In April 2011 the University produced a Carbon Management Plan (CMP) including targets for reducing emissions:

- To reduce emissions by 19% by 2014/15 against a 2008/9 baseline target (the period of the CMP)
- To reduce our Scope 1 and 2 CO₂ emissions by 43% by 2020 from a 2005 baseline

These targets were absolute targets i.e. any growth will clearly make the targets much harder to achieve. These targets were set before the major changes in funding in the UK HE sector, and while they allowed for a degree of growth in the University, the actual growth has been much greater than anticipated. In last year's report we reported against the shorter-term target – we did not achieve this but had achieved a 5% reduction in absolute emissions whilst growing significantly. Against the longer term 2020 target we have so far achieved a 16%

reduction. In the UK 71% of universities are projected to not meet their 2020 emissions targets.

In terms of relative carbon emissions:

- CO₂ per m² building floor area - 20% down over the period of the CMP; 34% down in last 10 years
- CO₂ per student – 21% down during CMP; 38% down in 10 years
- CO₂ per £ financial turnover – 31% down during CMP; 55% down in 10 years

As well as growth, a factor that influences our gas use and hence carbon emissions significantly is the weather. For example, carbon emissions rose in 2012/13 predominantly due to the weather – gas usage was up by 8% due to the cold winter and spring.

Apart from the weather, another factor outside our control that has an effect on our carbon figures is the assumed conversion rate from kWh of electricity to CO₂. These are set each year by government (DEFRA) and can change according to the changing UK electricity generation mix. These have been falling generally in recent years but can fluctuate e.g. the 'dash for coal' increased the grid factor by 11% in 2014. There are a number of differing interpretations of how carbon emissions should be reported, with no standardised approach to these changing grid factors. The assumption made is that we will continue to report actual energy use as well as carbon emissions, and to follow DEFRA guidelines and use the most up to date annual grid conversion factors, but also to be open and clear about our assumptions.

4.2 Carbon legislation

Carbon Reduction Commitment (CRC)

This legislation commenced in April 2010 as an emissions trading scheme whereby all organisations of a certain scale have to annually purchase emissions permits, at an initial fixed price of £12/tonne CO₂. In effect this is now a simple Carbon Tax – the price per tonne for this year has now risen to £16.50, with an annual cost of around £360k to the University. This legislation is currently under review by government and is expected to be replaced by a simpler carbon levy, but with similar (and rising) costs. Under this legislation our emissions were 21,940 tCO₂ in the year to April 2016.

Display Energy Certificates (DECs)

This legislation requires all public sector buildings above 250m² floor area to display a certificate showing the energy performance of a building based on actual consumption, and must be updated annually. It shows an 'A to G' rating based on a comparison with a theoretical benchmark building with a performance typical of its type, where A is the lowest CO₂ emissions (best) and G is the highest emissions (worst). Also shown on a DEC are the ratings for the previous two years; this provides information on whether the energy performance of the building is improving or not.

Including off-site residences the University now has to provide 68 DECs. We have a significant number of poorly rated science/laboratory buildings, but this is partly due to the simplistic benchmark for laboratories, and due to the energy-intensive research equipment in the buildings concerned. We have reduced the number of G rated buildings from 8 in 2009 to 5 this year. We have an interactive website showing all our DECs – see <http://bathuni.energyprojects.net/>

5.0 WASTE AND RECYCLING

The recycling rate for 2015/16 has reached 54% for the waste which is disposed of in the bins across campus, which is a significant improvement on the 36% rate in 2013/14.

Some of the key operational improvements this year have included:

- Food waste bins have been introduced in a small number of staff kitchens to see how much food waste can be diverted from the general waste. Staff have embraced the trial and it is hoped to roll out food waste bins across all staff kitchens in the future.
- Skips - all of the general waste collected in skips is pre-treated before either being disposed of in landfill or at an energy from waste facility. This diverted over 96 tonnes of waste from landfill in 2015/16. Greater segregation of materials previously disposed of in skips has led to an increase in recycling of metals and wood with over 49 tonnes and 44 tonnes respectively recycled in 2015/16.
- Reuse - there has been a focus on prioritising reuse over disposal with particular successes with furniture, IT equipment (not containing data), mattresses and bedding. An average of 21% of IT waste is reused and over 70% of bedding.
- Coffee Cups - 25 coffee cup recycling bins have been located around campus giving staff and students the opportunity to recycle all disposable coffee cups. The cups are taken to a recycling facility in Cornwall where they are made into items such as pens and pencils. The scheme has the potential to divert over 650,000 disposable cups per year from the general waste stream.
- Carton (tetra paks) recycling has been introduced to all Halls of Residence; this means that all the cartons have been recycled rather than being disposed of as general waste.

Some of the key campaigns have been:

- Across Accommodation & Hospitality Services 'Leave no Trace' has been rebranded to have a focus across different aspects of the whole department. One focus is on reducing the amount of disposables (coffee cups, cups and take away containers) used in catering outlets. Customers bringing their own container get a 20p discount off their purchase and receive a loyalty stamp, 10 stamps gives them up to £2 off a purchase. The scheme has been very successful with a significant increase in the number of discounts offered. In October, compared with last year:
 - 2015: 1,777 20p discounts from bringing their own cup
 - 2016: 7,240 20p discounts from bringing their own container/cup
- Hospitality offers a Munchbox scheme where at the end of service customers can purchase surplus food for a set price of £2.50. The scheme which also minimises food waste has been very popular with students and in September 2016 was rolled out to The Lime Tree, Fountain Canteen and Claverton Rooms.
- The Accommodation end of term waste campaign has continued to be a success with more unwanted items being diverted from the waste stream to a greater number of local charities. In 2015/16 over 27 tonnes of items were donated to the British Heart Foundation raising over £22,000 and a stall selling crockery to new students at the start of term raised £300 for Friends of the Earth. New links have been forged with local charities and community groups such as Scout Groups, Curo and SWALLOW, ensuring that donated items were distributed to those in need.



6.0 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. 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 2015/2016 staff and student numbers) are:

- Staff 2,089 tCO₂ equivalent
- Student 2,013 tCO₂ equivalent
- 0.255 tCO₂ per FTE staff/student (14% lower than 2014/15)

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

- 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 recredited 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, trial electric bike scheme, and walking network, and provides interest-free loans for public transport season tickets.
- Further electric car charging points have been installed, taking the total to 9 on campus, plus 5 charging points for Estates electric vehicles. Additionally, Manvers Street has also had an electric charging point installed.
- First Bus has upgraded its fleet to the University with new lower emissions vehicles.

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.

Set against the staff and student population increasing by around 32% between 2007 and 2015, the Annual transport surveys indicate that in this period:

- Daily vehicle flows have fallen 4.8%
- Car trips per FTE staff/student head have fallen 28%
- Bus trips per FTE staff/student head have risen 29%
- Cycle/Walk trips per FTE staff/student head have risen 39%

7.0 BIODIVERSITY

The University 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; this improves the social amenity as well as actively supporting bat life on campus by providing suitable flight routes.
- Ongoing work has been undertaken to remove non-native flora from woodland areas and to replace with native wildflower species.
- The Natural Pond created in 2014 is reported as having become well established, and there are plans to add more ferns to the stumpery.

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 will be planted in the spring to replace the trees lost in developing 4 East South building. Planting around our recent new builds is underway; the 10 West Planting Project uses trees and plants of value for wildlife particularly bees and birds, and a wildflower meadow is to be established along the front of 4 East South. The wildflower seed mix is a biodiversity mix grown for attracting butterflies, pollinating insects and small invertebrates. There will also be some planting of mulberry trees within the wildflower meadow.

8.0 SUSTAINABLE PROCUREMENT

In 2014 a new Sustainable Procurement Policy and Action Plan were approved. (<http://www.bath.ac.uk/purchasing/sustainability.bho/index.html>). All major procurements continue to be assessed for sustainability impact and appropriate criteria used during the supplier selection process. Recent examples of this include the retendering of the University's Travel Management Company where an allocation of 10% within the evaluation criteria was used to assess how the bidders could help the University achieve its corporate sustainability objectives and encourage individual travellers to consider sustainable travel choices. A similar approach was also taken during the procurement process to re-let the contract for a managed print service where an allocation of 3% within the evaluation criteria tested for energy usage of devices, supply chain, recycling initiatives and reuse/disposal of the existing fleet.

Looking ahead, the Department of Accommodation and Hospitality is exploring ways in which the University can further improve the sustainable sourcing of food across the various food outlets and catering services. Part of the eventual solution will inevitably involve utilising local supply chains to help reduce the mileage associated with the supply of food. Opportunities for a more collaborative approach with other large organisations within the region and with similar food requirements will be explored.

This year the regional purchasing consortium has estimated our indirect (Scope 3) carbon emissions due to our purchasing spend in 2015/16 to be around 71,000 tonnes CO₂, of which 65% was due to construction.

9.0 CURRICULUM

A sub-group reporting to the Sustainability & Carbon Management Steering Group (S&CMSG) has been set up to look at sustainability within our teaching across the University. Previous work has identified that 16% of all units and 7% of core units of existing teaching modules within the University included some explicit aspect of sustainability, and that about 27% of academic staff at Bath teach or research sustainability-related issues.

National research by the NUS also shows that 80% of students consistently believe that Sustainable Development (SD) should be actively incorporated in teaching and promoted by universities, and over two thirds believe that SD should be incorporated into all university courses. To build on this a final year project in the School of Management was sponsored which gathered evidence from Bath students and prospective employers; this was in line with national data, and this has been echoed by feedback the Students' Union has had.

A Teaching Development Fund bid is being used to start to develop a central resource and best practice guidance on teaching sustainability within the curriculum. The Department of Chemical Engineering, in conjunction with other departments, is looking to run a pilot project to respond to the increasing demands from accrediting bodies around sustainability in the curriculum. The School of Management has signed up to the Principles for Responsible Management Education which covers their research, teaching and operations. The MOOC on Sustainability for Professionals has continued to run twice a year. Also, a staff/PG student group has been established to organise climate change related events, such as Global Climate Change Week.

10.0 OTHER

10.1 ISO 14001 management system

Accommodation and Hospitality Services 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 'Leave No Trace' campaign and supports initiatives such as 'Student Switch Off' and 'Less Landfill = More Planet', and this year has trained all 250 staff in environment matters including tours of our solar panels and CHP units.

10.2 Students' Union

The Students' Union (SU) Environmental Policy promotes a change in behaviour to use fewer resources and recycle more and has established an elected student role of Environmental & Sustainability Rep. to boost environmental student activity. The SU is represented on S&CMSG and a regional green networking group involving the Department of Estates, Bath Spa University, the local council, Bath College and Wessex Water.

The SU, in conjunction with Estates, ran a Bath Goes Green event in October 2016 to promote environmental messages to students and staff, and this is now set to be a twice yearly event. This has provided a platform for a number of student societies to run activities such as a Vegan bake, a divestment campaign and an upcycling workshop, as well as for external organisations such as the local council energy/waste teams and local environmental organisations to run promotions. For the first time there has been an environmental element in the SU's Top 10, aiming to reduce waste across campus. At the start of term each year the Volunteering Team organise a beach clean in Weston-Super-Mare, and this year Freshers' Week included a number of environmentally-themed activities, including a cycle-powered cinema.

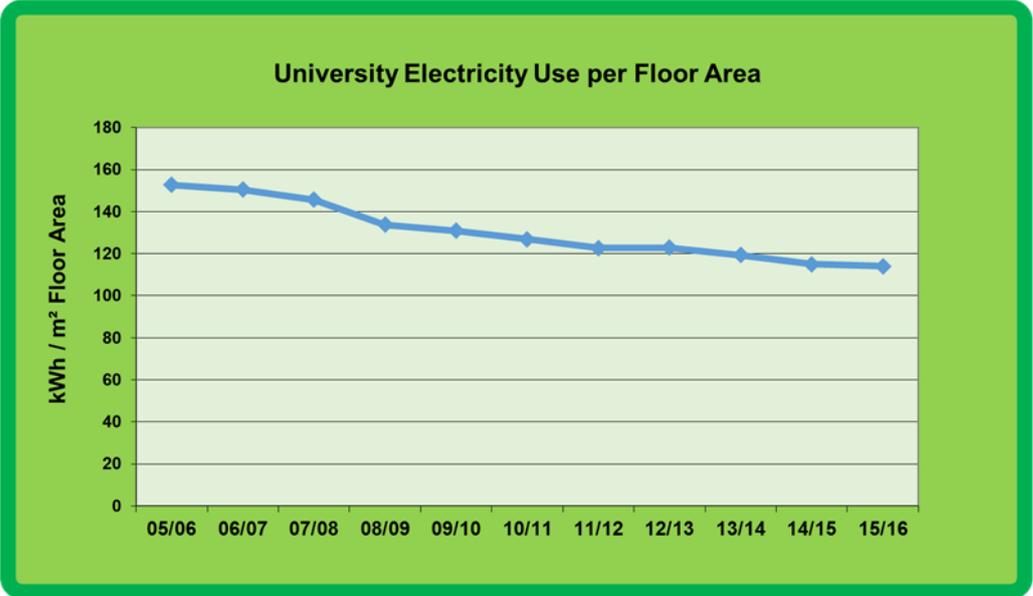
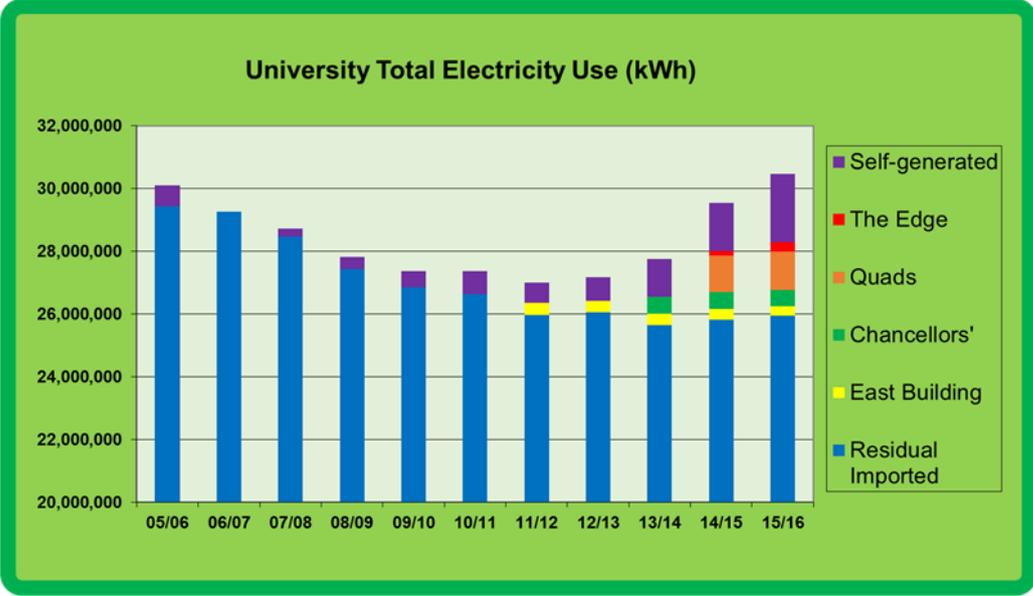
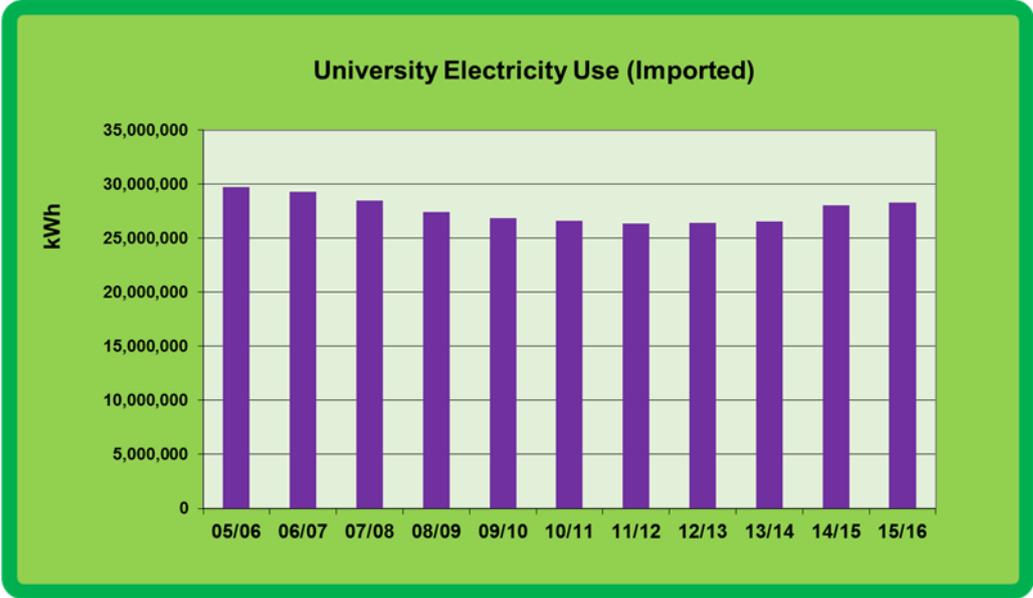
11.0 UNIVERSITY SUSTAINABILITY RESEARCH

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/>.

The Department of Estates currently sponsors 2 Psychology PhD students looking at behavioural change, in both transport and energy/water use.

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

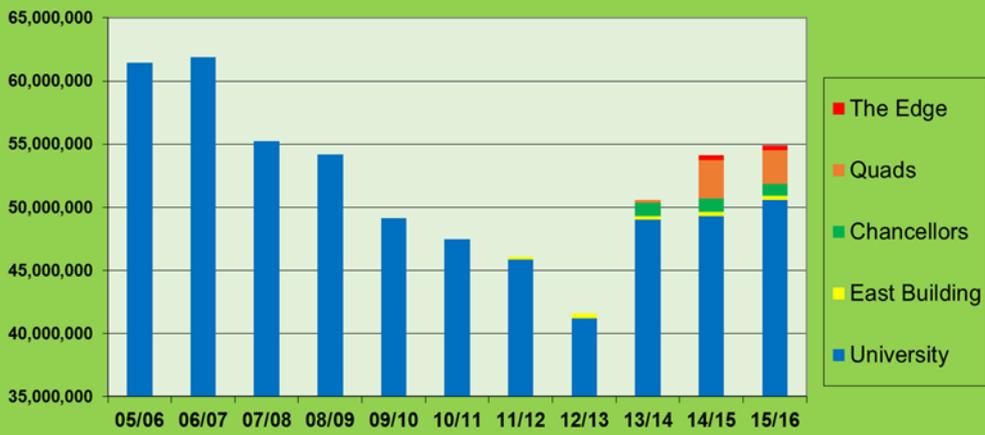
APPENDIX 1 – ENERGY AND CARBON GRAPHS



University Gas Use (weather-corrected)



University Gas Use (kWh) - weather corrected



University Gas Use (weather corrected) per Floor Area



University Water Use



University Water Consumption (m³)



University Water Use per Floor Area



University Carbon Dioxide Emissions



University Carbon Dioxide Emissions per Floor Area

