
Keele
University
Carbon Management Plan
2016-2020
Keele University

Carbon Management Plan 2016-2020:

Introduction

The need for action to tackle climate change is now greater than ever. The concentration of carbon dioxide in the atmosphere is now well beyond the level needed to keep global warming below 2°C, the point at which widespread impacts to human life are anticipated. The higher education sector in the UK is responsible for a considerable proportion of total national emissions and as such has a key role to play in not only reducing those emissions but also in setting an example that other sectors can follow and in acting as a role model for the future leaders that we educate.

Keele University is proud to be one of the leading universities in the UK for sustainability and intends to be at the forefront of the fight to combat climate change. In order to achieve this we have declared it as one of the six key aims within the Universities Strategic Plan; *'Aim 5 - to promote environmental sustainability in all that we do'.*

This Carbon Management Plan builds on over 30 years' commitment and investment by the University to reduce energy use within our buildings and that which arises as a result of our activities. Keele is now well progressed with plans to become a *"Hub for sustainability"* with its unique features being used to bring together universities, researchers, local communities, schools, national and international experts, energy technology developers and suppliers and those simply wishing to learn about sustainability. Becoming a Low Carbon University is integral to this concept.

This Carbon Management Plan commits Keele University to work towards a target of a 34% reduction in carbon emissions by 2020 against our 1990 baseline, and an 80% reduction by 2050. These targets specifically mirror those of the National Government, demonstrating the University's aspiration to play its part in helping meet the UK's greenhouse gas reduction obligations. Furthermore, the Universities work in this area supports the wider objectives contained within the Sustainable Development Goals declared by the United Nations in 2015. These include specific ambitions around energy efficiency, renewable energy and developing smart technologies and infrastructure.

Achieving the short term 2020 carbon target will be a momentous challenge not only as it still requires significant emissions reduction but because the University continues to develop and grow rapidly, with a strategic goal to increase student numbers to 13,000 by 2020. At the same time, the inability of the National Government to deliver significant low carbon generation on the national electricity grid is impacting on the calculations used to forecast performance. As the National Governments ambitions to deliver new nuclear power stations has not been realised as expected, each kWh of electricity taken from the grid has a significantly higher carbon dioxide content than originally predicted within the 2010 Carbon Management Plan.

Ultimately, although the University has identified and initiated significant energy reduction projects, we acknowledge that the only way to achieve these goals is likely to be to implement significant on-campus renewable energy capacity. Plans for deployment of technologies such as large scale wind and solar are advanced but it is likely that the lead time required to implement projects of this scale means they will not come to fruition in time to contribute significantly to the 2020 target.

Background

Since our first Carbon Management Plan was introduced in 2010 the University has embarked on a journey that has seen significant investment in carbon reduction projects. We've implemented more than 100 initiatives with a total investment of £2.6m. These projects which include the installation of new efficient gas boilers, the development of a Combined Heat and Power energy centre, the replacement of innefficient lighting systems and improved insulation amongst others and are expected to deliver lifetime carbon savings of over 30,000 tonnes.

We have also invested in renewables with 150kW of solar PV deployed and the incorporation of a Sustainability Hub which demonstrates how various different technologies can complement each other.

During this time Keele also became one of the first Universities in the UK to implement the ISO 50001:2011 accredited Energy Management System. The ISO standard provides a holistic approach to managing energy usage and ensures that all policies and procedures from all aspects of the Organisation are reviewed and monitored to deliver a positive impact on carbon emissions.

But we need to do more

This refreshed plan reaffirms both our short and long term carbon targets and sets out our approach to delivering the necessary real term reductions. Importantly, it also aligns the carbon management policy with our wider environmental policy framework which has been implemented since the original plan was released in 2010.

Scope & Boundary

It is important to be clear over the scope of emissions which are being reported under this plan. This ensures both transparency and that the document remains relevant whilst the University continues to grow and evolve.

At an organisation level, the emissions which result from the operations of both Keele University and its subsidiary Keele University Science & Business Park Ltd are accounted for. Within this boundary, although work will continue in reducing overall emissions, the organisation takes the approach that this plan accounts only for emissions over which it has *direct* control over. This ensures that we are only accounting for those emissions we have the ability to regulate and that we are not doublecounting emissions that may be reported by other entities.

A summary of the emissions which make up our carbon footprint are detailed below, showing those emissions which are currently accounted for within the University and its Science Park (in white) and a selection of others which are planned to be incorporated as better data becomes available (in dark blue). The University will begin monitoring scope 3 emissions sources as better data becomes available each year.

SCOPE 1 - Direct Emissions

Natural gas used for combustion in non-domestic premises

Natural gas used to create electricity (CHP)

Diesel and petrol used by University fleet

Fuel oil used in generators

Fugitive Emissions from on-site refridgeration and air conditioning

SCOPE 2 - Indirect Emissions

Electricity consumed by University within non-domestic premises

SCOPE 3 - Other Indirect Emissions

Emissions from water consumption

Emissions from waste water treatment

Emissions from waste disposal

Emissions from staff business travel

Emissions from commuting

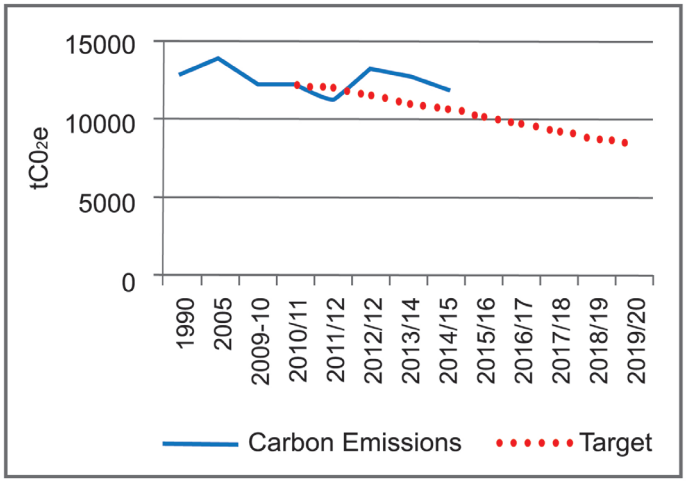
Emissions from student travel

Supply chain emissions

Baseline & Targets

In line with both UK government targets and the Higher Education Funding Council for England (HEFCE) guidelines, carbon emissions are measured against a 1990 baseline, with reductions calculated in absolute terms. The baseline figure has been provided by HEFCE who commissioned consultants; SQW to undertake the work using, primarily, data return from the Estates Management Record (EMR).

Figure 1 - Baseline and target emissions



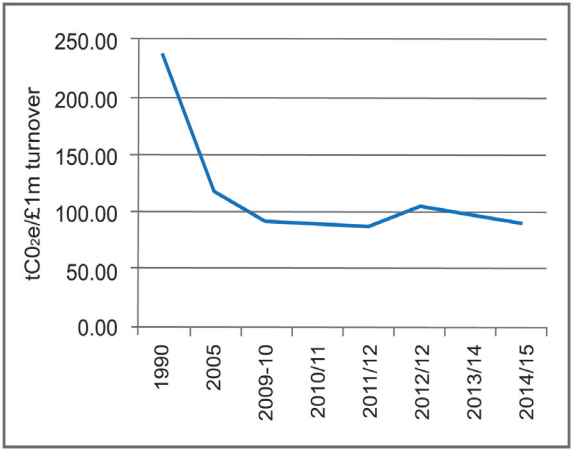
The University targets are to reduce our total scope 1 and 2 emissions by a minimum of 34% by 2020 and 80% by 2050 against the baseline as shown in *figure 1.* Achieving these targets will be a real challenge and will require not only the implementation of energy efficiency projects and renewable technologies, but also for all staff and students to play their part.

Progress to Date

Since its original implementation, the Carbon Management Plan has led to investment in a range of measures to increase energy efficiency and to generate low carbon energy. Our investment through the Salix Recycling Fund alone has led to projects which are now saving more than 2,500tCO_2e each year.

All of these projects, combined with other initiatives have combined to make a significant impact on our carbon footprint. This has however come at a time of significant growth, with new academic and commercial developments on campus in particular offsetting much of the progress made to date. The acquisition of four large Innovation Centres in 2012/13 in particular led to a jump in total emissions. Ultimately, our emissions in 2014/15 were 11,934 tonnes, down against the target by 1,000 tonnes or 7.5% as shown in *figure 2*.

Figure 3 - Keele University emissions vs 2020 target



Bank of England inflation rates used to normalise turnover figures to 2015 levels.

Figure 2 - Keele University compared to turnover

Academic Year	Absolute Emissions tC0₂e	Change
1990 Baseline	12,921	
2005	13,803	+6.8%
2020	8,528 (target)	-34%
2050	2,584 (target)	-80%

To allow a better understanding of the impact of the carbon reduction efforts to date, the University measures CO_2e emissions against turnover each year, as this is a good indicator of changes to activity levels on campus. This metric shows that the efficiency of the organisation has increased markedly since 1990 from 235tCO_2e/£1m to 88tCO_2e/£1m in 2014/15 and continues to increase year on year *(shown in figure 3)*.

Significant Projects

Amongst the successful projects run to date, a number of standout initiatives have contributed not only to the carbon reductions target but have also served to enhance the Keele's reputation for being one of the leading environmentally sustainable Universities.

Sustainability Hub

A farmhouse on campus originally built in 1833 has been completely refurbished to provide a hub for commercial and academic functions. Opened in 2011, the Sustainability Hub combines technologies such as ground source heat pumps, biomass, solar PV and a wind turbine to deliver a low energy building. The Hub serves as the focal point for sustainability activities and has provided a valuable learning experience which has informed the design of new developments on campus.

Solar PV

Three large solar arrays have been installed to date providing a total capacity of 138kWp. 100% of this zero carbon electricity is used on campus, helping to avoid more than 66 tCO_2e per year.

Horwood Energy Centre

A 125kWe CHP engine was installed in April 2015 to provide heat, hot water and electricity to the Horwood halls of residence and several academic buildings. The unit provides the baseload and operates year round, only being topped up by highly efficient gas fired boilers when demand is high. The system is currently saving more than 200 tCO_2e per year.

Introduction of Electric Vehicles & Public Charging Points

The University has been investing in electric vehicles since 2013, and as part of its support services, currently operates three electric cars and vans with more planned for the near future. Twelve charging points have also been installed to encourage our staff and students to choose low carbon transport options.

Boiler Optimisation

Significant carbon savings are being achieved by retrofitting existing boilers with smart load management controls, reducing the boiler firing times to match demand. The implementation of this alongside our extensive building management system is reducing carbon emissions by more than 500 tonnes each year.

Library Lighting Refurbishment

The poor quality and inefficient lighting at Keele Library was upgraded with new efficient luminaires (T5 & LED) along with presence detection controls ensuring that lights are now only on when needed. This project was started in July 2014 and the building electricity consumption has since decreased by 15%; equating to 180,000kWh and 85tCO_2e per annum. The brighter lighting has also delivered a much more pleasant and suitable atmosphere for students to study.

nus green impact

Behavioural Change & Learning

Keele is currently in its third year of the National Union of students (NUS) Green Impact program. The scheme engages with University staff to work in teams to reduce the environmental impact within their work areas and in stil good energy conservation behaviour. The scheme has been very successful overall and will be improved going forward by using newly installed smart meters to provide data to help raise awarness.

The University have also run another NUS program called *'Student Switch-Off'* within the Halls of Residence. Student Switch off is an inter Halls energy awareness program, encouraging students to take action to save energy by switching off their personal appliances and lights when not in use. The Student Switch Off program uses prize incentives such as Ben and Jerry's Ice Cream, tickets to Students' Union nights out and communal parties and focuses on peer-to-peer communication and creating a sense of competition to provide incentives that go beyond just being more 'environmentally friendly'. The scheme has been running for three years and savings which are difficult to measure accurately are estimated at 5% to 10%.

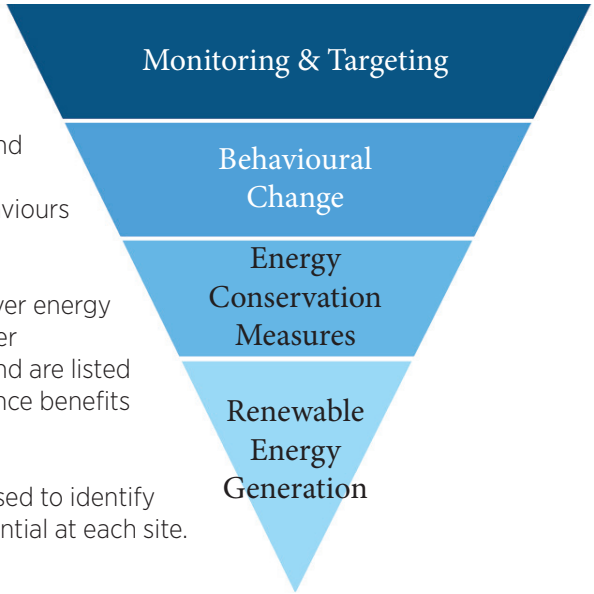
One of the largest long term effects on carbon emissions of a University's activities is through the behaviour and decisions of its graduates. Within Keele's strategic plan we are committed to educating our students on environmental issues and providing opportunities for them to put strategies into practice.

There are many initiatives to embed sustainability considerations into the curriculum and wider experience of all our students, including using the University as an example and test bed of sustainability strategies in organisations through a module open to any students entitled 'Greening Business: Employability and Sustainability'. Keele has been awarded the NUS Responsible Futures accreditation for its work with the Students' Union in this area.

How We Achieve The Target

To realise the 2020 target, we need to reduce emissions from current levels by 3,500 tCO_2e whilst minimising the impact of future developments and growth. Split into the five remaining years, this represents around 700 tonnes per year.
Our key tool to achieve this target is the Energy Management Plan. Implemented originally in 2013, this document forms the core of our ISO15001 Energy Management System and details a comprehensive approach to energy efficiency. This plan includes an annually refreshed action plan which considers each proposal against a hierarchy *(figure 4),* allowing for resources to be implemented against those that are able to leverage the most impact.

Figure 4 - The Carbon Reduction Hierarchy



- Monitoring & Targeting– Increasing our ability to see where energy is actually being used so that we can target our efforts at the areas with the highest potential.

- Behavioural Change – Ensuring that staff and students are engaged and aware of the impact that they have on our carbon emissions. We have specific actions focusing on promoting energy saving habits and behaviours in order to reduce unnecessary energy use.

- Energy Conservation Measures – A list of all Initiatives that would deliver energy savings as identified during building energy audits. These include boiler replacements, lighting refurbishments and insulation improvements and are listed in order priority based on factors including payback period, maintenance benefits and improved aesthetics.

- Renewable Energy Generation – The building energy audits are also used to identify feasible low carbon heating and renewable electricity generation potential at each site.

Key Future Initiatives

The University is currently undergoing a period of exciting transformation as it aims to retain its position as not only a leading academic and research institute but also as the number one University for student satisfaction (National Student Survey 2014 & 2015). With the introduction of tuition fees there is more competition than ever before to attract students so to meet our strategic goal of increasing student numbers from 10,000 to 13,000 by 2020 we need to respond to market pressures by enhancing and improving the services and facilities we provide. This has meant some small changes such as increasing the opening hours of our buildings or expanding teaching spaces but we also have several major projects underway that will impact on our carbon emissions going forward.

Smart Energy Network Demonstrator (SEND)

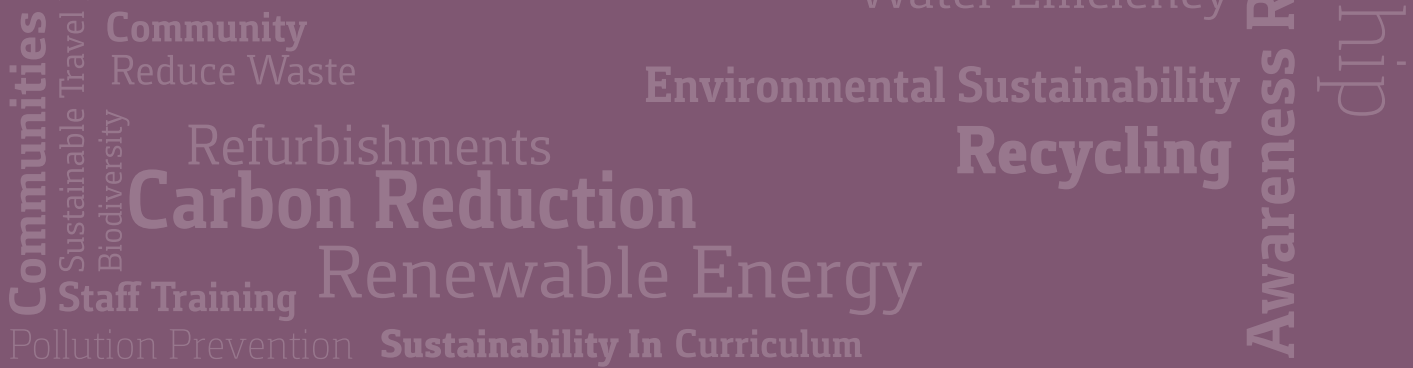
The primary role of the Keele University SEND project is to demonstrate how a mix of renewable and alternative energy sources can be utilised together to provide a low carbon, low cost and resilient local network. Taking advantage of the unique campus wide electricity, gas and heat networks, the project will act as a national demonstrator and focus for research on the dynamic management of energy resources around a complex residential and commercial site. Technologies being considered for implementation include large scale solar PV, wind, biomass and a range of innovative storage solutions.

Accommodation Enhancement and Expansion

The University is well advanced with proposals to update the majority of the student housing on campus, most of which is dated and inefficient. Two new blocks are currently being constructed at Barnes and will see 453 modern bedrooms with associated facilities by end 2017, allowing the decommissioning of the Hawthorns halls of residence saving as much as 800tCO_2e per year. Further plans are being developed to ultimately deliver a total of 4,300 rooms across the campus within the next 4-5 years. The developments will aim to be certified as BREEAM excellent and preliminary studies have shown that between 300 and 350 tCO_2e per year will be saved through more efficient heating systems alone.

Impact from Future Commercial Developments

Furthering its reputation as a research based institution; the University currently hosts a community of more than 40 companies as part of its Science & Innovation Park. This is seen as a key growth area for the organisation and two large developments are currently under way to deliver high quality office and workshop accommodation by end of 2017. With more than 10 additional plots earmarked for future expansion the challenge is to ensure that sustainable design standards are implemented to minimise the impact that these will have on the Universities overall carbon footprint.



Progress Monitoring & Review

This Plan has been developed by the Estates & Development Directorate under consultation with the University Environment and Sustainability Steering Group (ESSG).
Performance will be monitored by the Directorate with updates provided to the ESSG on a quarterly basis. An annual update will be provided to the University Executive Committee as part of the wider sustainability report which will also be made openly available.

Conclusion

There can be no doubt that since its inception the Carbon Management Plan has made Keele University a more environmentally sustainable institution, with more than 100 projects and initiatives completed as a direct result. Whilst emissions have not fallen as quickly as might have been expected, comparisons with output show that at a time of increased business activity, we are managing to achieve more with much less carbon.
To meet our 2020 target though we will need to go further. To achieve the 34% reduction we will need to realise around 700 tonnes of carbon saved per year whilst ensuring that any future developments have a minimal impact. What we do know is that the potential is there, with some exciting large scale projects initiated and other smaller yet equally as important efficiency actions being identified every day. Whilst our ability to meet the short term target may be in question, it is important that we are able to celebrate the great steps forward we have taken as an organisation as we begin to work towards the ultimate 2050 decarbonisation goal.

Keele
University

Energy and Environment Team
Keele University
Staffordshire ST5 5BG

Estates and Development Directorate
William Emes
01782 733467
sustainability@keele.ac.uk
@greenkeele