

The Carbon Neutral University – A sustainable University Energy Strategy

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We propose the University of Sheffield takes on the bold challenge of becoming carbon neutral by 2025 - a timescale relevant to climate change. Carbon reduction targets should be based directly on the science involved, demonstrating feasibility and inspiring change across the international community.

Part 1: Climate Science – the carbon budget

The recently published 5th Intergovernmental Panel on Climate Change (IPCC) report¹ emphasises again the urgent need to act on man-made global warming. The UK, together with many other nations, has committed to hold the increase in global temperatures below 2°C. We have already seen a rise of 0.8°C above pre-industrial levels, inducing the melting of glaciers, and increased extreme weather events such as flooding, tornados, hurricanes and drought. These serious and costly consequences will only intensify as warming continues.

There is no longer any scientific doubt that man-made CO₂ emissions are driving global warming. Carbon dioxide stays in the atmosphere for more than 100 years, hence cumulative emissions matter to a total carbon budget. The science is clear, and the action needed is clear also.

“The EU needs an across the board reduction of over 80% by 2030 if it is to make its *fair* contribution to avoiding the 2°C characterisation of dangerous climate change.” - Professor Kevin Anderson, Tyndall Centre for Climate Change, Manchester².

“The benefits of strong, early action considerably outweigh the costs ... The scientific evidence points to increasing risks of serious, irreversible impacts from climate change associated with business-as-usual paths for emissions.” - Nicholas Stern³

Part 2: Climate science at the University of Sheffield

University of Sheffield academics have a long history of involvement in climate science. For example, Professor Ian Woodward, now retired, and Professor Terry Callaghan from the department of Animal and Plant Sciences, shared the 2007 Nobel Peace Prize as members of the IPCC for their efforts to build up and disseminate greater knowledge about man-made climate change.

Furthermore, the University has committed itself in many ways to developing strategies for a sustainable future. The flagship “Project Sunshine” aims to tackle increased food and energy demand with a wide array of scientific projects. The Sheffield Solar group conducts research in PV materials, and carries out real-life testing on a solar array that also contributes electricity to the University. In 2009 our University opened the Sheffield-Siemens Wind Power Research Centre. In 2012 WindNet was established, drawing knowledge from six departments across the

University in order to provide an interdisciplinary perspective of the key socio-technical barriers that might influence the development of wind farms. The Centre for Energy, Environment and Sustainability is a multi-disciplinary effort to advance understanding in these areas for a low-carbon future. The University's E-Futures Doctoral Training Centre supports over 70 PhD students researching sustainability across the University. Away from science and engineering, the Sheffield Institute for International Development is working on energy strategies for developing countries, and ways of bringing the economy of natural resources in line with the carbon budget. The vast array of sustainable research at the University demonstrates a considerable intellectual investment and capability in sustainability, and gives us a good starting point in the road to institutional change.

Part 3: Current University carbon emission targets are not in alignment with the carbon budget

Currently, the University plans its carbon reduction measures based on government regulation through the Higher Education Funding Council for England (HEFCE). This regulation requires the University to reduce its emissions by 43% by 2020 and 83% by 2050 (Figure 1). The current University energy strategy aims for exactly this 43% carbon reduction in only 3 years, with an investment of £40 million, achieved mainly by generating our own renewable energy from wind, solar, and biomass⁴.

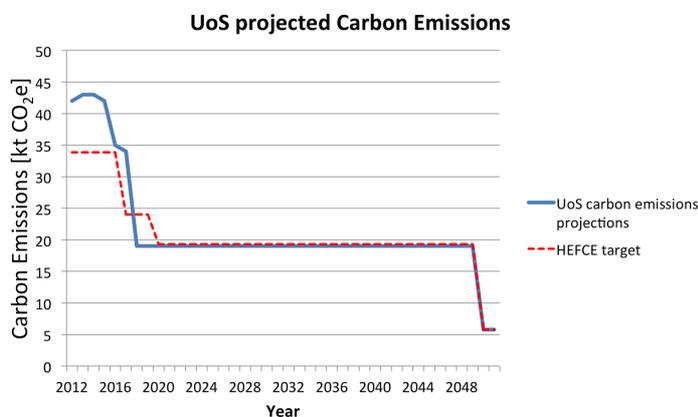
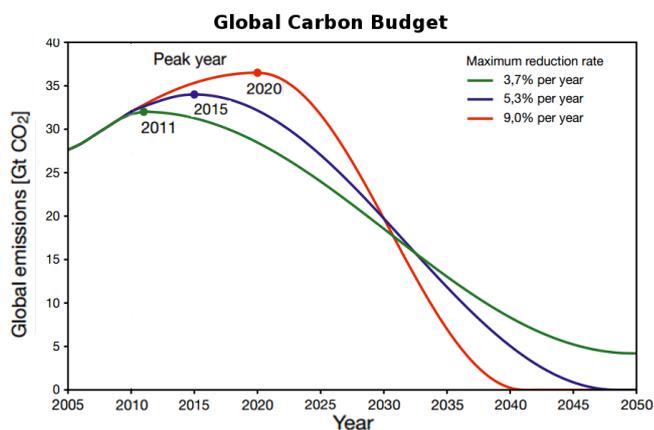


Figure 1 (left): red line: HEFCE carbon target, blue line: University carbon emissions projections according to University energy strategy⁴ (adapted).

Figure 2 (right): global carbon emissions pathways based on a total carbon budget giving a 67% chance of remaining below the 2°C limit. Colours represent scenarios for peak carbon emissions (note that only the 2020 peak scenario remains feasible)⁵.



Given the substantial and rapid reductions planned by 2018, the failure to achieve any further reduction for the next 30 or so years seems to be dictated by the requirement for HEFCE compliance rather than any drive by the University to set its own targets, underpinned by current science.

Figure 2 shows the global carbon budget as outlined in Copenhagen in 2009 to achieve the internationally agreed 2°C target. The carbon budget is strongly dependent on when we reach peak carbon emissions worldwide. The later we do so, the quicker we have to reduce carbon emissions to zero. Global carbon emissions are still on the rise⁶ and continue to pass earlier imagined peak levels in 2011 and almost certainly 2015. Considering that 2020 is the only feasible remaining scenario, this means our society needs to be carbon neutral by 2040. It is clear that the University's current plan to reduce carbon emissions by 83% before 2050 is too little too late. But matching the carbon reduction rates required by climate science is not enough. Institutions and organisations with the knowledge and expertise to make faster reductions need to step forward and show others the way.

Part 4: Aim higher - go carbon neutral

We ask the University to aim higher by achieving carbon neutrality in the next 10 years. This ambitious timeline will allow the University of Sheffield to lead other institutions by example, giving them time to develop their own strategies and limit the catastrophic effects of global warming.

Becoming carbon neutral will require significant initial investment. However, the University currently spends £7.5 million per year on utility bills⁴ and hence any energy savings will pay back the investment over time. In addition, HEFCE has recently extended the Revolving Green Fund⁷ to help universities reduce carbon emissions, with a total of £34 million available nationwide.

In this paper we consider direct emissions released by university operations (Scope 1 emissions, Greenhouse Gas Protocol), and emissions associated with purchased electricity and heat (Scope 2 emissions). Clearly at a later date the University will need to address its tertiary emissions from staff and student travel, etc (Scope 3). Reducing our carbon emissions will need big changes on many fronts, including self generation, improving building energy efficiencies, and widespread behaviour change.

We propose that the University creates a special interaction between academia, University estates, students and management to then enable the transition to such a sustainable system. The success of this transition will provide incentive and expertise for others to join and shape our future. As a University, the importance of carbon neutrality will filter through our students and into the international community, positively influencing people's decisions on energy use. Furthermore, it would be a positive advertisement for the University, and will undoubtedly bring in more funding through students, research grants, and as a consultant for a sustainable future.

First we need the University to commit to the challenge. We hope that academics, students and professional services can work together to reach the target. We are working on possible solutions and actively welcome ideas and contributions on how to become the first *Carbon Neutral University*.

List of active supporters:

Prof Philip Warren, APS
Dr Robert Howell, Mechanical Engineering
Prof Fionn Stevenson, SSoA

References:

¹ <http://ipcc.ch/report/ar5/index.shtml>

² <http://kevinanderson.info/blog/an-inconvenient-truth-us-proposed-emission-cuts-too-little-too-late/>

³ Stern Review: The Economics of Climate Change: Executive Summary, 2006

⁴ http://www.sheffield.ac.uk/efm/engineeringmaintenance/energy_carbon-mgt

⁵ http://www.ccrc.unsw.edu.au/Copenhagen/Copenhagen_Diagnosis_LOW.pdf

⁶ https://www.wmo.int/pages/mediacentre/press_releases/documents/1002_GHG_Bulletin.pdf

⁷ <http://www.greenwisebusiness.co.uk/news/higher-education-energy-efficiency-fund-to-get-34m-investment-boost-4369.aspx>