THE UNIVERSITY of EDINBURGH

ZERO BY 2040

Climate Strategy 2016-26
Technical summary

Climate change is recognised as one of the most significant challenges of the 21st century. The Paris Agreement in December 2015, resulted in world-wide recognition that global warming must be kept below 2°C above pre-industrial levels.

Organisations and governments are increasingly pursuing renewables to reduce future energy costs, meet their moral commitments to reduce their carbon emissions and secure their energy supply in a volatile world.

Renewable energy will represent the largest single source of electricity growth over the next five years, becoming the dominant energy source by the time our undergraduates reach middle age.

Recent reports show that the Scottish Government has met its annual target for 2014, after four years of missed targets. Mandatory reporting of carbon emissions by public bodies, including universities, is now a statutory requirement from November 2015 under the Climate Change (Scotland) Act 2009, with the first official reporting deadline in November 2016.

Efforts to move towards low carbon energy sources have accelerated domestically and globally, spurred on by climate science and efficiency improvements. Renewable energy exceeded coal and nuclear in supplying the UK's electricity at various points last year and remains on a rapid upward trajectory despite recent changes in government policy. The costs of technologies are changing quickly, with onshore wind now approaching cost competitiveness to fossil fuel based grid electricity (and it is already cheaper on a full economic cost basis). Solar photovoltaics at large scale should be comparable in the near future, having seen cost reductions of ~80% in 5 years, and indeed are already the cheapest energy source in dozens of countries around the world. The recent closure of Longannet power station means Scotland is now without coal-fired electricity for the first time since 1906.

Lessons learnt from our Climate Action Plan 2010 and best practice

It is recognised that climate change is likely to impact the University across a number of strategic priorities and cuts across financial, reputational and operational risks. The Climate Action Plan 2010-20 proposed a reduction in carbon emissions of 29% by 2020, against a 2007/8 baseline year. As of 2014/15, the University was 12% above baseline against an interim 2015 target of -20%. The principal reason for this has been an increase in the estate due to mergers and new buildings, with student numbers and the physical estate growing substantially since 2010.

It is clear that the original targets were not set with sufficient consideration for the likely drivers of carbon emissions in the University, or aligned adequately with other objectives. Performance against relative space and turnover indicators has been more positive, demonstrating improvements in the carbon efficiency of the University. This has been aided by large-scale investment in Combined Heat and Power (CHP) energy centres and district heating networks.

Universities from across the world increasingly adopt innovative measures to reduce their carbon emissions. They now commonly install on-site renewables and alternative energy sources for climate and financial reasons. Our reviews of data and scope of emissions, reporting, energy management, global best practice, and carbon forecasting have informed the scope and detail of the revised strategy with a priority to ensure that targets proposed can be met and commitments achieved.

Our vision

We will be carbon neutral by 2040.

As part of a global community working to address climate challenges, we will demonstrate our commitment through our research, our teaching, and the management of our operations and investments.

We will reduce our energy consumption, enhance our use of renewable energy, and explore new ways to cut our direct and indirect emissions, which will fall in line with the efforts required to avoid dangerous climate change.

We believe in demonstrating the value of climate solutions through our reporting and we will implement processes to understand the carbon impacts of our business decisions.

Following an extensive review of the University's emissions, this Strategy identifies key drivers as electricity, gas and business travel. We are therefore developing targeted programmes to reduce emissions in these areas.

Figure 1

Our emissions in 2025

Possible indicative pathway based upon predictive calculations

A new Climate Strategy

The 'institution' approach of the new Climate Change Strategy 2016-26 – which includes research, learning, teaching, operations and investments – presents a departure from previous plans that were operationally focussed, and is key to delivering change to fulfil the vision of being carbon neutral by 2040.

Our targets are:

- We will reduce our emissions of carbon per £ million turnover by 50% from a 2007/8 baseline year by 2025.
- We will return our carbon emissions to 2007/08 baseline year levels by 2025.
- We will become a net zero carbon university by 2040.

The importance of setting the right targets is evident with the failure of the Climate Action Plan 2010-20 to deliver on absolute targets, increasing the risk to the University's reputation. We have undertaken detailed forecasting of future carbon emissions to understand a 'business as usual' pattern of growth, as well as identifying the drivers of increasing carbon emissions and potential interventions to reduce future carbon emissions.

Figure 1 briefly summarises our conclusions on possible pathways to meet the absolute 2025 target, with baseline emissions for 2007/8 at ~87,000 tonnes.

We have incorporated decarbonisation of the UK electricity grid and its impact on our future carbon emissions into this analysis, as it is extremely significant. Our modelling suggests it should be possible to factor in future known growth whilst achieving the above targets. In effect, the lowering of UK grid intensity abates much of predicted future growth in emissions resulting from University expansion. To recognise the potential for research-intensive facilities growth, we have factored into our projections an additional 'Archer super computer type' facility or facility of comparable size, gradually coming online from 2015.

As this illustrates, it should be possible for the University to return to 2007/8 emissions levels and therefore meet the 2025 target with some margin for over-achievement (around 5-10% of emissions).

A number of additional opportunities exist, which will be explored over the lifetime of the strategy, but these have not counted as quantified reductions presented in Figure 1. Opportunities include savings arising from the impending switch on of the new CHP facility at Easter Bush, potential new design standards for Estates developments, opportunities arising from improved space management, innovations in energy, ICT and buildings technology, and substantial opportunities should the University adopt renewables technologies. We believe further energy reduction opportunity targets beyond the initial 2-year energy reduction (10%) target should also exist. Many of these opportunities may offer financial and efficiency as well as carbon savings. An implementation plan will be fully developed by Spring 2017.

Assumptions behind modelled emissions

This section aims to provide insight into the development of a range of possible carbon scenarios for the future. Each step is depicted with a graph to show differences depending on assumptions. Assumptions chosen in each section form the base of each successive graph.

To avoid pitfalls from the 2010 Climate Action Plan, the growth of the University had to be accounted for. Historic datasets of "growth factors" – size of the estate (gross internal area), its users (numbers of staff and students) and intensity of its activities (measured by proxy of turnover) were used to model a University business as usual (BAU) growth scenario, which was then compared with growth forecasts prepared by colleagues in Finance and Estates Departments. This was the base to understand the University's strategic direction and ambition.

Energy-related emissions are consistently responsible for 86-90% of total emissions. They were forecasted using average intensity multiplied by assumed growth in key areas – people, turnover and size. Depending on the University's growth scenario and effectiveness of efforts aimed at improving energy efficiency, it is expected that total energy consumption will grow by ca. 15-30%.

Business travel emissions are responsible for 9-13% carbon emissions annually and their impact is growing. Limited historic data is available, although business travel spend grows at a quicker pace than the University's turnover (which in itself grows quicker than staff numbers). The University budget will

grow by 50-80% and staff numbers by over 20%, according to the data we have collected. It is therefore estimated that emissions from business travel will more than double over the next 10 years and may be responsible for as much as 25% University's carbon emissions.

Remaining sources of emissions (water, waste, own vehicle fleet and fuels) are relatively minor (under 2% together) and as such, their forecasting is somewhat rudimentary, linearly following historic growth patterns.

Figure 2 shows differences depending on the growth of the University. A more cautious BAU scenario was chosen as the base for next steps in the forecast.

Grid decarbonisation

Since such a large part of total emissions comes from energy supply, the University's carbon emissions are substantially impacted by the UK's energy policy and resulting changes in carbon intensity of energy supply. As the grid decarbonises, the University's emissions will fall. There is no consensus as to the degree of grid decarbonisation – Figure 3 shows the difference in impact it may have on the University. The yellow line is essentially the BAU scenario from the previous graph without any change in the carbon intensity of the grid, to better illustrate the impact of different scenarios. It is assumed that medium carbon scenario of 250 gCO2e/kWh is most likely.

Emissions scenarios

As already mentioned, the Climate Action Plan 2010 was overly ambitious because it set an absolute reduction target that has failed to accommodate growth of the University due to mergers with other institutions and new buildings. To avoid this from happening in the future, the possibility of a new big research facility coming online in 2019/20 was investigated, with energy consumption similar to that of the Archer ACF.

Reduction options

Next, possible interventions were evaluated in terms of their feasibility and carbon impact. Interventions are listed in Figure 1. Those are indicative pathways, based on review of carbon policies of different institutions around the world.

Figure 5 shows the impact of those interventions. The 2020 modelled increase from additional research facility has been smoothed out for simplification.

Figure 2 Total future emissions depending on growth scenario

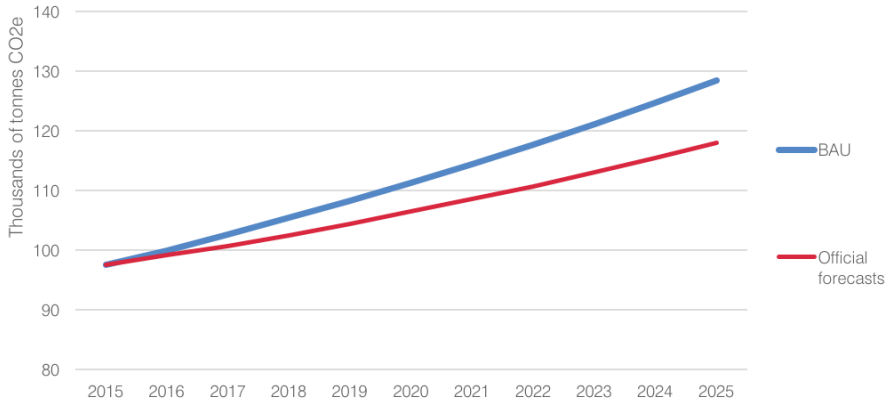


Figure 3 Impact of grid decarbonisation

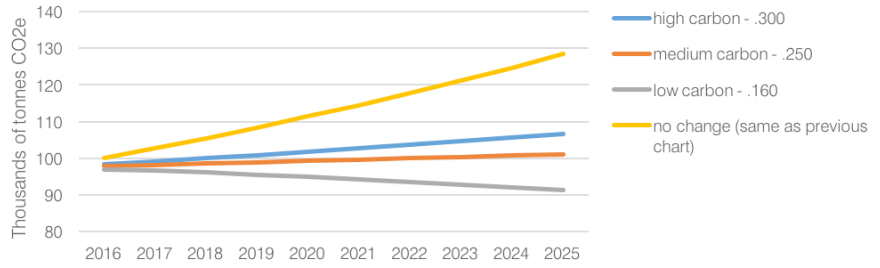


Figure 4 Impact of a merger with a big research facility

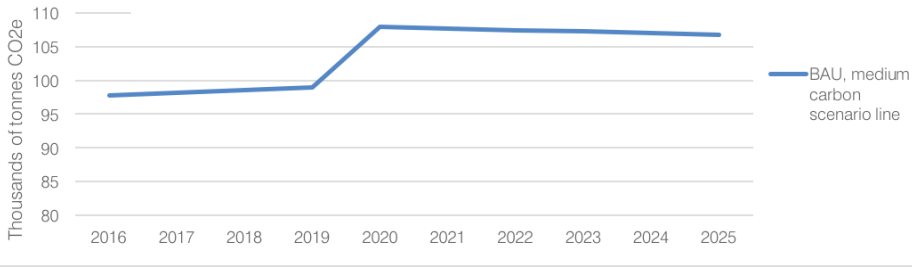
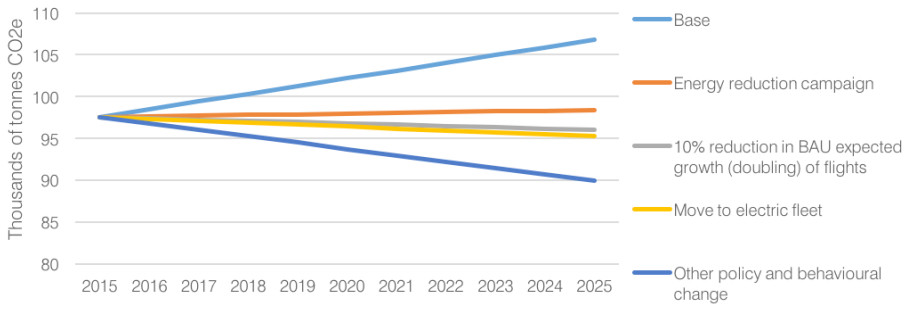


Figure 5 Possible pathways and their impacts



You can read more online at
www.ed.ac.uk/zero-by-2040

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