



A Climate and Sustainability Strategy (CaSS) – proposal

A CLIMATE AND SUSTAINABILITY STRATEGY (CaSS) – PROPOSAL	1
SUMMARY	2
An ambitious vision	2
An ambitious plan for our long-term sustainability	2
OUR MOTIVATION	4
A strong need for environmental sustainability and decarbonisation for a thriving University of the future	4
Walk the talk	5
The climate crisis and the carbon budget	5
Benefits of climate leadership	9
UNIVERSITY CARBON CHALLENGE – A UNIVERSITY SUSTAINABILITY PROFILE	11
Our current campus carbon emissions	12
University sustainability challenge summary	14
HOW TO DEVELOP A CLIMATE AND SUSTAINABILITY STRATEGY (CaSS)	15
CaSS planning process	16
<i>Institutional Structure</i>	17
<i>The final strategy document</i>	18
<i>A sustainability office – a one-stop place for sustainability on campus</i>	19
<i>Summary</i>	20
Case study	21
<i>A large university wind farm</i>	21
REFERENCES	22
APPENDIX	24
IPCC carbon scenarios for 2C w/o BECCS	24
Cornell Climate Action Plan Process	25
Leeds sustainability strategy development	26
Carbon accounting (Scope 1, 2 and 3 emissions)	27

Summary

An ambitious vision

“The University of Sheffield is a research-intensive University, committed to changing the world for the better through the power and application of ideas and knowledge.”

A Values-led University with Global Purpose, University strategy – Our plan, page 11

Our goal is to become a Carbon Neutral University Campus, and to lead the way in creating innovative ways to protect our environment. This, in itself, will create a new set of opportunities for sustainability research, attract funding and recruit students – all the while protecting our future for generations to come, and making the University of Sheffield truly sustainable.

The world needs to be carbon neutral by 2050, so to lead the way the University of Sheffield should set a more ambitious target to get there significantly sooner. We should aim to be carbon neutral by 2030, to show others that it can be done. Otherwise, who will?

An ambitious plan for our long-term sustainability

This proposal document aims to motivate and inspire a ‘Climate and Sustainability Strategy’ (CaSS) for the University of Sheffield.

CaSS should define ways for TUOS to become carbon neutral significantly before 2050. It should provide a roadmap, building on and extending the existing energy strategy, which currently aims to reduce carbon emissions by 43% up to 2020. The aim of climate neutrality is admittedly a “stretch” goal that intends to convey the magnitude of the societal challenge we face. But finding a way to achieve this goal demonstrates leadership and will inspire others to act.

To become truly sustainable and remain socially relevant our University campus needs to become carbon neutral. Rarely has the slogan “Think globally, act locally” been more true. To achieve the COP21 goals on limiting climate change means that we will really need to be carbon negative and we should bear this in mind in our campus based actions and our research.

This proposal sets out the reasons for a long-term strategy, the current situation on campus and the first steps to developing this strategy. It builds on our existing carbon reduction targets and draws on the experiences from a number of other Universities and organisations that have already set out along this path.

To develop a plan that delivers on its ambitious target, all branches of the University must support each other. There is a groundswell of bottom up support for a wide range of sustainability issues, from students and staff, and these have led to a number of ad-hoc interventions. Strong leadership from the Vice-Chancellor, Council and Senate is instrumental to following through on a strategy and deliver this vision. With strong leadership and sustainability as a high priority, the University community can come together to embed carbon neutrality into everything we do.

We propose to deliver a first version of the University of Sheffield Climate and Sustainability Strategy within one year of starting, with the aim of achieving campus carbon neutrality by 2030. The plan will set out short-term, mid-term and long-term goals, and will have to be regularly updated to adapt to

new situations. Such a strategy is bound to inter-connect our general University strategy themes in order to enable success:

1. Education and Student Experience,
2. Research and its Impact
3. Strategic Partners
4. Our Place Locally and Globally
5. Our Public Responsibility

All these aspects have to be considered and should contribute to provide a strong and helpful framework to integrate sustainability into all parts of University life.

This proposal outlines how our CaSS can be created. The first step is to create an institutional structure, with a dedicated sustainability task force containing the professional service managers and officers, scientific support teams and consultants required for this challenging task. Such a team would include relevant sub-groups to drive and deliver this ambitious strategy under the oversight of the VC, and UEB (Council and Senate) executive subgroups.

Vision Carbon Neutrality	Motivation To become a sustainable University
Action To develop a Climate and Sustainability Strategy (CaSS) document for the whole University	Action To set up a dedicated CaS structure and task force to prioritise campus sustainability



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Our motivation

A strong need for environmental sustainability and decarbonisation for a thriving University of the future

Our planet is in a sustainability crisis. The planet is warming at an unprecedented speed caused by greenhouse gases, while world population is growing, resources are dwindling, and our economy is dependent on carbon-intensive energy. This means we will have more climate change induced extreme events like flooding or droughts, affecting more and more people. If we do not stop the planet from warming beyond 2°C we risk catastrophic changes to our planet's biosphere and our own survival. Hence, after 20 years of negotiations all of the world's nations have finally recognised the problem and agreed in Paris to limit global warming to below 2°C¹.

While governments have agreed on a 2°C target, the innovative solutions required to achieve this target and their practical implementation are not part of the Paris political agreement.

Universities are the places where these innovations are developed, and the University of Sheffield has a significant portion of its research focussed on sustainability. We are an organisation of research and innovation, with the thinkers from today educating the thinkers for tomorrow.

As our Vice-Chancellor puts it so eloquently:

*"Our strategy is therefore more than simply ours as an academic community – it serves our wider world. And it is open and pragmatic – we are ready to try different approaches to offer the education and scholarship the world needs. **We will be bold where we should be, while preserving what matters most.**"*

Professor Sir Keith Burnett, University strategy – Our plan, page 5



Walk the talk

We know it is not enough to offer only theoretical solutions, but we need to live them. It is the practical innovation and implementation on a large scale that is needed to turn our carbon intensive lifestyle into a carbon neutral, sustainable society of tomorrow. Our University's sustainability research has recognised this and developed solutions for change. Now it is time to translate our theories into a stream of constant and practical solutions to decarbonise our campus, as outlined in our public responsibility strategy.

"Concentrate on reducing our carbon footprint and using natural resources wisely and sustainably."

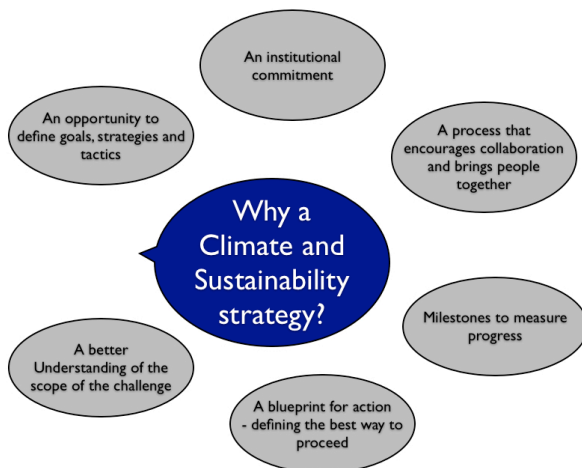
Our Public Responsibility, University strategy – Our plan, page 61

The world must become carbon neutral by 2050, and if we cannot achieve this status sooner, then we are not doing enough! Considering what we are and our impact on our community and the world, we should be targeting carbon neutrality significantly earlier and set ourselves an ambitious deadline - 2030.

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

Figure 1



To ensure a steady progress of innovation and action, a strategy is needed. A plan that engages everybody, and leads to real change. This plan sets in motion a path for the University of Sheffield to find and enact the solutions to becoming carbon neutral significantly before 2050 (Fig. 1).

As one of the world's top 100 universities, and a major sustainability research hub with leaders in soil science, energy research, supply chain sustainability, carbon capture and more, we have a pivotal role to play. We have the responsibility both to reduce our contribution to climate change and generate solutions to address the mounting pressure on our planet.

The climate crisis and the carbon budget

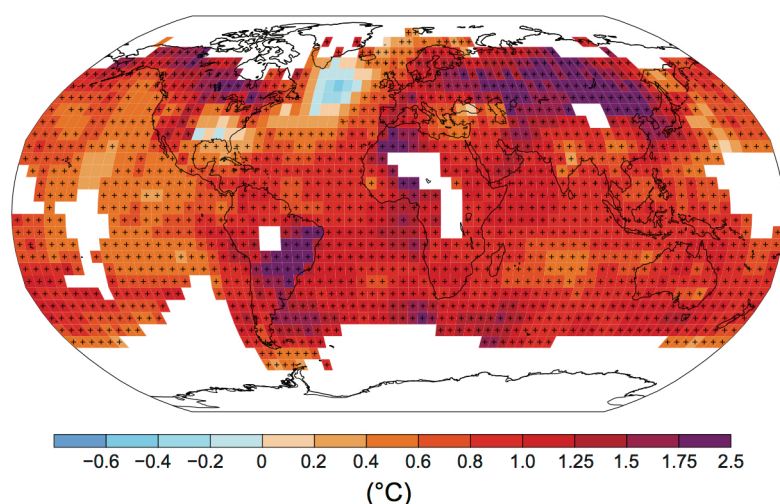
The recently published 5th report of the Intergovernmental Panel on Climate Change (IPCC) ² emphasises the urgent need to act on man-made global warming. The UK, together with the world nations, has committed to hold the increase in global temperatures below 2°C ¹.



We have already seen a rise of 1°C (Fig. 2) 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.

Figure 2: Map of the observed surface temperature change from 1901 to 2012 derived from temperature trends determined by linear regression from one dataset. Figure SPM.1 (b) taken from the IPCC Fifth Assessment Report, Climate Change 2013: The Physical Science Basis, "Summary for Policymakers", page 6, <http://climatechange2013.org>

(b) Observed change in surface temperature 1901–2012



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 finite carbon budget. The CO₂ emissions quota, giving us 66% chance to keep a 2°C temperature limit leaves us to emit about 1000GtCO₂ from 2011 onwards (Fig. 3 ²).

Figure 2: Figure 3: Cumulative carbon dioxide (CO₂) emission consistent with limiting warming to less than stated temperature limits at different levels of probability, IPCC AR5 Synthesis report, table 2.2, page 61, 2014 ²

Cumulative CO ₂ emissions from 1870 in GtCO ₂									
Net anthropogenic warming ^a	<1.5°C			<2°C			<3°C		
Fraction of simulations meeting goal ^b	66%	50%	33%	66%	50%	33%	66%	50%	33%
Complex models, RCP scenarios only ^c	2250	2250	2550	2900	3000	3300	4200	4500	4850
Simple model, WGIII scenarios ^d	No data	2300 to 2350	2400 to 2950	2550 to 3150	2900 to 3200	2950 to 3800	n.a. ^e	4150 to 5750	5250 to 6000
Cumulative CO ₂ emissions from 2011 in GtCO ₂									
Complex models, RCP scenarios only ^c	400	550	850	1000	1300	1500	2400	2800	3250
Simple model, WGIII scenarios ^d	No data	550 to 600	600 to 1150	750 to 1400	1150 to 1400	1150 to 2050	n.a. ^e	2350 to 4000	3500 to 4250
Total fossil carbon available in 2011 ^f : 3670 to 7100 GtCO ₂ (reserves) and 31300 to 50050 GtCO ₂ (resources)									

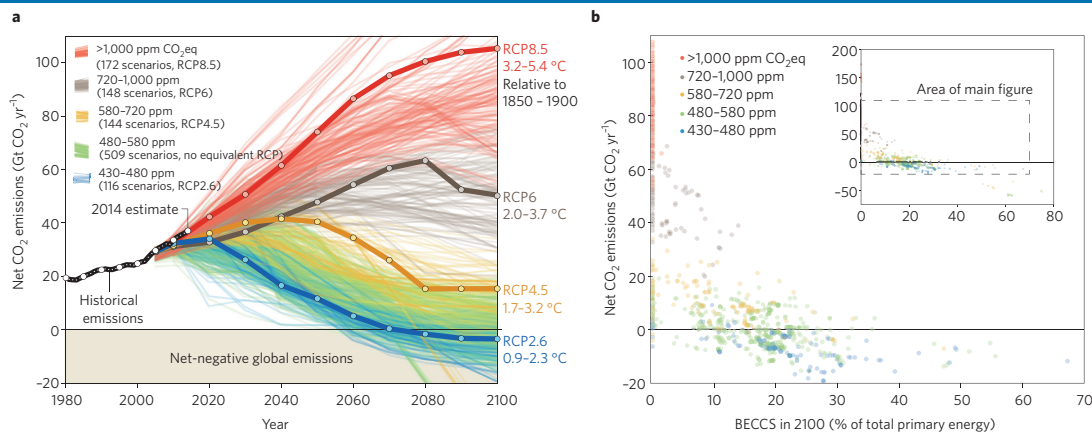


Since CO₂ is emitted every year, the remaining quota decreases every year. Plotting our current emissions and modelling the future emissions reductions needed (Fig. 4a) shows that emissions need to go into negative territory by 2070-90 and beyond (RCP2.6, the Representative Concentration Pathway scenario in line with 0.9-2.3°C warming). Fig. 4a also shows that we are already emitting more CO₂ in 2014 (black line) than what was assumed for RCP2.6, which will further shorten the time frame until zero emissions are needed.

Figure 4

a) Historical emissions from fossil fuel combustion and industry (black) compared to emissions scenarios from IPCC AR5 report.

b) The emissions scenarios from panel a have been grouped into five groups according to the most relevant RCP and labelled in different colours. Percentage of BECCS shown according to these scenarios show that nearly all blue (RCP2.6) scenarios are requiring a high amount of BECCS. Figure 1, Fuss et al., Nature Climate Change, Oct 2014 ³



The problem with the RCP2.6 - 2°C situations from the IPCC report (that were providing the scientific background for the Paris agreement and thereby directly influenced most governments (incl. the UK)), is that most of their scenarios assume a “very unlikely” adoption of large-scale negative emissions technologies (Fig 4b, BECCS – Biomass, Energy, Carbon Capture and Storage³). As Kevin Anderson, Director of the Tyndall Centre for Climate Change Research, in Manchester states;

“...the framing of the 2 °C goal and, even more, the 1.5 °C one, is premised on the massive uptake of BECCS some time in the latter half of the century. ... **The scale of the assumptions is breathtaking. It would be the equivalent of decades of planting and harvesting of energy crops over the area of one to three times that of India.** At the same time, the aviation industry envisages powering its planes with biofuel, the shipping industry is seriously considering biomass to propel its ships and the chemical sector sees biomass as a potential feedstock — and by then there will be 9 billion or so human mouths to feed. This crucial assumption deserves wider scrutiny.”

Prof Kevin Anderson, Tyndall Centre for Climate Change Research, Manchester, “Talks in the city of light generate more heat.” *Nature*. Dec 2015



Obviously, the above-mentioned scale of carbon capture assumed is theoretically enabling a slower rate of cutting our carbon emissions, but were only added into the modelling as fringe scenarios. A recent study by Avoid 2, a UK government funded climate change research programme found the needed BECCS scenarios to be “highly challenging” to say the least ⁴. However, politicians have selected these modelling assumptions as the major target for our world governments and as baseline for the Paris agreement, while not even mentioning the flaw in their assumptions. Obviously this allows for a slower, more economically beneficial rate of carbon emissions cuts - easier to achieve.

However, in the real world and as a scientifically focussed institution, it would be recommended to set targets on realistic assumptions, i.e. that while necessary, only small scale BECCS technologies will be deployed.

So the question is how quickly do we have to reduce our carbon emissions without BECCS? The answer is dependent on when we achieve global peak carbon emissions. Indeed, if we assume that we may achieve peak emissions soon (by 2020), the world needs to reduce their carbon emissions to zero before 2050 (IPCC database, RCP2.6 scenarios without BECCS). Especially developed nations like the UK - which have some of the highest historic cumulative carbon emissions per person, have a responsibility to lead the way and cut their emissions significantly faster than many of the poorer and far less carbon polluting nations in the world. Again according to Professor Kevin Anderson:

“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.”

Prof Kevin Anderson, Kevin Anderson blog, June 2014 ⁵

Leading academic institutions serve as a role model for broader society to demonstrate how we can successfully solve the climate crisis. We have the academic staff to cut through the mist of political agenda and base our targets on scientific background.

Hence, if climate scientists say that the EU needs an over 80% reduction of carbon emissions by 2030, our University should take up the challenge and cut carbon emissions to zero by 2030. This 14-year time frame is clearly challenging and becomes more challenging the longer we wait hence we should start now.

Conclusions

1. All nations have agreed to stop global warming at 2°C – Paris, Dec 2015.
2. The planet has already warmed 1°C by 2015.
3. We have a set carbon budget we cannot exceed to stay below 2°C.
4. The modelling scenarios of the most recent IPCC AR5 report are used as a guide to set carbon reduction targets for world and UK Governments.
5. Most (101 of 116) of the modelling scenarios for a 2°C world (labelled RCP2.6) are assuming unrealistic technology miracles to deliver.
6. To realistically limit global warming to 2°C with today’s technology, and considering our current carbon emissions, a quick worldwide decarbonisation before 2050 is very likely needed.
7. As a leading academic institution in a developed nation, our University should provide and apply the solutions to decarbonise our campus significantly before 2050 – with an ambitious target being 2030.



Benefits of climate leadership

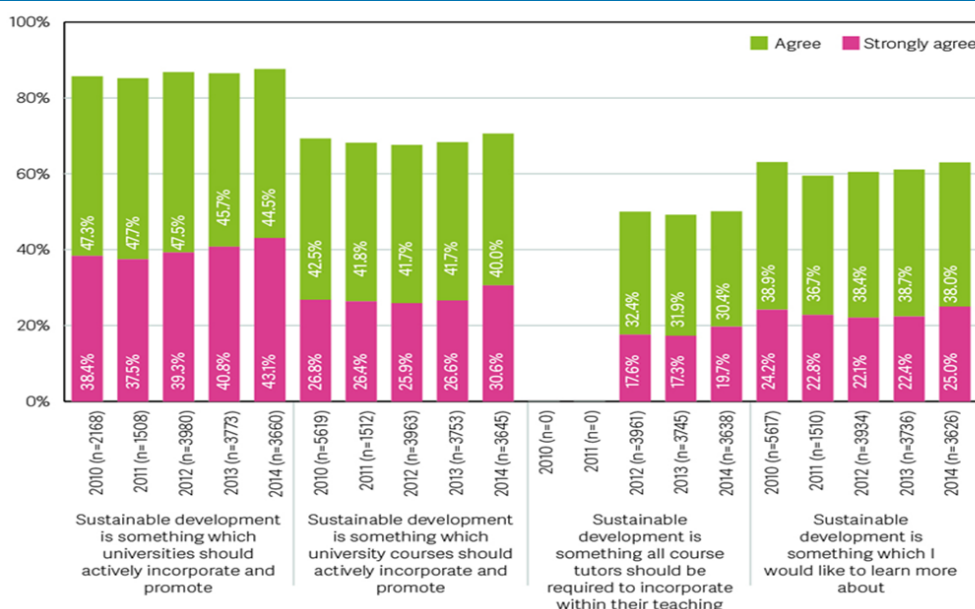
As a University, sustainability action will filter through our students and into the international community, positively influencing people's decisions on energy use. Furthermore, it would be a fantastic advertisement for the University, and will undoubtedly bring in more funding through students, research grants, and as a consultant for a sustainable future.

"An increasing number of students wish to benefit from the best possible higher education experience, and the shift of the funding burden for home students from the public purse to the individual student requires our acknowledgement and response."

The Challenge of Resource, University strategy – Our plan, page 69

We must consider that our students are very much aware of the climate crisis and more than 80% of first year students expect that the University should actively incorporate sustainable development (Fig. 5).

Figure 5: Student attitudes towards, and skills for, sustainable development, The Higher Education Academy, Report, Sept 2015 ⁶

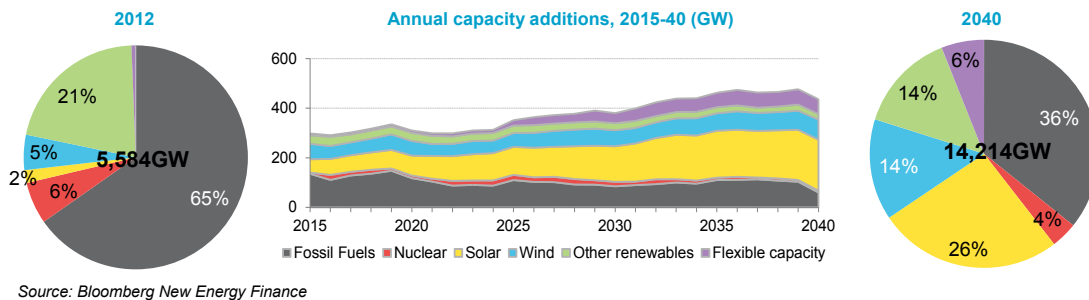


Attraction of students is just one of many compelling reasons for climate action by our University, besides that, it is the right thing to do.

Further, the clean energy sector is expected to expand significantly over the next decades (Fig6), not only providing exceptional employment possibilities for our graduates from these areas but also widening the potential for industry collaborations and funding opportunities. A high sustainability profile as outlined in this strategy proposal could clearly maximise on these commercial and networking opportunities.



Figure 6: Bloomberg New Energy Finance Report, 2015



Critically, much if not all of the costs for our sustainability transition could be offset through carbon tax and energy cost savings, considering that we currently spend ~ £600.000 in carbon tax and more than £7million on utility bills every year.

Hence considering just cost savings and potential new funding opportunities through our sustainability work would pay back any investments needed now in the long-term.

Below are just a number of benefits from sustainability leadership besides just 'doing the right thing' for our planet (and ultimately ourselves):

1. Attracting students
2. Enhancing reputation
3. Building local, national and global partnerships
4. Enabling new sustainability research and funding
5. Contributing to global efforts to combat climate change
6. Complying with legislation
7. Delivering the carbon strategies of the UK HE funding councils
8. Cost savings
9. Developing world-class teaching and research facilities fit for the future

An ambitious CaSS could set a path that enables us to become a truly sustainable University – economically, socially and environmentally.



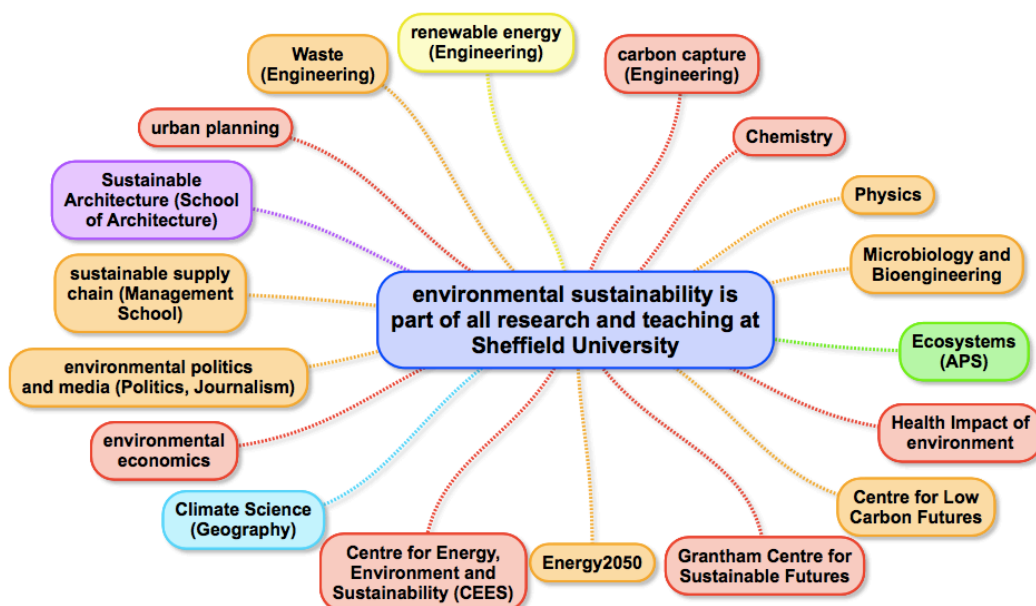
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University Carbon Challenge – a University sustainability profile

Our wide-ranging research in all aspects of environmental sustainability (Fig.7) is placing our University to ideally become a leading provider of climate change solutions.

Figure 7: Environmental sustainability is embedded in TUoS research and teaching .



Our researchers and engineers have realised the challenge and are already now providing the solutions for a sustainable future.

"In Sheffield we are accelerating world-leading research in areas which are vital for future sustainability over the next decade."

Jon Price, the University's Director of Energy Innovation and Knowledge Exchange, Source:
<https://www.sheffield.ac.uk/news/nr/tackling-climate-change-1.529038>

People are at the heart of these developments, and together with collaborators all over the world, we can transform our human society to a long-term sustainable one.

"I am an optimist. And I am an optimist because of the type of people we have in the team we've put together, and knowing that there are people like them all over the world working towards this common goal of a sustainable planet."

Professor Tony Ryan OBE, Director of the Grantham Centre for Sustainable Futures, University of Sheffield strategy, Our Plan, page 34

In summary, climate science is not only showing us the path we must take on this planet, but the University of Sheffield also has the intellectual capacity and motivation, as well as the knowledge and



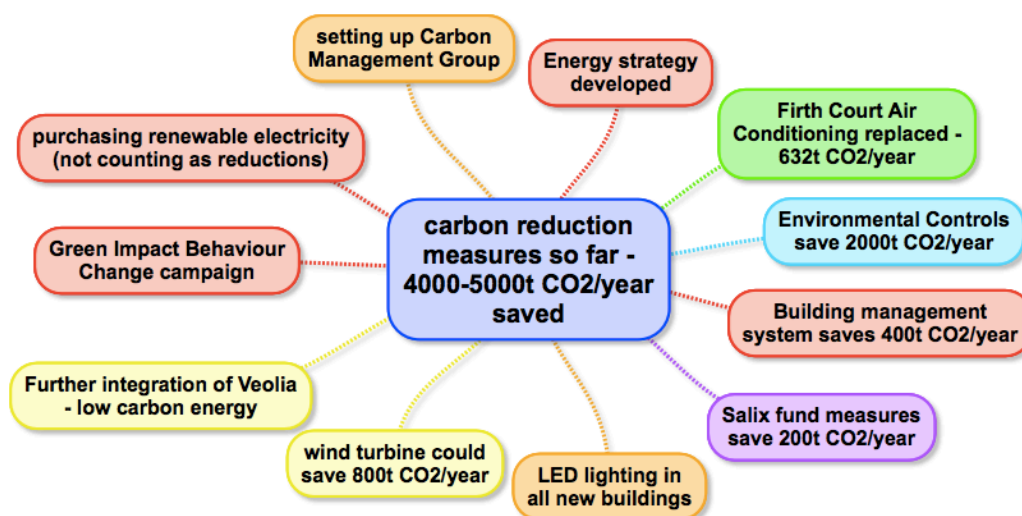
experience required to put climate change action on campus forefront and centre in our University priorities.

Our current campus carbon emissions

In 2011, the University committed to reducing its carbon emissions by 43% until 2020, in line with HEFCE targets and ahead of UK carbon targets (3rd UK carbon budget, CCC⁶). This initial commitment has produced a flurry of actions - established an energy strategy and a culture of sustainability within the wider University community.

Several large-scale developments, such as the air condition upgrade to Firth Court, the installation of a 900kW wind turbine at the AMRC, and the employment of extra staff together with a Building Management System allowed for significant carbon emissions reductions compared to business as usual (Fig.8). Further, behaviour change efforts (ie, Green Impact initiative) are running in nearly all University departments and are invaluable to motivate students and staff to reduce their environmental impact at the University and at home.

Figure 8: Overview of some carbon reduction measures initiated until 2015



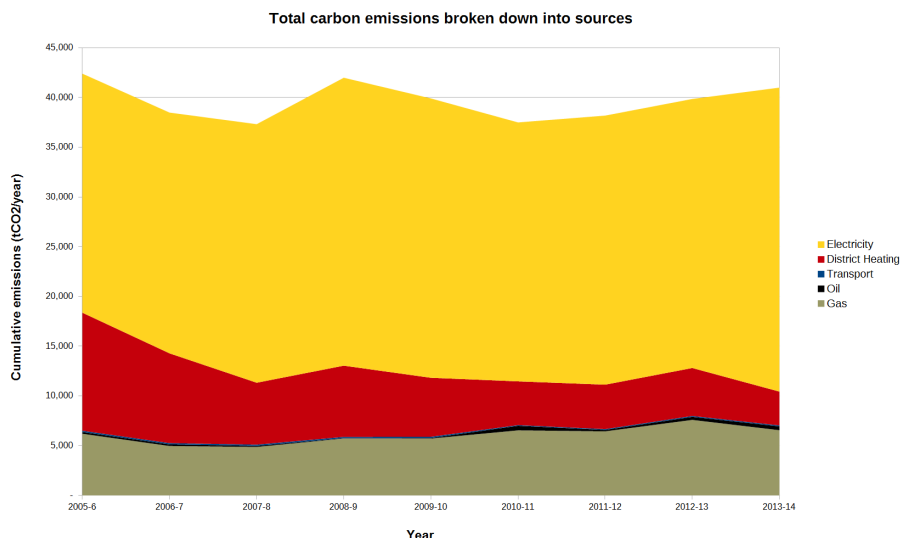
Our existing energy strategy document⁷ provides a detailed energy consumption profile of our University, and has also lead to the development of carbon modelling software allowing us to test the carbon reduction impact of various measures on campus. Both profiling and software are essential requirements and tools to develop our CaS strategy, while the existing energy strategy provides us a 2020 baseline.

The energy strategy has lead to several carbon reduction measures being realised (Fig8), but continued growth of our Estate, limited finances and missing sustainability leadership have so far made it difficult to achieve our carbon reduction targets. As outlined in our 2013 Carbon Management Plan⁸,



we aimed to reduce our scope 1 and 2 carbon emissions (see appendix) by 12% by 2012 and should reduce them further to 29% by 2017 against our 2005 baseline. However, as shown in figure 9 our emissions stayed at approximately the same level – being reduced by only about 3% in 2014.

Figure 9: TUoS carbon emissions from 2005/6 to 2013/14 by source



We are one of many UK Universities that is far from achieving the significant carbon reductions required to protect us from dangerous global warming. However, our position 84 (Fig. 10) in the UK carbon league, should give us plenty of opportunity to improve!

Figure 10: Brite Green Report, 2015

Rank	Higher Education Institutes in England	Carbon reduction target (%)	2005 Baseline 2005 (tCO ₂ e)	2013/14 emissions (tCO ₂ e)	% change from 2005 to 2014
Decrease in emissions					
1	London Metropolitan University	46	13,499	6,586	-51.21%
2	University of Cumbria	45	9,978	5,159	-48.30%
3	School of Oriental and African Studies	48	3,442	1,837	-46.62%
4	Lancaster University	43	25,899	13,978	-46.03%
5	Buckinghamshire New University	50	6,975	3,971	-43.07%
6	City University	43	13,776	7,959	-42.22%
7	Rose Bruford College	4.8	960	558	-41.84%
8	University of Reading	13	27,562	16,260	-41.00%
9	University of Greenwich	43	14,633	8,734	-40.31%
10	University of Bradford	50	13,158	7,863	-40.24%
80	University of Hull	34.6	18,233	17,389	-4.63%
81	University of Northampton	43	7,381	7,048	-4.51%
82	Liverpool Hope University	43	5,217	5,007	-4.03%
83	University of Teesside	34	8,419	8,110	-3.67%
84	University of Sheffield	43	42,397	40,995	-3.31%
85	Coventry University	43	12,872	12,460	-3.20%
86	Roehampton University	40	6,718	6,564	-2.30%
87	University of Chichester	43	2,920	2,853	-2.29%
88	University of Warwick	60	46,540	46,161	-0.81%
89	Oxford Brookes University	50	14,640	14,552	-0.60%
90	University of Bristol	38.5	49,994	49,876	-0.23%

The number of Universities and colleges not being on target clearly indicates the challenging task ahead. It also points to a need to increase the priority status and effort made in higher education institutions that are not on track – including TUoS.

University sustainability challenge summary

1. The world needs to become carbon neutral by 2050 to prevent dangerous climate change and the University of Sheffield should play a major part in providing the solutions and applying them on our own campus.
2. Only a carbon neutral University is a truly long-term sustainable University.
3. We are currently missing out on the major benefits climate leadership could bring.
4. Reducing carbon emissions, mainly coming from fossil-based grid electricity, gas heating and transport is no easy task in the time frame required, hence TUoS needs a sustainability strategy suitable for the challenge.
5. TUoS does have an energy strategy and a carbon management group aiming to reduce carbon emissions by 43% by 2020, however to achieve this target and add a long-term carbon-neutral aim, a bigger effort and strategy is needed.
6. TUoS is doing major research in environmental sustainability, and has all the skills to be a leader on climate action and sustainability. However, there is currently no effective translation of research leadership to EFM campus work groups – EFM has been left alone to manage the situation.

How to develop a Climate and Sustainability Strategy (CaSS)

We propose to develop a Climate and Sustainability Strategy as a comprehensive response to the climate crisis, to promote the education and research needed to generate solutions and demonstrate these solutions in campus operations.

Valuable climate action resources for higher education

The climate crisis is not an issue to be addressed alone and we don't have to. There are a number of organisations that provide support.

The biggest available (online) and most comprehensive source of information for decarbonisation of campus emissions and sustainability practices has been provided by the US higher education sector. In 2006, twelve visionary US Universities and Colleges, motivated by the conviction that higher education has the capacity and responsibility to lead on climate and sustainability action, worked with the AASHE⁹ (<http://www.aashe.org>), ecoAmerica¹⁰ (<http://ecoamerica.org>) and Second Nature¹¹

(<http://secondnature.org>) to develop the American College & University Presidents Climate Commitment (ACUPCC). In 2007 they invited their peers across the US to sign the commitment. This commitment asks higher education institutions to develop a plan to achieve carbon neutrality and tracks their progress. As of 2014 **679 institutions have signed this commitment** in the US. (Overview: <http://annualreport.secondnature.org/2014/>)

From their experiences the Association for the Advancement of Sustainability in Higher Education (AASHE), provided a full guide for the development of a campus climate action plan available online: <http://www.aashe.org/wiki/climate-planning-guide>

The ACUPCC was recently renamed "Climate Commitment" and guides and member information can be found on the Second Nature website¹¹: <http://secondnature.org/>

Individual plans and progress of member institutions can be found here¹²: <http://reporting.secondnature.org/>

As an example University with an award winning climate action plan, **Cornell University**, provides a very valuable resource. Cornell's first climate action plan (CAP) was published in 2009 and since then newer versions were published in 2011 and 2013. Cornell already reduced their carbon emissions by more than 30% until 2013 and initially set out to become carbon neutral by 2050, but in 2014 started an acceleration working group that determined that achieving carbon neutrality by 2035 is both imperative and feasible. The Cornell CAPs can be found here¹³: <http://www.sustainablecampus.cornell.edu/initiatives/climate-action-plan>

In the UK, HEFCE has provided a number of guide materials on carbon reduction strategy in 2008 and 2010 as well as a guide on scope 3 emissions measurements in 2012. Further the Environmental Association for Universities and Colleges¹⁴ (EAUC, <http://www.eauc.org.uk>) is a charity that supports campus sustainability in over 215 Universities.

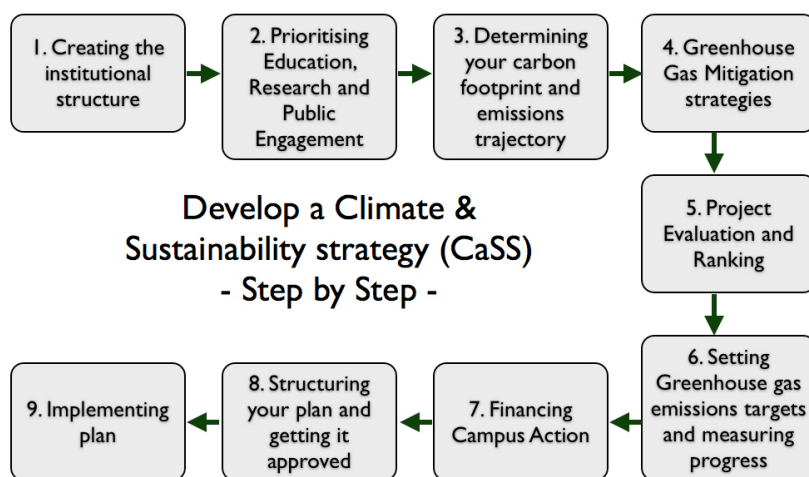
As an outstanding example for a UK University, the University of St Andrews has set themselves the target to become carbon neutral by 2016 and seems on track to achieve this target. <http://www.st-andrews.ac.uk/about/sustainability>



In summary, the above resources in particular the ACUPCC or climate commitment are providing the incentive and the advice needed for a carbon neutral vision to be achieved in a higher education institution such as our University. To achieve this vision, a strong strategy document and sustainability structure is needed to look at the options of each individual institution, evaluate and implement those necessary to achieve carbon neutrality.

CaSS planning process

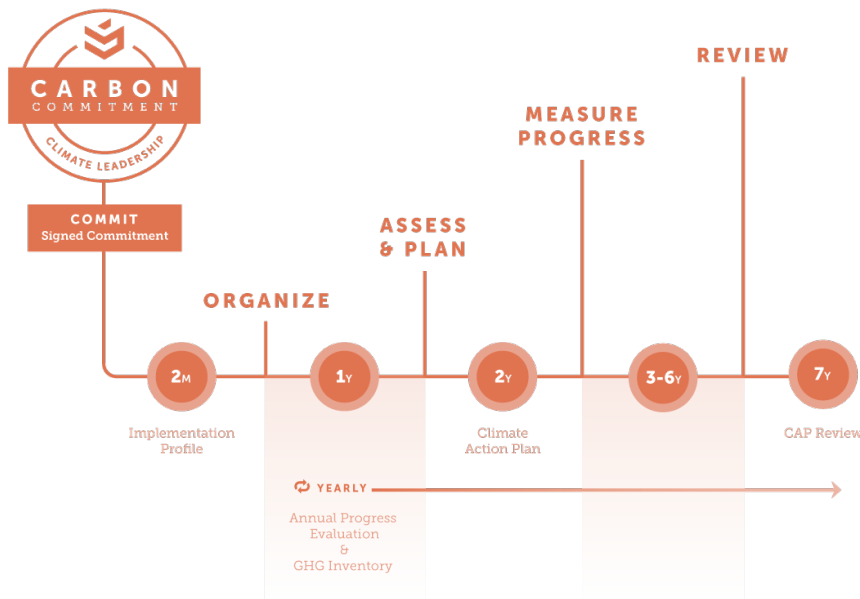
Figure 11: Steps to develop a Climate Action plan according to the AASHE



A Carbon and Sustainability Strategy will define our path to a sustainable, carbon-neutral University. Such a strategy should be multidimensional, addressing curriculum, research and campus operations. A sustainability strategy document with all these dimensions considered, provides a better understanding of the challenge, defines the goals and milestones, enables collaboration and underlines the commitment made (see also Fig. 1 on page 5).

High-level University commitment from the Council and Senate, with environmental champions in executive positions is necessary to embed sustainability throughout the institution.

Figure 12: General time line provided for signatories of the Carbon Commitment of US Colleges and Universities as provided by secondnature.org/climate-guidance/commitments-implementation-guide



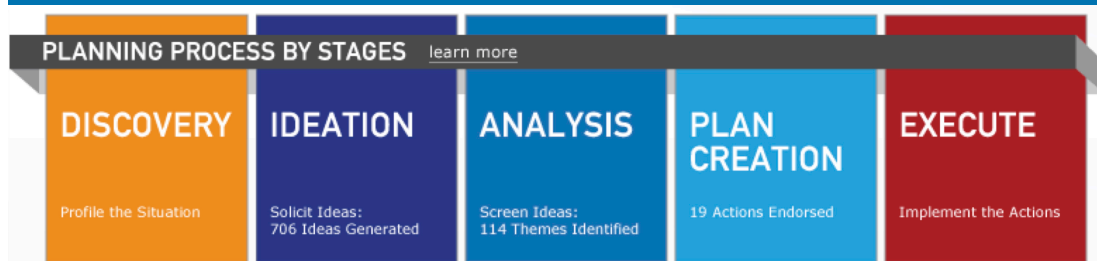
To develop a climate action plan the AASHE guide material proposes to go through a logical process of steps summarised in figure 11¹⁵. However, we might find that proceeding in a different order makes more sense at TUoS. Working on any of these items simultaneously will be most effective but is highly dependent on the available resources.

The actual process of creating a plan may take 1-2 years, as indicated by the Second Nature guide material for US Universities signing the

Carbon commitment (Fig. 12). Further regular progress should be measured and the plan updated if situations change i.e. new technologies become available/ affordable.

The suggested steps and time lines are a guide developed by the AASHE for American Universities signing the ACUPCC¹⁵. As a specific example, Cornell University has shared their path to their action plan creation¹³, which took them more than a year and mirrors the steps suggested by the AASHE guide. They divided their planning process into five stages – 1-discovery, 2-ideation, 3-Analysis, 4-plan creation, and 5-plan execution (Fig. 13).

Figure 13: Cornell University – planning process by stages
Source: Cornell Climate Action plan 2009



Institutional Structure

After committing to a sustainability vision, an important first step is to create an institutional structure for preparing and implementing the plan. This means identifying participants and establishing one or more committees and operational working groups. Already existing sustainability officers and managers around campus should play key lead roles in a new 'sustainability service', with a *passionate team being of utmost importance to inspire and bring positive energy to the task.*

Figure 14

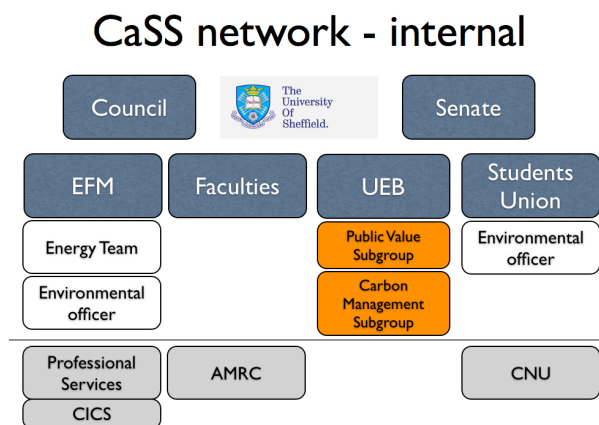
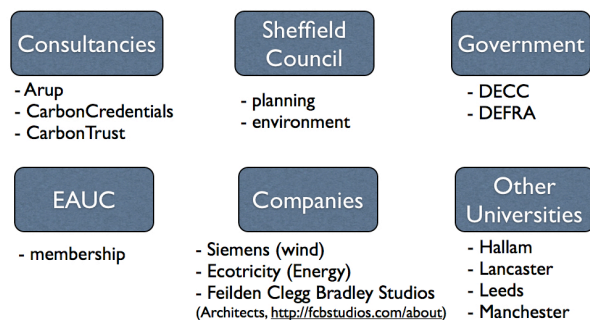


Figure 14

CaSS - External support + collaboration



Internally there are several University structures that need to get involved and could provide team members (Fig. 13). It is further important to go *beyond internal structures and include the wider community* to have the full support to “save the planet” (Fig. 14).

A clear and transparent sustainability structure is of upmost importance for maximum stakeholder participation – providing the support and delivering all potential benefits i.e. public engagement.

An operational sustainability strategy team (CaSS team) led by a chair or co-chair should report directly to the VC and UEB (Council and Senate) through the Public Value and Carbon Management subgroups to ensure high level priority and engagement. This operational sustainability strategy lead team is responsible to develop the strategy, but could also take on day-to-day sustainability service for the University (see below sustainability office).

The final strategy document

The final strategy should give us a vision everybody can buy into, provide sustainability standards to embed, and suggest short-term, mid-term and long-term actions including regular reviews and updates.

The process requires:

- coordination
- analysis
- goal setting
- supervision of theme lead sub-committees
- preparation of the document

Importantly, University stakeholder engagement should start from an early stage and help define the major themes our University would like to pursue under the agenda of sustainability. Campus Carbon Neutrality is one important deliverable in the long-term, but for this sustainability strategy, the importance of social engagement, communication, learning and teaching, should be debated and help motivate all University stakeholders. This kind of process has recently been pursued online and through working groups to develop our new University strategy – Our Plan¹⁶. For another example of a process of consultation, please find the University of Leeds process in the Appendix.

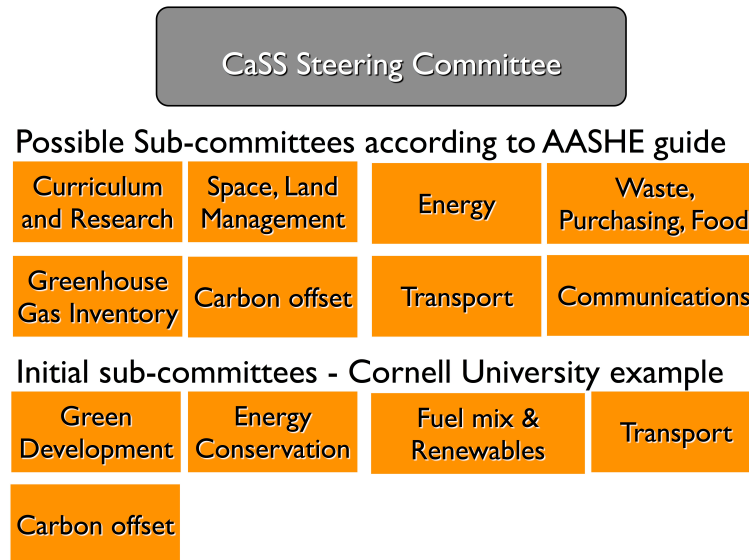
Specifically, for reduction of our carbon emissions, expert-working groups will be required for brainstorming, analysis and summaries of actions to be added to our strategy. Structure examples from the AASHE guide and Cornell University are shown in Figure 15, indicating that the CaSS steering committee would involve a number of expert committees to do the analysis of resource intensive action points and choose the best options for our University. Here our Faculties could get directly involved as consultants, to limit costs of external consultants.



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Figure 15: Committee Structure to develop the plan, with specialised subcommittees indicating the various areas of expertise needed, suggestions from AASHE guide, or as an alternative structure from Cornell University



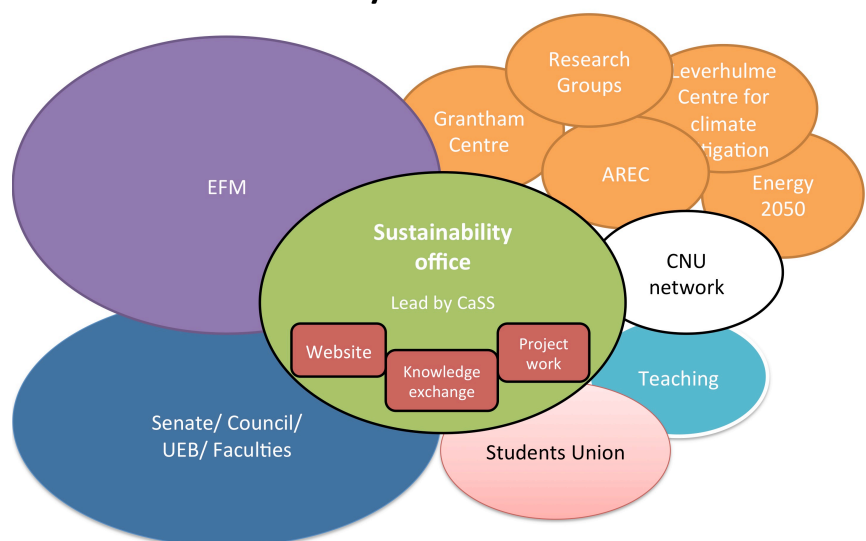
A sustainability office – a one-stop place for sustainability on campus

As part of the strategy development and organisational structure, a sustainability office has been a driver of action. Universities, with a successful history of sustainability action mostly maintain a sustainability office, a service or even whole departments for to run their sustainability operations. (see Leeds¹⁷, Manchester¹⁸, Cornell¹⁹)

These University sustainability hubs empower and engage to catalyse a sustainable campus transformation. Without such a specific structure and a strategy, embedding sustainability all around our campus will be very difficult to achieve.

Figure 16: Possible interconnection and support of a sustainability network within TUoS

Sustainability office - network



There are plenty of things to handle for day-to-day operations – website/ social media updates, sustainability projects, workshops, networking, event organisation, knowledge gathering and exchange between all stakeholders. Specifically, project management will need dedicated people to effectively drive sustainability on our campus. A possible sustainability office could provide services to a sustainability network on campus – outlined in figure16. Figure 17 and 18 also give some ideas of possible staff roles and tasks, as well as suggested direct costs as an example.

Figure 17: Sustainability staff roles

Proposed Staff roles	
Staff	Roles
Sustainability managers (EFM and All University)	Coordinates sustainability office and follows up strategy, funding
Communications officer	Communications between all partners, arrange regular meetings between centres, communicating progress, collecting reliable, research-backed data
IT-staff (CICS)	Running website, with up to date carbon emissions, waste data etc and sustainability research projects, see also my-sustainable-campus-website
Project coordinator and officer	organises projects depending on strategy
Project officers	from research centres and faculties, longer-term
Interns	student work, short term projects
CNU (volunteers network)	connections, volunteering

Figure 18: Costs and potential funding

Costs scenario + funding

- Costs-initially: 2 people (1 year strategy support)
 - 2x Sustainability Office Manager (EFM+extra) + Communications/IT
 - 2x grade 8/ grade 7 (£40-50,000/year) + 1x grade 6 (35,000) budget (£50,000)
 - Strategy Consultants = ?
 - First year = ~£185,000 + Consultancy
- Cost-longer-term: 5 people
 - ~200,000-300,000/year
- Total costs over 3 years: ~£800,000+
- Funding sources
 - University
 - Grant applications to HEFCE, Carbon Trust, etc
 - Sustainability centres

Summary

TUoS is not the first and neither the only institution that has decided to embed sustainability in their campus, with decarbonisation as one important criterion to be addressed. Resources and examples of other higher education institutions provide good examples and guidelines on the process of developing a sustainability strategy. It is clear that such a strategy is needed and that it has to be supported by a strong institutional structure. We should hence create that structure and prepare a sustainability strategy document that represents the views of the University community, and sets out time frames, actions and financing to enable a sustainable campus transformation. Creating a sustainability task force, including an operational sustainability office, could enable the development of the strategy and sustainability standards, while ensuring that sustainability is embedded into all parts of University life.



Case study

There are a number of ideas that a sustainability and carbon strategy plan could include in addition to the already existing measures taken by the University energy team. These projects outline several ideas that could be evaluated throughout the development of our climate action plan, but need detailed screening for feasibility by sustainability action teams.

A large university wind farm

In order for the university to be carbon neutral in terms of electricity usage, a wind farm of 35 MW would be required to offset the current electricity demand (assuming a 20% capacity factor). With the total capital cost being approximately £1.5 million/MW, this would require an investment of £52.5 million. This number can change depending on a number of considered factors. Smaller wind turbines (~1 MW) results in an increased number to meet demands but is more likely to result in planning approval, however the overall cost per MW will be higher. On the other hand, larger wind turbines (> 1 MW) results in a reduced number of total wind turbines to meet demand, but potential visual impacts may impede planning success.

The potential cases for generating our own carbon-free electricity from a wind are outlined in figure 19. It shows that one large wind farm would in principle be able to generate all of our electricity carbon free. This could reduce our carbon emissions by up to 72% for an investment of £52m. To enable the evaluation and feasibility of such a project requires complex project work with experts and time. A sustainability task force would be able to handle such cases, while including the University community in the process for full benefit generation (research grants, media attention, council support, etc.).

Figure 19: Source – project – Carbon Neutral University Network - 2014

Total Potential Carbon Reduction			
	72.5% (100% Electricity Offset)	43% (HEFCE 2020 Target)	26.5% (ARUP Energy Strategy Report)
Size of Wind Farm Required (20% Capacity Factor)	35 MW	21 MW	7.5 MW (0.9 MW Existing at AMRC)
MWh/yr	62,000	26,660	16,425
Total Carbon Emission Reduction	72.5%	43%	19.2%
Total Price (£1.5million/MW)	£52.5 Million	£31.5 Million	£11.25 million



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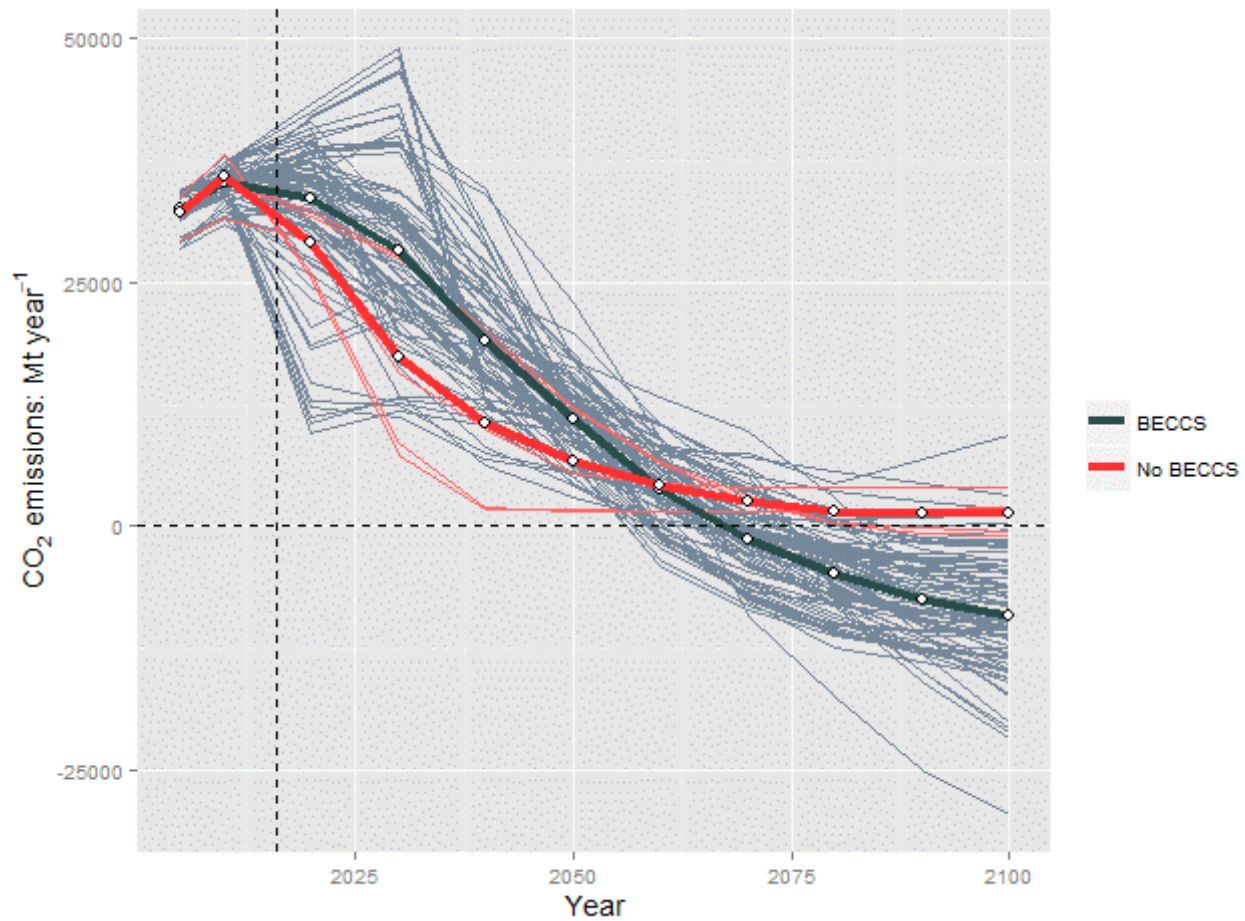
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Appendix

IPCC carbon scenarios for 2C w/o BECCS



CO₂ emissions scenarios from RCP2.6, IPCC AR5 report, differentiating scenarios w/o BECCS. Dotted line on x-axis at year 2016. Graph prepared by Rachael Treharne, APS, University of Sheffield. Source: IPCC AR5 scenario database, website: <https://secure.iiasa.ac.at/web-apps/ene/AR5DB/dsd?Action=htmlpage&page=welcome>



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Cornell Climate Action Plan Process

Taken from http://csc-production.s3.amazonaws.com/2014/02/10/19/11/00/999/CAP2009_5.pdf

Cornell Climate Action plan, 2009

1. Planning process in stages

CAP Planning Process by Stages

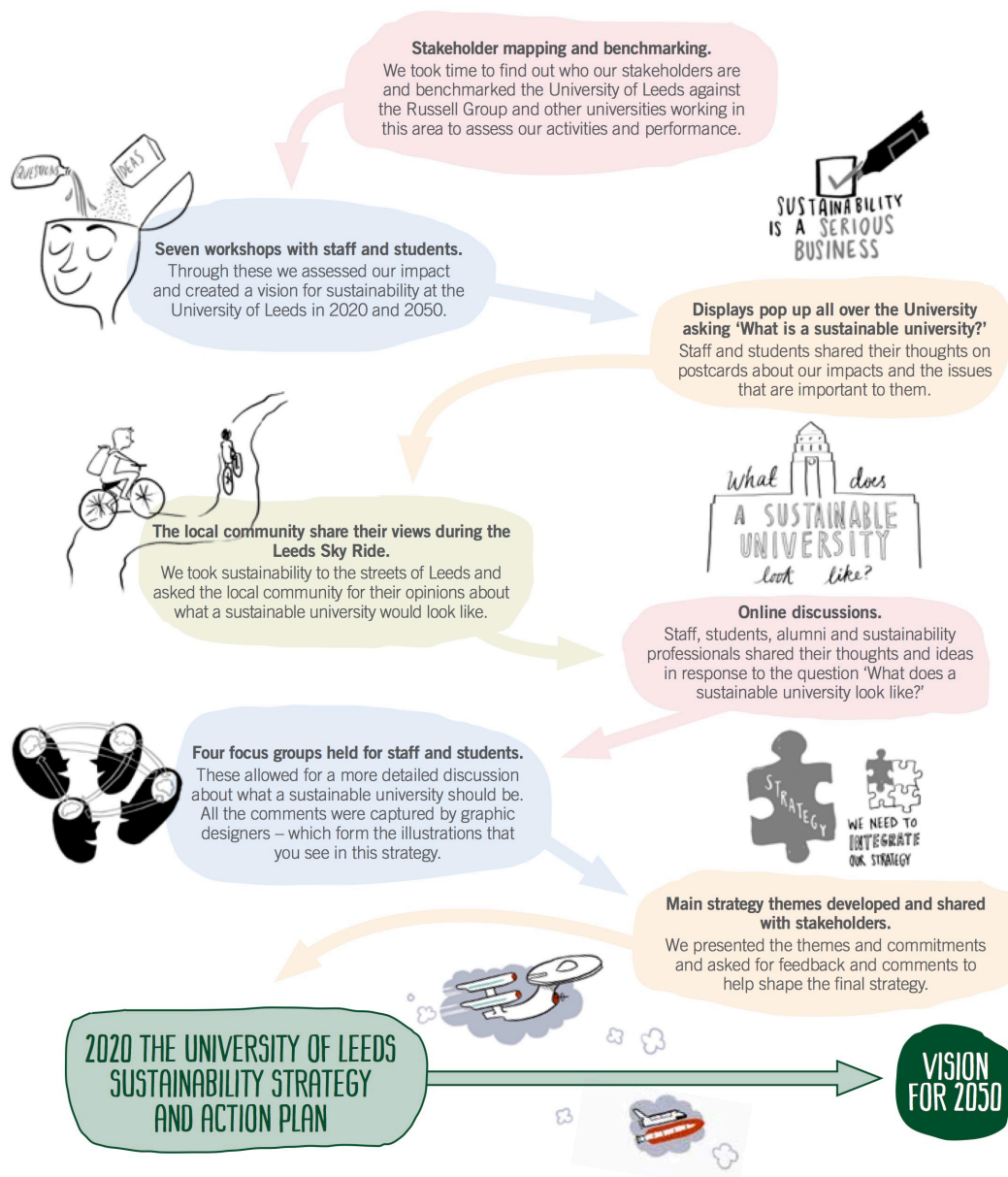




Leeds sustainability strategy development

THE STORY SO FAR...

Creating this strategy has involved a wide-ranging development process with staff, students and wider stakeholders. It's people who will make the strategy a success, so it's critical to involve them at every step...





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Carbon accounting (Scope 1, 2 and 3 emissions)

Greenhouse gas emissions are categorised into three groups or 'scopes' by the most widely used international accounting tool, the Greenhouse Gas (GHG) Protocol. While scope **1** and **2** cover direct emissions sources (e.g., fuel used in company vehicles and purchased electricity), scope **3** emissions cover all indirect emissions due to the activities of an organization.

Examples for scope 1 emissions are carbon emissions from University cars or direct burning of gas for heating. Scope 2 emissions are generated through purchased electricity or steam. Scope 3 emissions are any other carbon emissions that were created through the working of the University, such as purchasing goods, business travel, employee commuting, waste disposal, investments, leased assets etc.

Which carbon emissions should we reduce?

In order to account for our carbon emissions with certainty, an early decision on the type of emissions need to be made by the climate task force.

Clearly Scope 1 and 2 emissions are already accounted for and should be a major focus, but scope 3 emission including travel, waste disposal, goods are currently not measured precisely and with varying degrees of accuracy. In other carbon strategies, like the Cornell Climate Action plan, only staff and student travel is included, while goods or waste are not. However, various stakeholders and experts should be interviewed to make a final decision.



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This report has been compiled after many helpful discussions with University stakeholders from all levels. Specific thanks goes to the members of the Carbon Neutral University Network, the Grantham Centre, and the Estates Energy team for their invaluable motivation and support.

Date: 27 January 2016 (version 1)

This proposal is to be presented at Public Value Subgroup meeting on February 1st 2016.