Carbon Management Plan
2019
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Newcastle University Carbon Management Plan

Foreword

I am pleased to be able to reaffirm our University’s commitment to enhancing our environmental and energy performance through this updated Carbon Management Plan. This follows our commitment to the Department for Business, Energy & Industrial Strategy (BEIS) 2020 Emissions Reduction Pledge.

Environmental sustainability is one of the key strategic enablers of our Vision and Strategy. Implemented by our ISO 14001 Environmental Management System (EMS) and our ISO 50001 Energy Management System, this plan outlines our progress to date and projections against our targets, as well as the means and methods we use to address these.

I’m proud to lead the University in the drive to reduce our carbon emissions. We are committed to early action, recognising that the carbon reduction agenda offers an opportunity to realise long term savings. We will ensure that this plan makes an important contribution to the image and reputation of Newcastle University as a fantastic place to study and work, in line with our new Vision and the values and guiding principles that underpin it. We will engage with students and staff to foster a culture of carbon reduction and environmental awareness as an integral aspect of university life.

We will continue to monitor and review the application of the opportunities identified in this plan, ensuring that sufficient resources are available. An annual statement of progress will be made to Council for subsequent public release.

I look forward to working with the whole Newcastle University community to make a real difference and to ensuring that we are visibly leading as an organisation on this agenda, locally and globally.

Professor Julie Sanders
Deputy Vice-Chancellor
Chair of Environment and Sustainability Committee
1. Introduction

The Higher Education Funding Council for England’s 2010 “Carbon Reduction Target and Strategy for Higher Education in England” sets a target to reduce Scope 1 and 2 carbon dioxide (CO$_2$) emissions$^1$ by an average 34% across the sector by 2020 against a 1990 baseline. This translates to a 43% reduction on a 2005/6 baseline. The targets support national policy in the Climate Change Act 2008 which sets a UK emissions reduction target of 80% on 1990 levels by 2050.

We have also publicly committed to the Department for Business, Energy and Industrial Strategy (BEIS) 2020 emissions reduction pledge in line with the UK Government’s Clean Growth Strategy$^2$. As part of this commitment, we are to meet a 30% reduction in Scope 1 and 2 CO$_2$ emissions by July 2021, against a 2009/2010 baseline year.

Several key principles will underpin our future approach to decision making and investment. We will:

**Scope 1 and 2 emissions:**

- Assess whole life cost and carbon impact and identify measures to reduce carbon in all business cases.
- Include energy and carbon saving measures in refurbishments.
- Pursue measures to reduce carbon emissions from buildings. Work to ensure floor space is functionally suitable and well utilised.

**Scope 3 emissions:**

Scope 3 emissions are indirect emissions that an organisation produces through their activities, but occur from sources not owned or controlled by the organisation$^3$. Examples of such activities include business travel, commuting, supply chain (procurement), waste and water.

**Note that within this document the terms ‘emissions’ and ‘carbon emissions’ refer to carbon dioxide equivalents, measured in tonnes (tCO$_2$e).**

Newcastle University’s Carbon Management Plan (CMP) sets out our approach to contribute towards the sector level targets and supersedes our 2012 update CMP (developed in participation with the Carbon Trust Higher Education Carbon Management Programme). In this CMP we are committing to a new carbon reduction target (see over):

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$^1$ Scope 1 emissions are direct emissions from boilers and owned transport, scope 2 relates to indirect emissions from the generation of purchased electricity, heat or steam. Scope 3 emissions are those indirect emissions that occur as a consequence of the activities of our organisation, but which are not owned or controlled by us e.g. emissions from staff and student commuting.


1. We aim to maintain its scope 1 and 2 carbon emissions by 2020 against a 2005/06 baseline in spite of our estate growth.

2. We maintain an aspirational reduction target of a reduction of 43% against a 2005/6 baseline provided the government decarbonises the power supply by 40% by July 2020 in line with the recommendation from the Committee on Climate Change⁴ – a further saving of ca. 9000 tonnes.

3. We also aim to meet the target of a 30% reduction by July 2021 against as 2009/10 baseline as per the BEIS emissions reduction pledge.

4. Part 1 and 2 emissions reductions will require a range of innovative approaches and technologies whose exact form and cost have yet to be calculated.

5. The emissions accounted for in this plan (and the above targets) apply only to the scope within the context of our Environmental and Energy Management Systems*.

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*”The provision of education and research, and the management of buildings, laboratories and land at the University’s UK sites excluding the NCL London Campus”⁵

We consider part one of this target to be achievable but extremely challenging given our projected growth in floor space and energy intensive research over this timeframe. The level of investment and organisational change required to meet the parts 2 and 3 are dependent on decarbonisation of the electricity supply. Failure to do so would severely impact upon our ability to deliver on our mission to be a world class, research intensive University, and therefore government must play its part.

Chart 1 overleaf exhibits a series of current and future emissions trajectories to the 2020/21 academic year against the University’s aspirational 43% target reduction (the dashed, green line), and the 30% BEIS carbon pledge target (the solid red line). Total emissions excluding new builds are represented by the solid purple bar, with additional emissions arising from confirmed new builds highlighted in orange, and further anticipated emissions atop this from planned builds denominated in light blue/white stripes. We recognise that a range of innovative and efficient approaches and technologies will be required to achieve the 43% reduction against 2005/06 baseline given the expansion of our estate, as well as further detailed studies to identify and quantify savings/costs.

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⁴ The Committee on Climate Change have recommended that Government ensure a carbon intensity some 40% lower than current levels by 2020. To achieve this target, billions of pounds of investment is required in renewable energy and new gas-fired power stations (replacing high-carbon, coal-fired plants) by 2020, with increasing investment in nuclear power and carbon capture and storage also required before 2020 to meet longer term targets. If government achieves the 2020 decarbonisation target, our total Scope 1 and 2 emissions will be approximately 20% lower than the level of possible reductions we have quantified to date. See: CCC (2010) The Fourth Carbon Budget – Reducing emission through the 2020’s; Chapter 6, Power sector decarbonisation to 2030. Pg. 245. (Available at: https://www.theccc.org.uk/archive/aws2/4th%20Budget/CCC-4th-Budget-Book_with-hypers.pdf)

⁵ Newcastle University EMS and EnMS Scope (available at: https://www.ncl.ac.uk/sustainable-campus/about/ems/)
Chart 1 indicates Newcastle University’s scope 1 and 2 carbon emissions in 2005/6 were 41,187 tonnes from fossil fuel, steam and electricity consumption, plus 381 tonnes from University-owned vehicles (excluded from the graph) – a total of 41,568 tonnes.

There was limited growth in our scope 1 and 2 emissions between 1990 and 2005/06 as a result of active energy management and the reduction in the carbon intensity of the national electricity supply. Over this period student numbers increased by approximately 50% while our income (often involving energy intensive research) more than trebled. Two new energy intensive research buildings, the Devonshire and Paul O’Gorman buildings were constructed during this period.

By comparison, some Russell Group universities saw a near doubling of their carbon emissions between 1990 and 2005/06 while more widely across the sector some institutions have shown modest reductions in emissions. The variation in emissions trajectories across the sector reflects the range of activity, with the most significant increases being seen in research intensive universities.

This is highly relevant to Newcastle University. Our scope 1 and 2 carbon emissions per staff and student FTE reduced by over 25% between 1990 and the 2005/06 baseline year, due to a policy of largely containing growth within our existing floor space, and balancing construction with refurbishments, demolitions and disposals. However, in pursuit of our mission to be a world class, research intensive university, from 2010-11 the opening of new buildings that are essential for our activities has added substantial floor space growth. We estimate that this growth will result in an estimated increase in emissions of approximately 5,292 tCO₂e per annum in our UK estate by July 2021.

Therefore, if the government fails to achieve the grid decarbonisation target, we need a programme of measures to reduce emissions which exceed the projected increase arising from our capital programme. In addition to significant investment in energy efficiency, efficient space management will also be required to achieve the target, including disposing of space through demolition, sale or lease to third parties.
In addition to the floor space growth in Newcastle we are also expanding internationally. In 2011 we completed the construction of our NUMed development, a 14,000m² Medical Sciences campus in Malaysia. We have been delivering degree programmes in Singapore since 2004. Our emissions from international activities are excluded from the scope of this CMP, although we have begun collecting energy consumption data from NUMed; as data quality improves, we will begin to include these emissions in future reports.

However, we do anticipate meeting the 2020 BEIS Carbon Pledge 30% reduction target despite this increase in research intensity and expansion of the estate as outlined in Chart 1. This plan sets out the measures we will take to manage carbon emissions and meet the targets outlined above.

Our achievements since 2005/06 are detailed in Table 1:

<table>
<thead>
<tr>
<th>Measure</th>
<th>Estimated Annual Carbon Saving (tCO₂e to date)</th>
<th>Cost (to date)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scope 1 and 2 emissions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salix revolving green fund investment</td>
<td>4100</td>
<td>£2.6m</td>
</tr>
<tr>
<td>Boiler Replacement Programme</td>
<td>1441</td>
<td>£5.3m</td>
</tr>
<tr>
<td>ICT measures:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote shutdown of cluster PC's, Virtualisation of servers,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refurbishment of data centre.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMS upgrade and optimisation</td>
<td>288</td>
<td>£231k (not including BMS support and maintenance annual costs)</td>
</tr>
<tr>
<td>Appointment of additional staff including:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy (and EnMS) Manager; Sustainability (and EMS) Manager;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainability Officers x3; Assistant Sustainability Officer, and 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>annual student assistant placement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation of sub metering</td>
<td></td>
<td>£200k per annum</td>
</tr>
<tr>
<td>Awareness campaigns and network of Environmental Coordinators.</td>
<td></td>
<td>£190k (not including sub-metering maintenance annual costs)</td>
</tr>
<tr>
<td>HVAC Upgrades</td>
<td>1565</td>
<td>£1.7m</td>
</tr>
<tr>
<td>Building Refurbishment Projects</td>
<td>Not yet quantified</td>
<td>£35m</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>26 (per annum)</td>
<td>Not quantified</td>
</tr>
<tr>
<td><strong>Scope 3 Emissions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced proportion of individual staff commuting by car from 40% in</td>
<td>350</td>
<td>Not quantified</td>
</tr>
<tr>
<td>2004 to 14% in 2018 (modal split taken from 2018 Staff Travel Survey).</td>
<td></td>
<td>(costs of staff time and promotional activity)</td>
</tr>
<tr>
<td>Student Travel Survey to take place in 2019.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 1 – Carbon management activity since 2005/06

Our priorities to 2021 include further improving our understanding of our carbon footprint, e.g. through monitoring and targeting, and using this understanding to prioritise investment in energy efficiency and conservation measures. Improved building-level data will inform our space management strategy. An overarching priority is the continued development of a ‘carbon reduction culture’ at the University.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cost</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT measures including a ‘green’ PC specification, shift to multifunctional printing devices and double sided printing (see section 6.6).</td>
<td>Not quantified</td>
<td>£0 Achieved within existing cost base.</td>
</tr>
<tr>
<td>Implemented a recycled office paper policy</td>
<td>500</td>
<td>£0 Achieved within existing cost base.</td>
</tr>
</tbody>
</table>
2. Context and drivers for Carbon Management

Energy management has been a University priority for many years, and is highlighted by the achievement of ISO 50001 certification in July 2015 of our integrated EMS and EnMS, which is also certified to the ISO 14001 standard. The drivers for energy and carbon management include:

- Reduced energy costs.
- Reduced identified environmental impacts through lower carbon emissions.
- Compliance obligations (including legislative and voluntary), and the needs and expectations of interested parties as identified through our EMS and EnMS.
- Reduced reliance on fossil fuels and improved energy supply security
- A range of additional benefits, including improved safety and security (e.g. through improvements to internal and external lighting systems) and lower maintenance costs (e.g. from modern efficient boilers).
- To protect and enhance our reputation and credibility by demonstrating effective carbon management, integrated with our vision and strategy.

3. Our Vision

Our vision is of Newcastle as a research-intensive, civic university, with a global reputation for academic excellence. As a university, our institutional objectives are to achieve:

- Top 20 in the UK for research
- Top 20 in the UK for student satisfaction

Also, led by our core values and guiding principles, implement our four key organisational strategies;

- Education for life
- Research for discovery and impact
- Engagement and place
- Global

Underpinning our vision are a series of strategic enablers:

- Our people
- Infrastructure
- Environmental Sustainability
- Effectiveness and Financial Sustainability
- Network and partnerships
- Monitoring our progress

This CMP is to support the delivery of the University's Vision by working within a number of the strategic enablers, namely; Infrastructure, Environmental Sustainability, and Effectiveness and Financial Sustainability. By minimising our Scope 1, 2 and 3 CO₂ emissions, we lessen our negative impacts on the environment and allow increased funding for further research through the reduction of our utilities expenditure, whilst continuing to improve our estate and facilities, for an improved staff and student experience.

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6 https://www.ncl.ac.uk/media/wwwnclacuk/whoweare/files/vision-and-strategy.pdf
4. The situation since 2005/6

In the last financial year (Aug 2017 – Jul 2018), carbon emissions have reduced, despite increasing student numbers and research intensity. The key carbon reduction measures we have carried out since 2005/06 are detailed previously in Table 1, and later in Section 6.

Chart 3 outlines the breakdown of emissions from all scopes in the baseline year.
The breakdown of Scope 1, 2 and 3 tCO2 emissions between the residential and non-residential (academic) estates can also be seen below.

Chart 4 details the ratio of Scope 1 and 2 tCO2 emitted by the academic (non-residential) estate compared to the residential estate from total energy consumed.

Charts 5 and 6 outline the Scope 3 emissions from water consumption and waste production in the academic and residential estates.

A full tabulated breakdown of emissions from both estates can be seen in Table 2.

For differences in tCO2 emitted as a result of the University’s procurement activities; where a procurement activity is applicable to both estates (e.g. food and catering), tCO2 values are split based on the Gross Internal Area (GIA, m2) ratio between the estates:

i.e. Total Academic Estate GIA = 394,767 m2 = 79% of Total Estate  
Total Residential Estate GIA = 105,284.19 m2 = 21% of Total Estate

Where a procurement activity doesn’t relate to Residential, 100% of the total value is allocated to Academic (e.g. Business Services). Further breakdown of procurement activities can be found in sub-section 7.1.

For future reporting, increased efforts will be made into the collection of procurement data (as part of the Flexible Framework mechanism) and associated carbon emissions data to better represent the split across the Academic and Residential Estate.

Wastewater treatment emission figures are derived from the University’s total water consumption value across both estates (see Chart 5).

Chart 4: Newcastle University Academic and Residential Estate Scope 1 and 2 emissions, from EMR submission (tCO2 and % split 2017/18)
Chart 5: Newcastle University Academic and Residential Estate Scope 3 emissions from water consumed, from EMR submission (tCO₂ and % split) 2017/18

Chart 6: Newcastle University Academic and Residential Estate Scope 3 emissions from waste, from EMR submission (tCO₂ and % split) 2017/18
For staff and student travel/commuting Scope 3 emissions, it is assumed that tCO$_2$ generated can be wholly attributed to the academic estate (business travel & commuting to / from the academic estate) (see sub-section 7.3).

Table 2: Newcastle University Academic and Residential Estate Total emissions breakdown 2017/18

5. Assumptions

In estimating the carbon savings achievable from various measures over the next ten years, there is a level of uncertainty. As we progress with implementing the carbon measures, and as more surveys, feasibility studies and tenders are completed the uncertainty will be reduced and this improved understanding will be used to inform future versions of the CMP. In estimating carbon savings we have assumed that:

5.1 All refurbishments in the residential and non-residential estate consider opportunities to reduce carbon emissions where possible exceeding the requirements of Part-L of the building regulations.

5.2 Major refurbishment schemes achieve BREEAM ‘Very Good’ standard and an EPC ‘B’ rating or better, new non-residential buildings achieve BREEAM ‘Excellent’ or ‘Outstanding’ and an EPC ‘A’ rating.

5.3 Variations in the carbon intensity of grid electricity are taken into account as data is made available by government. Further decarbonisation of the UK electricity supply is essential to meet the Climate Change Act target of an 80% cut in emissions by 2050, and national commitments within the 2015 Paris Agreement.

5.4 For payback calculations energy prices are assumed to remain at current levels throughout the ten year period. This is despite the impending increases in Climate Change Levy (CCL) in April 2019, and anticipated rises in non-commodity charges (i.e. transmission and distribution charges) imposed by suppliers.

5.5 Works costs through to 2020/21 are assumed at current levels.

5.6 Operational hours for heating purposes remain stable or are reduced.

5.7 All business cases for major projects are assessed for their carbon impact, including life cycle costing.

5.8 Data on emissions from our activities overseas (NUMed in Malaysia, Marine Sciences in Singapore) is collected and reported on, but will not form part of our CMP footprint as reinforced by our EMS & EnMS scope.
6. Implementation

The carbon reduction programme we propose is not yet fully costed, a summary of the measures in the following pages is shown below. We currently estimate that the minimum cost of measures to achieve our targets is in excess of £10m over ten years:

<table>
<thead>
<tr>
<th>Measure</th>
<th>Annual Total Cost</th>
<th>Funding Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Improving governance</td>
<td>£0</td>
<td>N/A</td>
</tr>
<tr>
<td>6.2 Energy Efficiency measures</td>
<td>£2.25m</td>
<td>Salix Fund</td>
</tr>
<tr>
<td>6.3 Behavioural Changes</td>
<td>£180k</td>
<td>Various</td>
</tr>
<tr>
<td>6.4 Ventilation Improvements</td>
<td>Approx. £50k - £500k, dependent on Salix and ESS project pipeline</td>
<td>Various (Salix, ESS project budgets, LTM)</td>
</tr>
<tr>
<td>6.5 Boiler Replacement</td>
<td>£5.7m (total to date)</td>
<td>ESS Maintenance budget</td>
</tr>
<tr>
<td>6.6 Green ICT</td>
<td>To be confirmed</td>
<td>ISS and departmental budgets</td>
</tr>
<tr>
<td>6.7 Disposal of Buildings</td>
<td>Not yet quantified and can vary significantly, dependent on University Strategy</td>
<td>ESS</td>
</tr>
<tr>
<td>6.8 Refurbishment</td>
<td>To be confirmed</td>
<td>Reprioritisation of existing spend and/or business case to FMBSG</td>
</tr>
<tr>
<td>6.9 Fuel Switching</td>
<td>To be confirmed</td>
<td>To be confirmed</td>
</tr>
<tr>
<td>6.10 Monitoring and Targeting</td>
<td>£200k (non-staff costs)</td>
<td>Utilities Budget</td>
</tr>
<tr>
<td>6.11 Voltage Reduction</td>
<td>£1.5m</td>
<td>Business case to FMBSG</td>
</tr>
<tr>
<td>6.12 University-owned vehicles</td>
<td>Embedded within current projects</td>
<td>Existing budgets</td>
</tr>
<tr>
<td>6.13 Renewable energy and on-site generation</td>
<td>FiT income approx. £30k</td>
<td>ESS</td>
</tr>
<tr>
<td>6.14 Energy Procurement</td>
<td>Not quantified, varies with University energy consumption</td>
<td>Utilities Budget</td>
</tr>
<tr>
<td>6.15 Demand Response</td>
<td>To be confirmed</td>
<td>ESS</td>
</tr>
<tr>
<td>6.16 Fossil Fuel Divestment</td>
<td>Not quantified</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 3: Summary of Carbon Reduction measures, annual costs, and funding source
6.1 Improving the governance of carbon management

The Deputy Vice Chancellor (Professor Julie Sanders) holds the sustainability portfolio at Executive Board level, and the University’s commitment to addressing Sustainability by setting out objectives and responsibilities across a range of areas including Energy and Carbon.

We recognise that to achieve our carbon reduction target we need to further improve the governance of carbon across Academic and Service units. This includes:

6.1.1. Maintaining the Environmental Sustainability Committee (chaired by Prof. Sanders) to monitor the development and implementation of this plan and the ISO 14001 certified EMS, and ISO 50001 EnMS.

6.1.2. Annually reviewing the University’s Environmental and Energy Policies⁷, approved by Executive Board and University Council.

6.1.3. Improving internal systems for monitoring and reporting carbon emissions (see section 6.10 for more details).

6.1.4. Ensuring that responsibilities for carbon management issues and their associated risks are clearly defined and understood and owned by each academic and service unit.

6.1.5. Revising the business planning process such that Heads of Units address the carbon reduction agenda within their annual business plans.

6.1.6. Ensuring that carbon and wider sustainability objectives are agreed by relevant staff e.g. Heads of School/Service, Environmental Coordinators.

6.1.7. Developing, improving and enforcing policies relating to carbon management e.g. the University’s Academic Heating and Cooling Policy.

6.1.8. Developing a methodology for assessing the carbon impact of business cases.

Total cost over ten years: £0 – Costs of staff time assumed to be met from existing budgets.

Annual Carbon Reduction: There will be no direct carbon savings from these measures however they are essential to enable achievement of the wider objectives.

Simple Payback Time: 0 years.

Fig 1 is taken from the EMS and EnMS Management Responsibility Procedure as per our ISO 50001 certified Integrated EMS and EnMS. This outlines the management structure of the operational and responsible parties for energy and carbon management within the University.

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⁷ Newcastle University’s Energy Policy (available at http://www.ncl.ac.uk/sustainable-campus/about/enms.htm)
6.2 Energy Efficiency and Conservation measures

Many opportunities exist across the estate to conserve energy in buildings and to improve the efficiency of equipment and systems. To develop this plan we consider these on a building by building basis, as identified through our EnMS Energy Review procedure, energy surveys, and through liaison with Schools, Services and Environmental Champions.

Measures with a payback period of 8 years or less will be incorporated into the Salix revolving loan fund programme, with further projects being funded from the savings made (see emissions savings and project spend to date in Charts 7 & 8 below). The cost (£) savings from current and future projects will result in an annual budget of approximately £431k being available between 2017/18 and 2020/2021. For the purposes of this plan, we have conservatively estimated that these measures will have a mean payback period of 8 years and will deliver circa 1089 tCO2e per annum*.

We are also currently on-site with our £2.4m, campus-wide LED lighting retrofit scheme, a project match-funded by the University and Salix that is due for completion in July 2020. These works are to generate savings of 1,085 tCO2e per annum.

* The tCO2e saved through the Salix recycling fund varies between financial years as it is dependent on the blend of projects commissioned within the tranche of funding, and the change in carbon factors for electricity and gas.
Chart 7: Expenditure on Salix projects completed to date
Chart 8: Carbon savings (tCO2e) from Salix projects completed to date
**Table 4: Salix project types, project spend, carbon savings and average payback breakdown to date**

Planned projects for 2018-19 include further BMS / heating control upgrades, ventilation upgrades (namely fume cupboard efficiency improvements) and pipework insulation.

The ESS Sustainability and Maintenance Teams continue to operate the University’s Building Management Systems to ensure heating, ventilation and air conditioning systems are working optimally, in line with our Academic and Residential Heating & Cooling Policies.

### 6.3 Behavioural Change

Successful awareness raising programmes over the last 6 years aimed at improving environmental performance through behavioural change include our Switch Off 2010, Let’s Recycle More, Green Impact (GI) and Student Switch Off campaigns. However, since NUSU’s decision to disaffiliate from the NUS in 2017, we have been unable to run the Green Impact scheme. We continue to run Student Switch Off only as a standalone campaign, aimed at reducing energy usage and carbon emission within University halls of residence and are currently developing new initiatives.

The ESS Sustainability Team supports effective communication with and between ‘Environmental Champions’ (ECs) and other stakeholders (including staff and students) across our estate, this is crucial to delivering effective campaigns and instigating cultural change. Ongoing investment is required to maintain engagement - the high turnover rate of students and ‘message fatigue’ amongst staff means that new, innovative ways of getting messages out are required to embed cultural change. In December 2018 we recruited a new Sustainability Officer and Assistant Sustainability Officer, both of whose roles will have a large focus on staff and student engagement and the development of new schemes across the University.

Plans for continued awareness-raising include:

- **6.3.1 Building** on the relationships and knowledge developed during Switch Off 2010 i.e. through the rollout of the energy web-dashboards initiative to building users to allow staff to monitor their building’s live energy consumption online.
6.3.2.

Building on the successful recycling league table by developing a league table of carbon reduction performance.

6.3.3.

Working with ECs to audit and benchmark laboratories, implementing targeted awareness campaigns, and exploring opportunities for rationalising the use of equipment (e.g. -80°C freezers, analytical equipment etc.).

6.3.4.

Training kitchen staff in energy efficiency (an area of high energy use).

6.3.5.

Production of new engagement materials (e.g. toolbox talks) in line with the deployment of our new website in 2019.

6.3.6.

Formulation, implementation and maintenance of a new Staff and Student University engagement scheme to replace Green Impact. Planned launch at the annual Environmental Awards in summer 2019.

Much of the campaign work can be resourced by existing staff. Some additional funding is required for additional staff/student resource, for incentives to encourage behaviour change and for materials (design, banners, printing etc.).

Total cost over ten years: >£2,000,000 (£200k per annum in ESS Sustainability staff costs alone).

Annual carbon reduction: Not quantified

Simple payback time: Not quantified

6.4 Ventilation Improvements

A key driver of the energy intensity of research space is the ventilation of buildings particularly those with high numbers of fume cupboards. Up to 40% of laboratory energy use results from ventilation; electricity consumption from fan motors, and gas/steam/electricity consumption heating and cooling the supply air. A single traditional fume cupboard operating 24/7 can result in annual carbon emissions of ca. 6 tonnes, exceeding those of the average UK house. In the Bedson Building, fume cupboard projects in 2012 saved 319 tCO₂ annually, with further works to continue in 2018/19. Newcastle University operates over 400 fume cupboards, many on a 24/7 basis.

Opportunities to reduce the energy consumption and carbon emissions of laboratory ventilation systems include:

6.4.1 Lowering face velocities of existing fume cupboards whilst maintaining containment by changing e.g. control strategies and operating practices – thereby reducing electricity consumption from fan motors, and gas/electricity consumption from reducing the volume of air to be heated/cooled.

6.4.2 The use of high performance filters on Air Handling Units (AHU’s) – we are currently trialling this new technology in the Devonshire building.

6.4.3 Retrofitting fume cupboard occupancy controls on Variable Air Volume systems.

6.4.4 Installing low velocity fume cupboards, such as those installed in the new-build Baddiley-Clark building, in the existing estate e.g. during lab refurbishment.

6.4.5 Renewing or upgrading air handling plant including installation of heat recovery systems.

Further studies to identify the costs and savings available from each of the elements detailed here (which are ranked in order of expense with 6.4.1 being the lowest cost) are required. We are currently developing an asset register of relevant equipment to allow more detailed studies to be commissioned.

Estimated Total Cost over ten years: To be confirmed (many costs will be met by other budgets e.g. refurbishment projects, LTM etc.).
Target Annual carbon reduction: estimated at up to 1500 tonnes.

Simple payback time: **3-5 years** (dependent on the proportions of electrical, gas and steam savings identified).

### 6.5 Boiler Replacement Programme and Combined Heat and Power (CHP)

Due to the age and inefficiency of the existing district heating system fed by steam boilers at Kings Road and Merz Court boilerhouses, a £4M boiler replacement programme was launched in 2007/08. It commenced with the installation of modern, high efficiency boilers in Ridley Buildings 1&2 - replacing the connection to the district heating system.

Partial decentralisation of the system has been completed, with new efficient boilers now installed in Stephenson building (also serving Cassie), Hadrian Bridge (serving Politics and Robinson Library), Agriculture, Merz Court (also serving Claremont Tower/Bridge, Daysh, Old Library and Percy buildings), Fine Art, Architecture, and INEX. The programme was completed in 2012 with the removal and replacement of the inefficient steam boilers within Kings Road boilerhouse (serving King’s Road Centre and Armstrong, Bedson and KGVI Buildings), in addition to the boilers at Henderson Hall and Jesmond Road.

We have installed CHP units at both Castle Leazes and Kensington Park Terrace which are showing reductions in electricity use from the grid. We have also successfully commissioned an anaerobic digester system with integrated micro-CHP at our Cockle Park Farm site which is currently exporting electricity back into the grid. We will be using this data to form a potential business case for the retrofit of a new CHP unit(s) on campus.

<table>
<thead>
<tr>
<th>CHP Unit</th>
<th>Heat Generated (MWh)</th>
<th>Electricity Generated (MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Castle Leazes</td>
<td>873</td>
<td>563</td>
</tr>
<tr>
<td>Kensington Park Terrace</td>
<td>282</td>
<td>151</td>
</tr>
<tr>
<td>Cockle Park Farm*</td>
<td>11</td>
<td>9</td>
</tr>
</tbody>
</table>

*data from April 2018

**Table 5: Heat and Electricity generated by CHP units (August 2017 to July 2018)**

The Medical and Dental Schools are heated, in part, by steam generated from CHP in the Royal Victoria Infirmary (RVI) Energy Centre; as the heat loads within a hospital are higher, CHP is more economically advantageous in this setting. Due to the refurbishment and expansion being carried out by the NHS Trust at the RVI site the Trust has identified a need to increase the capacity of their CHP. We are currently exploring the options for the University utilising more heat from the RVI Energy Centre.

Total cost of the campus boiler replacement programme over ten years: **£4.2m** (already funded).

Annual carbon reduction from the campus boiler replacement programme to date are: **1451tCO₂**.

Simple payback time: **Over 10 years** (including avoided maintenance costs).

Total costs of the CHP proposals: **To be confirmed**.

Total carbon reduction from CHP proposals: **To be confirmed**.
6.6 Green ICT

Growth in ICT is one driving factor behind the average 2.5% annual increase in electricity consumption since 1990. The increased electrical demand arises not just from the PC's/servers themselves but also air conditioning equipment required to cool the spaces within which they sit (particularly server rooms and offices). We estimate that ICT may be responsible for up to 20% of non-residential electricity demand, equivalent to £750k and over 5,500 tonnes of CO₂ per annum.

Since the launch of our first CMP in 2008 a number of improvements to ICT systems have included:

6.6.1 A system to automatically shut down cluster PC's outside of operating hours has been implemented saving ca. 300tCO₂ per year.
6.6.2 The virtualisation of over 200 servers saving ca. 700tCO₂ per year.
6.6.3 The introduction of a 'green' purchasing policy for desktop computers, see http://www.ncl.ac.uk/iss/green/.
6.6.4 The refurbishment of the Claremont Tower data centre saving ca. 150tCO₂ per year.
6.6.5 The introduction of Windows Vista with its improved power management.
6.6.6 ISS have migrated the primary data centre from Claremont Tower to a new location in Databanx, consolidating the server estate and reducing the number of satellite server bases. This new data centre has a higher Power Usage Effectiveness (PUE) value than the previous location, with a contracted commitment to further improve PUE over time.
6.6.7 The replacement cycle of PCs has seen 356 green PCs across centrally managed services in 2014/15.
6.6.8 The development of an analytics tool allowing schools to view the printing behaviour of their students, and subsequent carbon impact.
6.6.9 The implementation of Windows 7 with its further improved power management capabilities across all academic and service units.
6.6.10 Increased use of high quality video conferencing facilities in order to avoid unnecessary business travel and associated emissions output.
6.6.11 The installation of energy efficient, 'combi-cool' AC units in our Claremont Tower Data Centre in 2018. These new units possess a ‘free-cooling’ capability whereby outside air is circulated and utilised for cooling, reducing the demand for electrically-powered direct expansion (DX) chiller units. This project is estimated to save 65 tCO₂ per annum.

Further improvements by 2020/21 will include:

6.6.12 Improving, in conjunction with ESS, the efficiency of any necessary remaining satellite server rooms.
6.6.13 Consideration of alternative approaches to service provision. As equipment needs to be replaced, ISS will review each business case for service need, provision and costs (including energy/carbon.) ISS will promote HPC (High Performance Computing) using energy efficient cloud technologies where appropriate.
6.6.14 Continual improvement of the efficiency of network equipment.
6.6.15 The continued roll-out of Multi-Functional Devices (MFD’s) for printing.

Many of these items are included in existing plans and expected budgets. For those which are additional, ISS will develop business cases for FMBSG as appropriate.

Annual carbon reduction to date: To be confirmed.
Additional estimated carbon reductions from further measures: To be confirmed case by case.

Simple payback time: 5-20 years dependent on measure.

### 6.7 Buildings

Expansion of our total floor space since the baseline year of 2005/06 as a result of new-builds and lease acquisitions (including internationally) is hugely significant. The buildings and their estimated annual carbon contributions are shown below in Table 6:

<table>
<thead>
<tr>
<th>Buildings built/leased (2005/06 to Jul 2021)</th>
<th>Annual CO₂ emissions (tonnes)</th>
<th>Gross Internal Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baddiley-Clark Building</td>
<td>764</td>
<td>5,892</td>
</tr>
<tr>
<td>CAV - Edwardson</td>
<td>659</td>
<td>1,749</td>
</tr>
<tr>
<td>King’s Gate</td>
<td>450</td>
<td>8,390</td>
</tr>
<tr>
<td>CAV - CARU</td>
<td>13</td>
<td>1,171</td>
</tr>
<tr>
<td>CAV - Magnetic Resonance Centre</td>
<td>217</td>
<td>1,095</td>
</tr>
<tr>
<td>CAV - Biogerontology (NBRB)</td>
<td>299</td>
<td>937</td>
</tr>
<tr>
<td>Castle Court</td>
<td>300</td>
<td>3,020</td>
</tr>
<tr>
<td>Music Building</td>
<td>52</td>
<td>1,063</td>
</tr>
<tr>
<td>Team Valley Store</td>
<td>61</td>
<td>2,095</td>
</tr>
<tr>
<td>Newcastle Business School (NUBS)</td>
<td>717</td>
<td>12,785</td>
</tr>
<tr>
<td>Blyth Marine Station</td>
<td>15</td>
<td>309</td>
</tr>
<tr>
<td>Albion House student residence</td>
<td>68</td>
<td>1,625</td>
</tr>
<tr>
<td>Barker House student residence</td>
<td>105</td>
<td>2,955</td>
</tr>
<tr>
<td>Biomedical Research Centre (TRB)</td>
<td>1,000</td>
<td>3,536</td>
</tr>
<tr>
<td>Cookson Administration Extension</td>
<td>100</td>
<td>350</td>
</tr>
<tr>
<td>The Key Building</td>
<td>10</td>
<td>203</td>
</tr>
<tr>
<td>Higham House</td>
<td>To be confirmed</td>
<td>318</td>
</tr>
<tr>
<td>Kensington &amp; Park Terrace Student Residence</td>
<td>396</td>
<td>11,750</td>
</tr>
<tr>
<td>Fareham - Isentropic</td>
<td>To be confirmed</td>
<td>To be confirmed</td>
</tr>
<tr>
<td>Neptune Marine Laboratory</td>
<td>16</td>
<td>785</td>
</tr>
<tr>
<td>Marjorie Robinson Library</td>
<td>164</td>
<td>4,022</td>
</tr>
<tr>
<td>Urban Sciences Building (USB) (Helix Site)</td>
<td>553</td>
<td>15,015</td>
</tr>
<tr>
<td>Park View Student Village (PVSV)</td>
<td>To be confirmed</td>
<td>37,293</td>
</tr>
<tr>
<td>Black Horse House</td>
<td>To be confirmed</td>
<td>1,476</td>
</tr>
</tbody>
</table>
Table 6: Buildings built or leased 2005/06 – 2020/21

To aid in offsetting the increase identified above there are proposals to dispose of an estimated 60,980m² of space before 2020 as part of the University’s strategy for the redeployment of our residential estate. At the time of writing, the following buildings have been, or are to be, disposed of or demolished. Carbon factors and GIA are taken from the year of the building’s construction / purchase / lease, or sale / demolition:

<table>
<thead>
<tr>
<th>Buildings disposed / to be disposed of (2005/06 to July 2021)</th>
<th>Annual CO₂ emissions (tonnes)</th>
<th>GIA (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claremont Place (disposed 2010)</td>
<td>241</td>
<td>2,075</td>
</tr>
<tr>
<td>Eland Lodge &amp; Studio (disposed 2017)</td>
<td>Not quantified</td>
<td>328</td>
</tr>
<tr>
<td>Henderson Hall Accomodation (only Old Hall and Porters lodges currently operational although planned for demolition 2019)</td>
<td>724</td>
<td>12,608 (4,161 Old Hall)</td>
</tr>
<tr>
<td>Richardson Road Accommodation (replaced by new PVSV development in 2018)</td>
<td>1243 (new PVSV emissions yet to be quantified)</td>
<td>18,569 (new PVSV GIA yet to be quantified)</td>
</tr>
<tr>
<td>Leazes Parade (disposal Oct 2019)</td>
<td>274</td>
<td>5,492</td>
</tr>
<tr>
<td>Leazes Terrace (disposal Oct 2019)</td>
<td>711</td>
<td>11,888</td>
</tr>
<tr>
<td>St Mary’s Halls Accommodation (disposal 2020)</td>
<td>478</td>
<td>10,020</td>
</tr>
</tbody>
</table>

Table 7: Disposed buildings from 2005/06 – 2020/21

Often the space being disposed of will be relatively inefficient, but lightly serviced, and therefore of low carbon intensity. Whereas new build space tends to be efficient but highly serviced and often more densely occupied. A good example is the replacement of the Jones Marine building (low density occupation with radiators and natural ventilation) with the Baddiley-Clark building (mechanically ventilated and air conditioned medical research space). We are also seeing a shift to a greater proportion of energy intensive buildings with our Helix (Science Central) development.
6.8 Refurbishment

Often, the most cost effective time to implement carbon reduction measures (e.g. insulating the building fabric, replacing the windows and upgrading the lighting) is during refurbishment. In order to achieve our target we need to ensure that we take advantage of these opportunities in our refurbishment projects between now and 2020 and have completed Phase 1 & 2 of a campus-wide draught-proofing project to the value of £137K, saving 150 tCO₂ annually. This project included the; Architecture, Drummond, Merz Court, Agriculture, Herschel, and King George VI buildings. The new Claremont & Daysh large-scale refurbishment capital project currently on-site will also render gas and carbon savings through the construction of new façade, glazing and external cladding.

However the current level of funding for major refurbishments is often not sufficient to allow for measures with good lifecycle savings to be incorporated. For future projects, it will be necessary to reprioritise spend to address the carbon reduction agenda. When planning projects, sufficient allowance must be made to ensure that opportunities are taken to install measures with good life cycle savings. It is estimated that in refurbishment projects through to 2020 this will lead to additional costs against a ‘business as usual’ scenario of at least £5m. For example, when planning projects consideration must be given to measures such as window replacement, which may have a relatively long payback period, but have a significant impact on occupant perceptions (of comfort, aesthetics etc.). In developing this CMP we have estimated that bringing windows across the academic estate up to Part L standards would cost in excess of £40m at today’s prices.

To address this, we are now in the process of developing a bespoke sustainability framework for Newcastle University. Historically, for new major construction and refurbishment projects we would seek to achieve high levels of environmental performance in line with the industry renowned BREEAM standard and our own ‘Project Briefing Documents’. The utilisation of a Newcastle University tailored framework will allow us to maximise the value of project funding whilst reducing negative environmental impacts (including carbon emissions) of future buildings and enhancing sustainability. This will be achieved by reallocating cost and resource away from elements not applicable to the University estate context, and applied to further improvements in the building’s environmental and energy performance.

Total cost over ten years: Many costs will be met within Salix, maintenance and refurbishment project costs - plus an estimated additional £5m to be sought via project business cases to address building fabric improvements with payback periods of greater than 5 years.

Annual carbon reduction: **Approximately 1600 tCO₂ currently** (projected reduction is subject to a mix of measures funded).

Simple payback time: **Assumed at 10 years** (but may be longer subject to the mix of measures funded).

6.9 Fuel Switching

We have a number of residences which are heated electrically including, St Mary’s Hall in Fenham, Bowsden Court in Gosforth and Albion House next to St. James’ Park on the outskirts of the central campus. Electric heating is expensive, environmentally damaging and difficult to control. Wherever possible we aim to replace these systems to a gas fired, ‘wet’ heating system.

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8 Newcastle University – Estates, Contractors (available at: [https://www.ncl.ac.uk/estates/contractors/](https://www.ncl.ac.uk/estates/contractors/))
We have had success in installing a wet heating system in place for electric heating at our Windsor Terrace and Grand Hotel student residences, producing 216 tCO$_2$e savings per year.

If the installation of efficient ‘wet’ systems cannot be achieved due to operational or infrastructure issues, or due to prohibitive costs, proposals to improve existing electrical systems including occupancy controls will be developed.

Total cost over ten years: **To be confirmed**

Annual carbon reduction: **To be confirmed**

Simple payback time: **10-15 years.**

### 6.10 Monitoring and Targeting

In 2009/10 new electricity sub meters were installed to all buildings on the central campus. Baseline data from these meters is being used to identify wastage e.g. equipment left on unnecessarily out of hours, and in assessing the success of installed energy saving measures. In 2017 we also procured a new sub-metering health, data monitoring and targeting platform (METERology) to ensure the optimal performance of our sub meters and collection of fine-grained consumption data. These meters also provide data to allow the calculation of Display Energy Certificates.

We are have expanded our Half Hourly read Automated Meter Reading (AMR) portfolio from electricity meters with over 100kW supply and gas meters. We are expanding this into our Non Half Hourly meter portfolio.

In order to ensure data analysis is effective and time efficient (e.g. exception reporting with auto emailing of results to interested parties), the ESS Sustainability Team utilises Systems Link Energy Management software in the collection, validation and monitoring/measurement of all energy consumption data (invoice, direct and profile), for all energy sources. The functions of this software allow for the effective reporting of energy consumption statistics and measurement against University objectives and targets as per our ISO 50001 certified EnMS.

In line with Building Regulations, new buildings need sub metering for lighting and power. These will be linked to our Monitoring Targeting System via our METERology platform which allows us to understand the contribution of end uses within buildings (e.g. lighting, heating, ventilation and plug loads from equipment).

There will be no direct energy savings per se from these measures, however they form an integral part of an effective energy management system, and will assist in delivering savings from other energy efficiency measures including behavioural change.

Non staff costs over ten years: **£137.5k** (an annual metering budget of £10k per year, plus additional METERology annual support at £7.5k per annum from 2017).

### 6.11 Voltage Reduction

Voltages measured at many points on the University’s electrical distribution network are higher than those required for modern equipment. Voltage reduction technology potentially reduces energy consumption without affecting performance, as some equipment will draw less power when voltages are reduced.

Where energy efficient systems (e.g. LED lighting and variable speed drives on motors) have been installed, savings may not be significant enough to justify investment, as savings
from reducing voltages are lower. Careful evaluation of the impact of the phasing of energy efficiency works on the savings available from voltage reduction will be required. Any potential impacts on research activity must also be understood.

Total cost over ten years: £1.5m – business case to FMBSG subject to completion of a feasibility study, analysis of evidence from other HEI’s, and more detailed costings.

Annual carbon reduction: 2,000tCO\textsubscript{2e}

Simple payback time: 5 years

6.12 University-owned vehicles

University-owned transport accounts for less than 1% of our Scope 1 & 2 carbon emissions. To date, the following actions have been undertaken:

6.12.1 A 2005/06 baseline for emissions from owned vehicles has been established.
6.12.2 Procedures and systems have been put in place for capturing emissions data in an ongoing way.

The following actions are currently envisaged over the course of the next ten years:

6.12.3 We are participating in a regional electric vehicles trial, we currently have 16 live charging points on campus, including one rapid charging point.
6.12.4 All procurement of new vehicles to be carried out by Purchasing Services with emission performance standards a deciding factor.
6.12.5 We are looking to increase our owned EV fleet year on year (currently stands at 11 vehicles), and for efficiency to increase as vehicles are replaced, leading to a 10% reduction in CO2 from this source by 2020.

Total cost over ten years: Embedded within current projects.

Annual carbon reduction: 40tCO\textsubscript{2e}

6.13 Renewable energy and on-site generation

Our approach to existing carbon emissions is sequential with our efforts to reduce carbon emission to 2020 primarily focussed on reducing energy demand. Where opportunities to reduce demand have been fully exploited, energy generation from renewable energy sources will be the next step to reducing emissions further.

Even with government incentives such as Feed-In Tariffs and the Renewable Heat Incentive, payback periods for renewable energy projects are usually in excess of 10 years due to high capital costs, and in the existing estate our funds are therefore generally better spent on projects with shorter payback projects and greater carbon benefits. To achieve sustainable new buildings we have incorporated renewable technologies into a number of existing and planned developments including:

6.13.1 19kW Photovoltaic (PV) array on the Devonshire Building.
6.13.2 The School of Agriculture have installed an anaerobic digester at Cockle Park Farm, and proposals for utilising the biogas from the plant (e.g. in a CHP plant) are being developed.
6.13.3 PVT (Photovoltaic Thermal) heating and micro CHP is operational at the Kensington Park Terrace student residences.
6.13.4 A PV array is operational at the Newcastle Biomedical Research Building at the Campus for Aging and Vitality.
6.13.5 A PV array is operational at the Armstrong Building within the central campus.
6.13.6 A PV array is operational at the new Building Science extension.
6.13.7 A PV and a PVT array are both operational at the Urban Sciences Building (USB).
6.13.8 A PV array is included in the new Innovation Centre build also on the Science Central (Helix) site.
6.13.9 We are working in partnership with Newcastle City Council in the commissioning of a new district energy centre for the Helix site. This energy centre will provide low carbon heat and power to both the Innovation Centre, and Learning and Teaching Centre via CHP.

We will continue to explore opportunities to increase the variety of renewable technologies utilised on the estate e.g. wind energy.

Annual carbon reduction: **To be confirmed**

Simple payback time: **10 years +**

6.14 Energy Procurement

The University procures its electricity and gas via the TEC framework (The Energy Consortium). Through this framework we purchase 100% low carbon electricity derived from nuclear generation to supply the vast majority of our estate.

Through entering into the TEC framework, we also benefit from preferential unit rates (£/kWh of energy used) for our electricity and gas and the ability to purchase up to two years into the future, ensuring security of supply. This allows us to allocate funding to the reduction of energy demand and other emission reduction schemes in the future.

We are also in the process of exploring renewable Power Purchase Agreements (PPAs) in order to take advantage of local renewable energy initiatives e.g. offshore wind infrastructure, and other off-site renewable generation to power our estate.

Total cost over ten years: **Not quantified**

Annual carbon reduction: **Not quantified**

Simple payback time: **Not quantified**

6.15 Demand Response

The University is evaluating the potential for demand response capabilities being deployed within campus buildings that possess back-up generators.

This would see a combination of reduced consumption at non-peak times, and utilisation of on-site generation during peak times, through the use of an aggregator. This has benefits for energy security as it would reduce the risk of having to calling upon reserve supplies from the grid, as well as offsetting our energy costs (with added revenue from taking part in such schemes) for more effective spending elsewhere.

Total cost over ten years: **Not quantified**

Annual carbon reduction: **Not quantified**

Simple payback time: **Not quantified**
6.16 Fossil Fuel Divestment

Following a review in the University’s investment strategy in line with our Sustainability objectives - in 2016, the University established an internal ‘Carbon Advisory Group’ (CAG) chaired by the Deputy Vice-Chancellor that includes attendance by the ESS Sustainability Manager, Lay Member of University Council, the NUSU President, and other internal specialists / Heads of School.

The CAG’s main function is to work with the University’s investment portfolio and facilitate the divestment from fossil fuel companies, namely those organisations directly involved in thermal coal and oil / tar sands exploration and extraction by 2021. From 2021, the group then aims to see investment in only socially and environmentally ‘progressive’ companies, and those that push the low carbon economy. The primary means of achieving this is by working with fund managers that are signed up to the United Nations Principles for Responsible Investment, and preferentially investing in companies that are working towards low carbon solutions and who will provide the University with reports on the carbon foot-print of companies within its portfolio.

The University's endowment fund stands at approximately £60m.

Total cost over ten years: Not quantified

Annual carbon reduction: Not quantified

Simple payback time: Not quantified

7. Scope 3

Scope 3 emissions are those indirect emissions that occur as a consequence of the activities of our organisation, but are not directly owned or controlled by us. Generally speaking, calculating scope 3 emissions is more complex than for scope 1 and 2. For this reason we are regularly reviewing and updating our methodologies for calculating these emissions.

<table>
<thead>
<tr>
<th>Source</th>
<th>Baseline year</th>
<th>Tonnes CO₂e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement (supply chain)</td>
<td>2011/2012</td>
<td>32,247</td>
</tr>
<tr>
<td>Business Travel</td>
<td>2014/15</td>
<td>7,385</td>
</tr>
<tr>
<td>Staff and Student Commuting</td>
<td>2011/12/13 (staff and student travel surveys conducted in alternating years)</td>
<td>2,621</td>
</tr>
<tr>
<td>Student Out of Term Travel</td>
<td>2012/13</td>
<td>9,517</td>
</tr>
<tr>
<td>Waste</td>
<td>2010/11</td>
<td>352</td>
</tr>
<tr>
<td>Water Use</td>
<td>2005/06</td>
<td>160</td>
</tr>
<tr>
<td>Wastewater Treatment</td>
<td>2012/13</td>
<td>279</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>52,282</strong></td>
</tr>
</tbody>
</table>

Table 8: Scope 3 emissions – baseline year and emissions in tonnes CO₂e

7.1 Procurement

These are emissions as a result of goods and services procured by the University. To enable us to quantify carbon emissions from procurement a close working relationship between Purchasing Services and the Sustainability Team has been developed ensuring a common goal and agreed objectives. As the University is a member of the North Eastern Universities Purchasing Consortium (NEUPC), we receive carbon emissions based on our procurement spend directly. The first reports were received and used for the 2017/18 year.
To establish a baseline, data has been taken from SAP (the University’s central finance and procurement system) where the total spend on each product category is converted to tonnes CO$_2$e using the guidelines set out by Defra/DECC.

**Baseline Year:** 2011/12  
**Baseline Emissions:** 32,247 tonnes CO$_2$e

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**Chart 9: Newcastle University Procurement Emissions in tonnes CO$_2$e from 2012/13 to present, split out into categories.**

Chart 9 displays an 81% increase in emissions presently in comparison to the baseline year, despite a target to reduce procurement emissions by 0.5%. This is due to a combination of the University expanding and a historic lack of reliable data, as spend is the least reliable way to calculate total carbon emissions. As previously mentioned, the University now receives reports from the North Eastern Universities Purchasing Consortium (NEUPC), which will lead to more reliable reporting (but that still based on spend), and has begun to analyse and report by commodity group (Chart 10), this allows future carbon reductions to be focussed in specific areas:
**Chart 10: Breakdown of emissions per Procurement Activity 2017/18, values are in tonnes CO₂e.**

**Target:** To be confirmed, new flexible framework and sustainable procurement specifications currently being constructed, and new objectives and targets written as per the University's EMS and EnMS.

The University are currently accredited to Level 4 of the Flexible Framework, with the view of achieving Level 5 by 2021.

### 7.2 Business Travel

The University has developed a list of emissions resulting from business travel. To calculate these emissions we follow the hierarchy provided by the Greenhouse Gas Protocol in their Scope 3 guidance. From 2017/18 emission reports from the University's travel agencies Selective Travel, and Dawson & Sanderson based on distance were used to get accurate and reliable emissions data. For other business travel not captured this way (i.e. through purchasing cards), we use spend and carbon conversion factors to calculate emissions. Previous years estimated emissions based solely on spend.

Business Travel is split out into different categories to better monitor emissions. These categories include air travel, rail travel, grey fleet (staff using their own cars for business), leased/hired vehicles, and travel by taxi.

**Baseline Year:** 2014/15

**Baseline Emissions:** 7,385 tonnes CO₂e
Chart 11 shows an 11% increase in 2017/18 when compared to the baseline year. There was however a 7% reduction seen between 2016/17 and 2017/18. This could be attributed to better data collection, including the use of emissions reports from the tendered travel agencies. Further work, such as a movement away from first class travel (which carries a greater carbon intensity), and encouraging staff toward more sustainable travel options should see further reductions going forwards.

Further internationalisation and international collaboration are risks to the ongoing reduction in total business travel emissions, especially when considering air travel as the University’s most significant business travel impact (see Chart 12 below):
In 2013/14 a figure of 4,479 tonnes CO\textsubscript{2}e was reported, and 7,385 tonnes CO\textsubscript{2}e the following year in 2014/15, the sharp increase in emissions reporting was attributed to the inclusion of air, rail and grey fleet data through enhanced scope monitoring and measuring operations. In light of this improvement, the baseline was shifted from 2011/12 to 2014/15. Data continues to improve, and the baseline may be updated in future if this is deemed necessary.

**Target:** Given the change in the baseline year, NU plans to further increase the quality of Business Travel monitoring and witness reduction per FTE by 2020/21. This target will be reviewed as part of the University EMS.

### 7.3 Commuting

Data for staff and student commuting is collected via travel surveys, carried out as part of a biennial review of our Travel Plan. In relation to staff commuting, we have achieved a significant modal shift with a reduction in car users from 46% in 2004/05 to 21% in 2017/18. This has been achieved by implementing a range of measures including reducing car parking spaces, increasing parking costs while improving flexibility (pay and display), improving cycle facilities (secure cycle parking, showers etc.), a cycle to work scheme and a staff discounted travel scheme.

The Travel Survey gathers information (while adhering to GDPR) on home postcode, distance of commute, place of work, modes of travelling to work and frequency allowing us to calculate carbon emissions from staff and student commuting. The surveys are carried out biennially on alternating years. Our baseline is therefore made up with results from the 2011/12 staff travel survey and the 2016/17 student travel survey. The student commuting baseline was updated due to an error been found in the methodology, explaining the sharp increase in emissions from student commuting:

**Baseline Year:** 2011/12 Staff Survey + 2016/17 Student Survey  
**Baseline Emissions:** 2,142 + 1559 = 3701 tonnes CO\textsubscript{2}e
Chart 13: Newcastle University Carbon Emissions from Staff Commute in tonnes CO₂e from baseline to present, split out into modes of travel. For 2013/14, metro and rail travel were combined into “Rail”.

Chart 14: Newcastle University Carbon Emissions from Student Commute in tonnes CO₂e from baseline year to present, split out into modes of travel. For 2012/13, metro and rail travel were combined into “Rail”.

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The University is committed to continue carbon reduction in this area through initiatives such as the Dr Bike scheme used to incentivise staff and students to cycle to work through the provision of free minor bicycle repairs. Other activities include encouraging car-sharing, further incentivising public transport, investment in electric vehicles and charging points and increased cycling infrastructure. In 2017 the University installed 2 new dual EV chargers to further improve provision for electric vehicles.

**Target:** We aim to see a year on year reduction in emissions per staff and student FTE but have no absolute target due to poor quality data and survey completion rates. As we are seeing decreases in emissions from staff commute, and the number of staff is increasing, in this respect we have met our target. This will now be reviewed and updated as part of the EMS to improve robustness of data and a more aspirational target.

### 7.4 Student out of term travel

The latest student survey was updated to include questions such as out of term address, mode of transport out of term and term time postcode to allow the associated carbon emissions to be estimated:

**Baseline Year:** 2012/13  
**Baseline Emissions:** 9,517 tonnes CO₂e

**Target:** Maintain emissions despite growth resulting in reduction per FTE.

Due to the complexity of calculating student out of term emissions, data for the current year is still being processed, and this section will be updated when this is completed.

### 7.5 Waste

We are continuously improving the data we receive from our waste contractors, and the methodologies we use to manipulate this data. Due to changing circumstances, including the loss of off-site segregation we benefitted from between 2011 and 2016, more of our waste was sent to landfill. We now receive monthly reports detailing waste weight data from the supplier, which details which type of processing the waste will go through. This is allowing us to further improve our methodologies for calculating carbon emissions, and set more accurate and ambitious targets.

**Baseline Year:** 2010/11  
**Baseline Emissions:** 352 tonnes CO₂e
Chart 15 shows a reduction of 7.2% between 2016/17 and 2017/18, and the 2017/18 total sits 15% below the baseline year, showing the impact of reducing total amount of waste produced and producing less waste for landfill has on our carbon emissions from waste disposal. We hope to see further reductions in total waste produced, and even more waste avoiding landfill with better on-site recycling and utilisation of other waste disposal methods like energy from waste and anaerobic digestion. Combined, we hope this will significantly reduce our carbon emissions resulting from waste disposal.
Further growth and expansion are major risks to meeting our targets for waste disposal and their associated carbon emissions. Further work on ensuring effective on-site segregation will help to mitigate these increases.

**Target:** Reduce emissions from waste to 1.47 kg CO2e per Staff and Student FTE by July 2018 through minimising total University waste mass. Target is based on the Total Waste Mass reduction (kg/staff & student FTE) EMS KPI target and 2014/15 emissions percentage breakdown (see Chart 15).

We have unfortunately missed our set target for waste. This is due to a change in how waste was processed off site, as explained above. We are now reviewing this target in light of this and as part of our EMS, and will update this document when these targets are agreed.

### Chart 16: Breakdown of emissions per Waste Disposal Category for 2017/18, values are in tonnes CO₂e

7.6 Water Use and Wastewater Treatment

Our use of water and its disposal also generates carbon emissions, although much fewer than other University activities. Data is gathered from Automatic Meter Readings (AMR), manual meter reads and utility bills. These emissions are monitored in the same way as Scope 1 & 2 energy emissions. After the commercialisation of the business water market in April 2017, data from supplier invoices (water bills) was sporadic due to a lack of industry preparedness - so where possible we use direct data i.e. meter reads and AMR, to ensure full robust data coverage.

**Baseline Year:** 2005/06 for Water Use; 2012/13 for Wastewater Treatment

**Baseline Emissions:** 160 tonnes CO₂e (7.4 kg CO₂e per Staff and Student FTE) for water use; 279 tonnes CO₂e for wastewater treatment.
Chart 17: Newcastle University Carbon Emissions from Water Use in Tonnes CO$_2$e from baseline year to present.

Chart 18: Newcastle University Carbon Emissions from Wastewater Treatment in Tonnes CO$_2$e from baseline year to present.
For water use, 28% total reduction in total water use and CO₂e emissions has been achieved since the baseline year, and per staff and student FTE a reduction of 48% has been achieved. Emissions from wastewater treatment are directly linked to the University’s water usage, and have reduced by 20% compared to the baseline year (the percentage differs as wastewater treatment is more carbon intense than water supply).

These reductions can be attributed to a number of factors, including the rollout of quarterly hourly profile data with AMR for some of our largest buildings on campus and alerts for abnormal water usage (i.e. flows overnight when water use should be minimal), low water use appliances installed as standard and the introduction of a new defect reporting system which makes reporting leaks and other issues easier for all members of staff.

Further savings will be achieved through continuing improvements in water use efficiency, continued monitoring of AMR data and further rollout of AMR across our estate.

**Target:** We aim to continue the linear downward trend line and achieve our EMS Key Performance Indicator (KPI) target of 13.9m FTE by July 2017, which translates to 4.8 kgCO₂e FTE (highlighted by the dashed line in Chart 19).

We have achieved these targets and are currently creating new, ambitious target to further push our performance in terms of water. This is been completed through our EMS, and this document will be updated when these targets have been set.

### 7.7 Fugitive Emissions

This covers emissions including those arising from leaks of refrigerant gases from cooling systems, and also from the digestive processes of our sheep, pig and cattle herds. We aim to establish a comprehensive data collection system for fugitive emissions for refrigerant systems once the data we receive from our contractor is reliable enough. The University has
yet to consider actions relating to the latter, due to the complexity of these estimations and the amount of variables which will affect this.

8. Conclusion

This plan has outlined and quantified the contributors to University carbon emissions, as well as identifying the planned and implemented measures utilised to reduce them, with significant progress in the capturing and accounting of Scope 3 carbon.

In this 2019 revision of the CMP, we have adopted a new target with our commitment to the BEIS Carbon Pledge alongside our outstanding, aspirational emissions reduction target. As presented in Chapter 1, Chart 1; we are on track to meet the BEIS carbon pledge of a 30% decrease against a 2009/10 baseline by July 2021. We are however no longer on course to hit our aspirational target of a 43% drop against a 2005/06 baseline by July 2020. This is mainly due to the increase in University total floor area through the construction and acquisition of new buildings, with increased movement toward a research (and energy) intensive estate in line with the new University Vision and Strategy. We are also still reliant on the decarbonisation of the grid in order to fulfil the aims of this plan.

With regards to Scope 3, we are now in the process of renewing targets as a number of them have become outdated. This will be completed in line with our annual EMS & EnMS Management Review process, and new agreed targets added to this document in a revision late 2019.

We will continue to utilise our Salix revolving green fund as our primary enabler for carbon reduction projects, and embed energy efficiency into our major construction and refurbishment works in our efforts to fulfil our carbon reduction pledge.

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