Climate Action at The Bartlett: Journey to Net Zero by 2030

Reducing emissions from the materials and products we buy and consume:

Progress Report

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1. Introduction

The Bartlett has pledged to become a net-zero carbon faculty by the year 2030. This aligns with UCL's overall commitment to becoming a net-zero institution by the same year.

In order to achieve this target, we are examining in turn each of the sources of emissions that contribute to our greenhouse gas footprint: emissions from the energy we use in buildings; emissions from the materials and products we consume; emissions from our travel; emissions from construction. We will also examine issues concerning offsetting, or "negative emissions"; and consider finance and sponsorship relationships with carbon-intensive businesses and institutions.

We will examine each of these six topics for two months, before repeating the cycle. This pattern is designed to avoid the risk that focussing exclusively and in depth on one topic could leave some crucial topics unattended; rather the aim is to make gradual progress spread evenly across all topics.

Each revisiting of a topic will produce a progress report, describing what has so far been achieved within the topic, and outlining next steps.

This is the first progress report under the topic of **reducing emissions from the materials and products we buy and consume,** or **procurement.**

2. Context

The scope of emissions considered within this topic includes the whole life-cycle emissions associated with materials, products and services purchased by the faculty. Categories include IT products, furniture, stationery, food and hospitality, workshop materials and laboratory equipment. As such, this topic is primarily concerned with "scope 3" emissions (see appendix, Table 1). This topic does not include emissions associated with travel or with construction, which will be considered as separate topics.

3. UCL-level emissions data and estimates

Establishing accurate baseline data is a major challenge in this topic. Capturing the emissions associated with a product involves life-cycle emissions analysis, a technique requiring knowledge and time, and being inherently subject to ranges of uncertainty. Later in this paper our initial steps towards building up an LCA based inventory of our procurement emissions from the bottom up will be described. However, we begin by setting out available data describing the UCL position, which provides a broad indication of the potential significance of this area within the Bartlett's overall carbon footprint.

The data in this section is as downloaded from the Higher Education Statistics Agency database (HESA, 2022), which provides annual emissions for Scope 1, 2 and 3 emissions for universities including UCL. We have not yet clarified the precise methodology by which these emissions are calculated, or whether they are entirely calculated by UCL, or by HESA, or by a combination. We assume that the emissions values must be derived from financial procurement data combined with emissions factors for the products concerned. There are of course uncertainties involved in the application of emissions factors to very broad procurement categories, hence it may be safest to consider the data given here as provisional estimates. Nonetheless, they give a useful guide as to the general significance of procurement emissions, and to the potentially most significant procurement sub-categories.

Figure 1 compares the shares by sector of total UCL greenhouse gas emissions for 2018/19 with 2019/20.

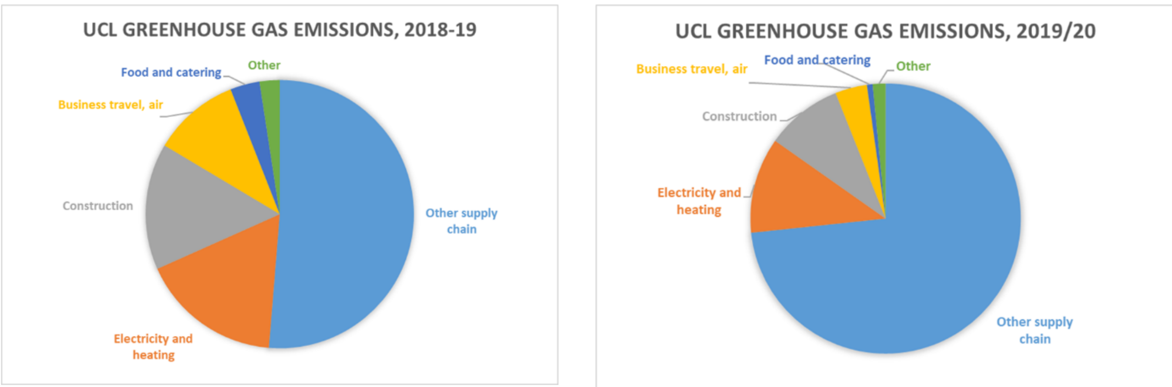

Figure 1: High-level sector comparison of UCL greenhouse gas emission shares for academic year 2018/19 with 2019/20. Based on data from HESA (2022)

The data suggests that at the UCL level "other supply chain", including procurement of goods and services, is the largest single emissions sector. It accounted for 51% of the total in 2018/19, and in 2019/20 this increased substantially to a 73% share. This very significant change is likely to be an effect of the lockdowns which took place during this year due to Covid-19. Figure 2 represents the same categories in absolute quantities. It shows that although there were some reductions in emissions from some of the other sectors – for example travel, which can also be attributed to the pandemic – there was a very substantial increase in other supply chain emissions in absolute terms, as well as the share, which contributed to overall emissions actually increasing during the year that was affected by the pandemic.

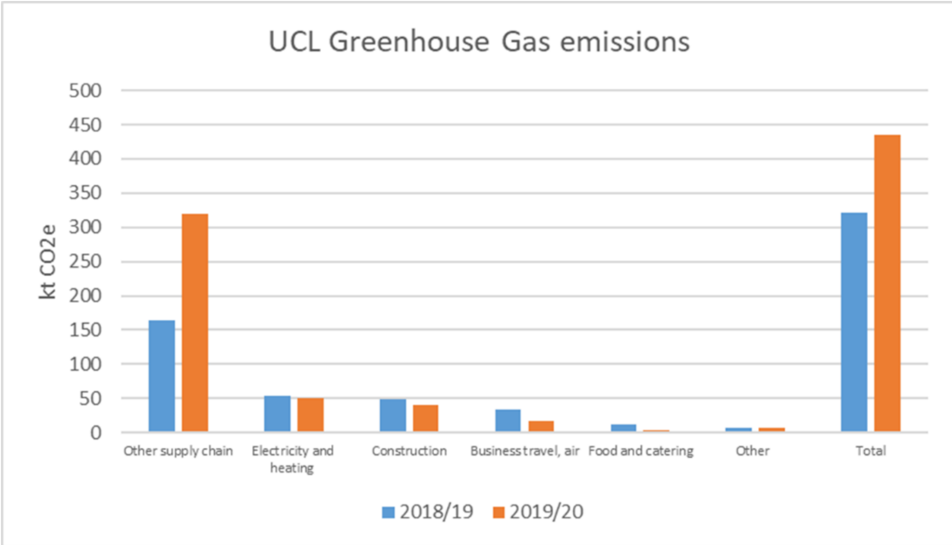

Figure 2: High-level sector comparison of UCL greenhouse gas emission quantities for academic year 2018/19 with 2019/20. Based on data from HESA (2022)

Figure 3 focusses on scope 3 supply chain emissions, detailing the contribution of different categories within each year.

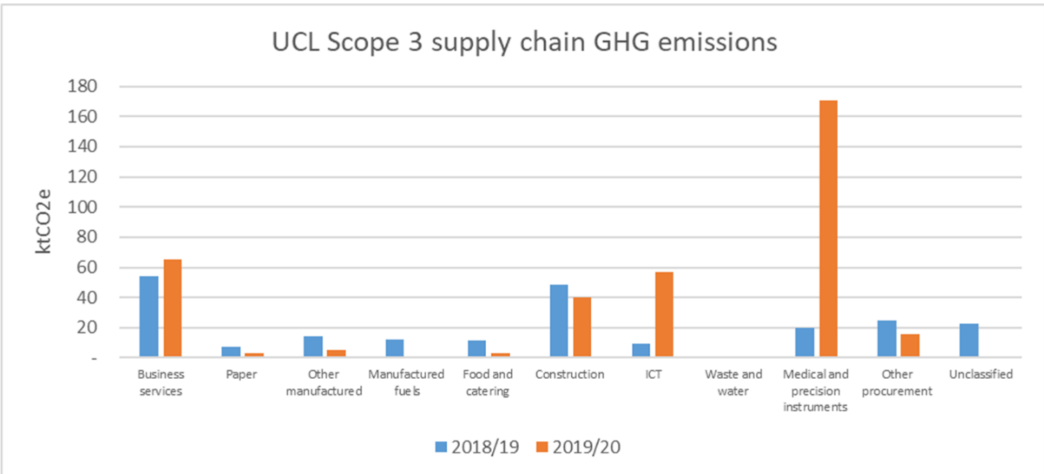

Figure 3: UCL Scope 3 supply chain GHG emissions, 2018/19 and 2019/20. Based on data from HESA (2022).

As shown in Figure 3, emissions from a number of categories fell in 2019/20, as would be expected as a result of the changed circumstances due to lockdowns, including paper, food and catering and construction. The overall increase in supply chain emissions were due to increases in three categories. Most substantially, an increase in medical and precision instrument is recorded – this is likely understandable as related to the pandemic, as well as being a category that is probably less applicable to the Bartlett. A very significant increase was also recorded in ICT. This is a category which is much more generally applicable to all faculties, including the Bartlett. ICT purchases may well have increased during the pandemic, as additional purchases of equipment were made to assist people in adapting to working from home. A third category, business services, records a smaller increase than the other two, but it is one of the largest categories in both years. No further subcategory information within this category is provided, so it is hard to know exactly which services this may cover, or indeed how an emissions factor was chosen to apply to it.

Thus from the UCL-level data we may expect procurement emissions to be a significant sector within the Bartlett's overall carbon footprint. Within this sector, ICT could be a significant category, particularly if an increase in blended working modes increases purchasing of ICT equipment for home-use, in addition to office-based equipment. Other categories could also be making significant contributions. However, the large contribution of the opaque category of "business services" indicates that establishing sufficiently clear procurement data may be part of the challenge.

4. Initial approaches to establishing Bartlett-level data

In July 2021, the Bartlett provided funding for a number of UCL students to carry out scoping studies into different aspects of the Bartlett's net-zero challenge. In one of these projects, India Goodwin and Tshiamo Ramano analysed the greenhouse gas emissions arising from the procurement of two product categories which are significant within the Bartlett's overall procurement budget: laptops, and paper products (Goodwin and Ramano, 2021).

Their analysis drew on life cycle analysis (LCA) data for relevant or comparable products, as identified in academic literature, or as provided by the suppliers themselves. They combined these LCA estimates with Bartlett faculty financial data[1] showing quantities of products bought during the 2018, in order to derive estimates of total life-cycle greenhouse gas emissions associated with the product types.

LCA is a form of analysis which can be used to quantify the total inputs to – e.g. materials – or outputs from – e.g. environmental impacts – a product over its whole life cycle. LCA is a useful tool to determine the quantity and source of a product's GHG emissions, also known as a 'carbon footprint'.

The "life cycle" of a product typically covers extraction of the raw materials needed to make the product, the manufacturing of the product and its distribution, and may also extend to its usage and end of life disposal. Specifying exactly what is covered by the LCA – the "system boundary" – is crucial. In their analysis, Goodwin and Ramano draw on data referring to two commonly used system boundary definitions for the product types. "Cradle-to-gate" includes the extraction of raw materials, the transport of these materials, manufacturing of components from these materials, assembly of components to create a finished product, and product distribution. "Cradle-to-grave" includes all the aforementioned phases, with the addition of the use and end-of-life disposal phases.

4.1 Results

Based on literature data, the mean value for cradle-to-gate emissions per laptop was found to be 163 kg CO_2 eq, while the mean value on a cradle-to-grave basis was 230.2 kg CO_2 eq. The range of values for cradle-to-grave estimates was significantly larger than for cradle-to-gate, indicating increased uncertainty around assumptions connected with the use and disposal phases.

[1] Thanks to Farhana Zaman, Ian Galloway, Philippa Shallard and Samina Miah, for their help in assembling the financial procurement data

Cradle-to-grave values for laptops were also gathered from data provided by suppliers. The mean was 225.2 kg CO_2 eq, a similar value to the mean of the literature estimates, though from a smaller range.

These results are illustrated in Figure 4.

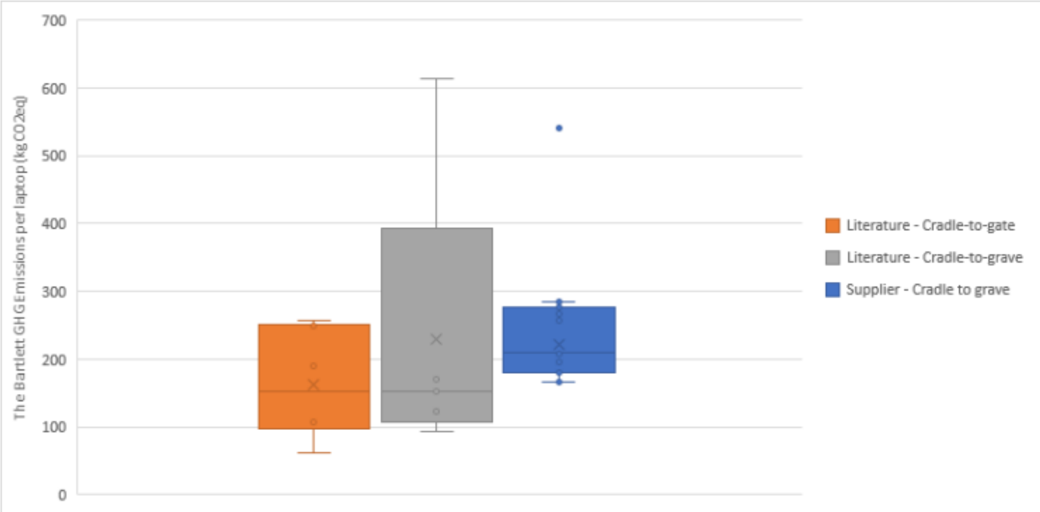

Figure 4: Box-and-whisker plots for the total GHG emissions per laptop purchased by the Bartlett according to literature and supplier data sources. Source, Goodwin and Ramano (2021)

The manufacturing phase of laptops tends to be the most significant source of emissions, representing between 72% and 97% of total cradle-to-grave emissions, according to supplier data.

The LCA estimates for laptops were combined with faculty financial procurement data, from which it was possible to derive estimates of the total emissions associated with the Bartlett's purchase of laptops in 2018. Using literature LCA values, the mean total cradle-to-gate emissions are 16,955.5 kg CO_2 eq., and the mean cradle-to-grave emissions are 23,938.3 kg CO_2 eq. Based on LCA data provided by suppliers, the mean total cradle-to-grave emissions would be 23,423.5 kg CO_2 eq.

Literature-based LCA values were also explored for various kinds of paper product. In general recycled paper results in lower life cycle emissions per tonne of product than virgin paper, however there are wide ranges depending on assumptions about the carbon intensity of the energy source used in the manufacturing processes.

When emissions factors for paper products are scaled up to the Bartlett level, it is noticeable that the highest overall emissions for the three categories considered are associated with recycled copy paper. However, this category also has considerably higher quantities purchased, in kilogrammes.

The range of total emissions for virgin copy paper is 48.61 – 67.66 kg CO_2 eq. with a mean of 48.61 kg CO_2 eq. The corresponding values for recycled copy paper are 251.5 – 365.5 kg CO_2 eq. and 299.3 kg CO_2 eq. For tissue paper, the range is 101.00 – 296.00 kg CO_2 eq., with a mean of 168 kg CO_2 eq. These results are illustrated in

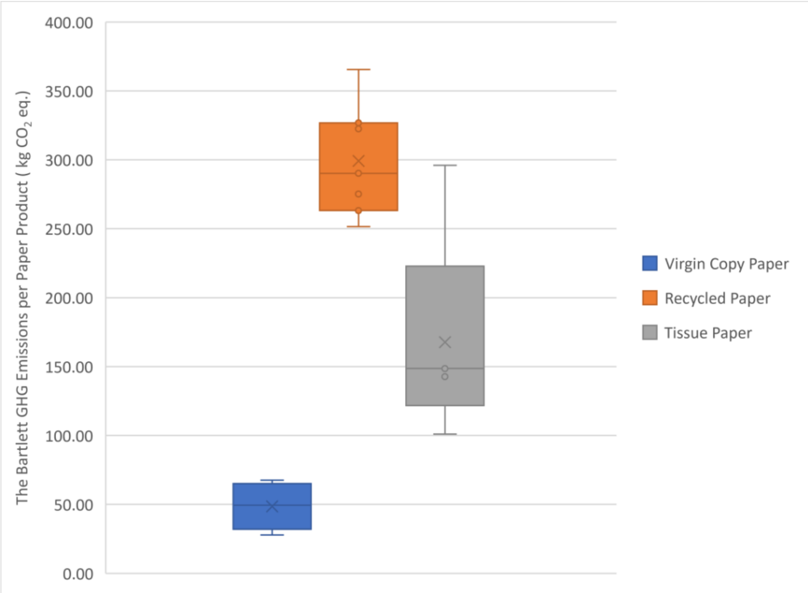

Figure 5: Box-and-whisker plots for the total GHG emissions of paper products purchased by the Bartlett based on literature. Source: Goodwin and Ramano (2021)

Combining these three paper categories results in a total emissions range of 380.32 – 729.12 kg CO_2 eq., with a mean of 515.48 kg CO_2 eq. for the Bartlett.

4.2 Discussion

This initial scoping analysis already provides some useful high-level information about the contribution of different procurement categories to Bartlett emissions. The first observation is that total emissions from laptops - mean value 23,423.5 kg CO_2 eq, cradle-to-grave, supplier data - is considerably higher than total emissions from the paper products analysed – mean value 515.48 kg CO_2 eq. This comparison is illustrated in Figure 6, below. This is useful information in terms of the prioritisation of actions – in this case, laptops look to be a signifcantly larger source of emissions than paper procurement.

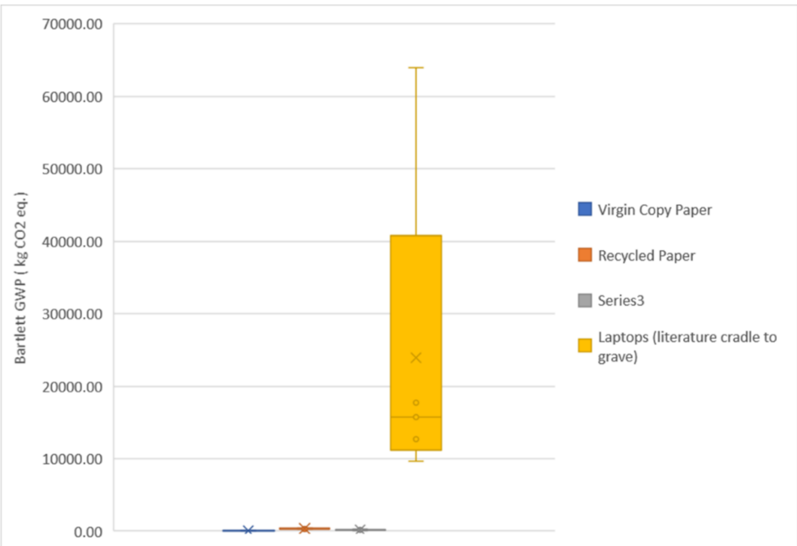

Figure 6: Comparison of total Bartlett procurement emissions for paper products and laptops, 2018/19. Series 3 = tissue paper. Source: based on data from Goodwin and Ramano (2021).

Further research in this area will add more detail to this, providing indication of how other product categories compare in terms of emissions, and eventually how the whole area of product procurement compares against other sectors such as building emissions, travel, etc. As an initial indication of this kind of comparison, the Bartlett sustainability report from Sustainable UCL tells us that emissions from Bartlett air travel was 1,752 tonnes in 2018/19. This is a strikingly different story to the comparison between "ICT" and air travel at the UCL level, where emissions were comparable, and indeed ICT greater in 2019/20. Clearly the category of ICT is more than just laptops, and there is more work to do on data to understand the real Bartlett level situation. However, it stresses the importance of doing this kind of bottom-up work, as it can usefully complement and perhaps enhance other top-down approaches.

5. Summary of progress and next steps

Progress so far has identified high level data for procurement emissions at the UCL level, and begun the process of building up a bottom-up description of procurement emissions for the Bartlett, by combining financial procurement data with LCA carbon footprinting values provided by suppliers and from the literature.

A key next step is to continue to analyse Bartlett procurement data and combine it with LCA values, to add further detail to our understanding of our procurement emissions.

At the time of writing, more students are engaged on similar projects to those set out in this report, which should help to provide some of this further detail.

We are engaged in discussions with Sustainable UCL and with UCL Commercial and Procurement Services with a view to developing a more systematic and joined up carbon footprinting approach.

Beyond this, our footprinting analysis should begin to highlight the spending areas that contribute most significantly to our carbon footprint, and also to suggest options for how this footprint can be reduced. For some products such as paper, we may need to examine our suppliers and the life-cycle emissions associated with their specific value chains, and make procurement decisions appropriately. For other products, we may be able to build relationships with suppliers that are committed to reducing product emissions through measures such as product take-back and refurbishing. For example, by using recycled materials, notably recycled aluminum, to produce the 13-inch 2018 Macbook air, Apple were able to reduce the product's lifecycle emissions by 47% on the model produced in the previous year (Apple, 2018). And in the area of furniture, one of UCL's existing preferred suppliers, JPA, already has its own net-zero by 2030 target, indicating its interest in engaging collaboratively in reducing the emissions footprint of the products they suppliers. We should aim to prioritise working with suppliers that have made similar commitments.

References

GOODWIN, I. & RAMANO, T. 2021. Evaluating the Life Cycle GHG Emissions of University Purchases - A Preliminary Analysis of the UCL Bartlett Faculty of the Built Environment. The Bartlett, UCL,.

HESA. 2022. *Higher education provider data: estates management* [Online]. Higher Education Statistics Agency. Available: https://www.hesa.ac.uk/data-and-analysis/estates [Accessed 9th July 2022].

Appendix

The greenhouse gas emissions associated with the activities of a company or organisation are divided into three scopes, as shown in **Error! Reference source not found.**:

Table 1: Scope 1, 2 and 3 emissions. Source: https://www.carbontrust.com/resources/briefing-what-are-scope-3-emissions

Scope 1	Scope 2	Scope 3
Fuel combustion Company vehicles Fugitive emissions	Purchased electricity, heat and steam	Purchased goods and services Business travel Employee commuting Waste disposal Use of sold products Transportation and distribution (up- and downstream) Investments Leased assets and franchises