

**Greenhouse gas footprint for
Langdale Leisure - 2018-19**

A report by Small World Consulting Ltd

Full Report

November 2019

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Document control

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Title: Greenhouse gas footprint for Langdale Leisure - 2018-19

Status: Full Report

Version: 1.0

Dated: 12 November, 2019

Approved by:

Expected Changes: None

Follow up work will create separate reports.

Document Details

Reference: Langdale Leisure FINAL 191112

Template: SWC-Report.dot

No of pages: 16

1 Introduction

1.1 Climate change: a growing concern

It is now widely accepted that climate change represents one of the greatest challenges facing humanity. The most recent report by the Intergovernmental Panel on Climate Change (IPCC) warned that global heating must be limited to 1.5°C above pre-industrial levels in order to avoid substantial climate and ecosystem breakdown. To meet this target, global emissions CO₂ emissions must reach net-zero by 2050. It is imperative that governments, organisations and individuals take action.

Climate change affects every organisation in a multitude of ways. Assessment of the business case for action includes consideration of direct financial implications, reputational opportunities and threats, implications for staff recruitment, retention and motivation and impact on the ability to attract the interest of businesses and funders in the future.

1.2 This report

This report is the third recalculation of Langdale Leisure's greenhouse gas footprint, and the first using 2011 as the baseline. As such, it sets out to deliver the key information that allows Langdale Leisure to engage in practical management of the aspects and impacts and to communicate the issues to its staff and other stakeholders, including visitors, where appropriate.

As in previous reports, we emphasise that all footprint studies contain a degree of uncertainty. However, we have confidence that this report identifies in broad terms the most and least significant components of the greenhouse gas footprint of the business and its supply chains to facilitate successful management.

Since the 2011 report we have adjusted many of the emissions factors used, in line with updates to BEIS' 'Greenhouse gas reporting: conversion factors 2018', Office of National Statistics (ONS) data and our own datasets. For the purpose of comparing the 2018-19 footprint with previous years, we have applied these more recent emissions factors to the 2011 consumption data from Langdale leisure, so comparisons between years better reflects changes in the business rather than differences in emissions factors used. This is particularly important as the UK economy has decarbonised significantly since the previous calculation. However, some methodological changes between the two studies will still not be accurately reflected, particularly the calculation of Langdale's food consumption footprint: in 2018-19 we have estimated this from actual weights of food purchased, rather than from expenditure.

2 Results

2.1 Overview

The best estimate for the total footprint of Langdale Leisure in 2018-19 is 4,116 tonnes CO₂e. This is 3,890 tonnes CO₂e excluding staff commuting, equating to around 436 grams CO₂e per £ of business turnover. We have presented the footprint as five high-level categories in 2019: Premises Fuel and Energy Use, Food, Procurement, Staff Commuting and Staff Business Travel (Figure 1). Recalculation of the 2011 footprint using current emissions factors (Figure 2) has resulted in a figure of 3,094 tonnes CO₂e (2,848 tonnes excluding Staff Commuting). The original 2011 estimate was 4,548 tonnes CO₂e (Figure 34,212 tonnes excluding Staff Commuting). Much of this change is due to decarbonisation of the background economy since 2011, and the difference this makes to the footprint estimates are shown in Figure 3.

Langdale Leisure's carbon footprint has increased by 33% compared to the recalculated 2011 footprint using 2018 emissions factors, but this represents a 4.1% reduction in carbon intensity in terms of gCO₂e per £ turnover. There are some caveats regarding changes in methodology since 2011 which will be detailed in this report.

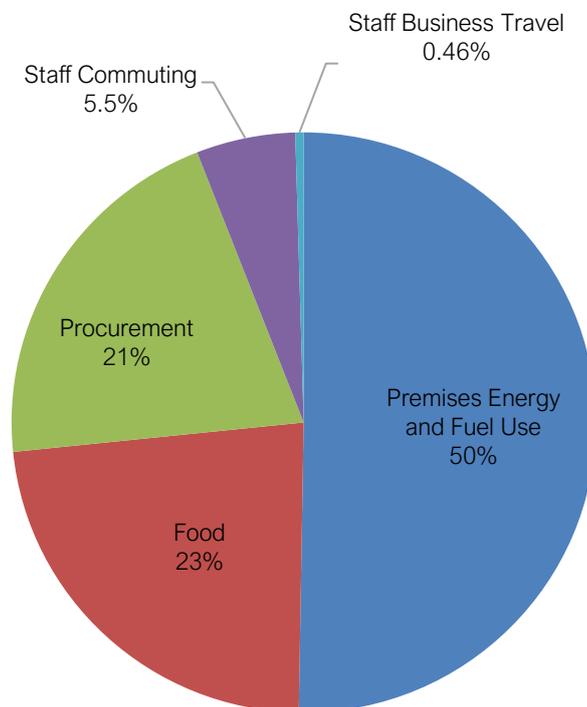


Figure 1: High-level summary of Langdale Leisure's greenhouse gas footprint (4,116 tonnes CO₂e)

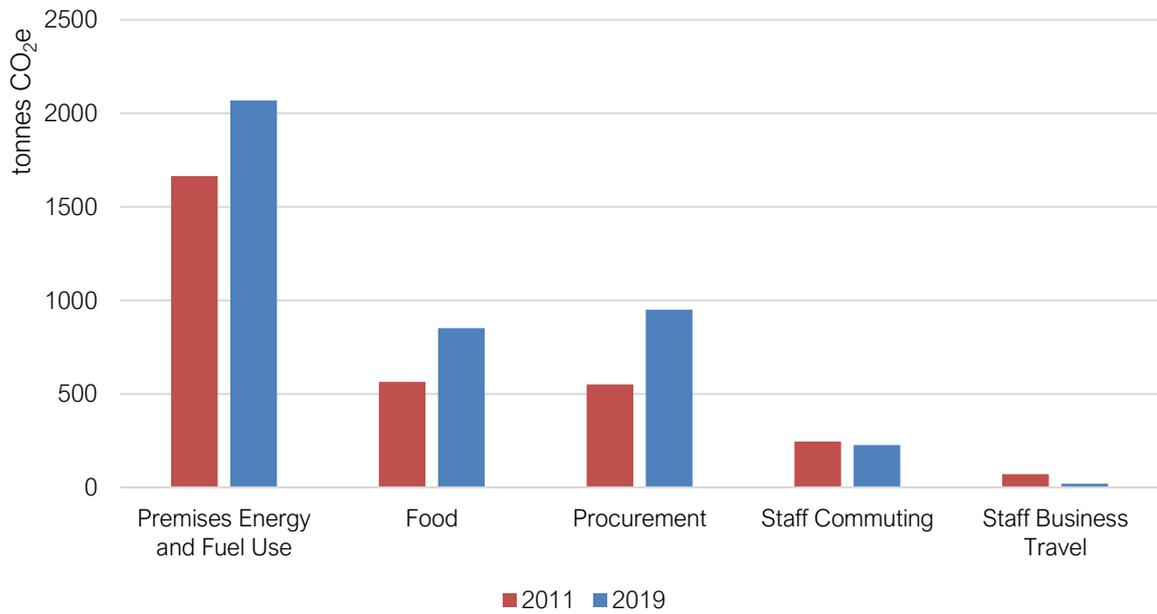


Figure 2: Breakdown of the 2018-19 and 2011 carbon footprints of Langdale Leisure (where 2011 has been re-evaluated using 2018 emissions factors)

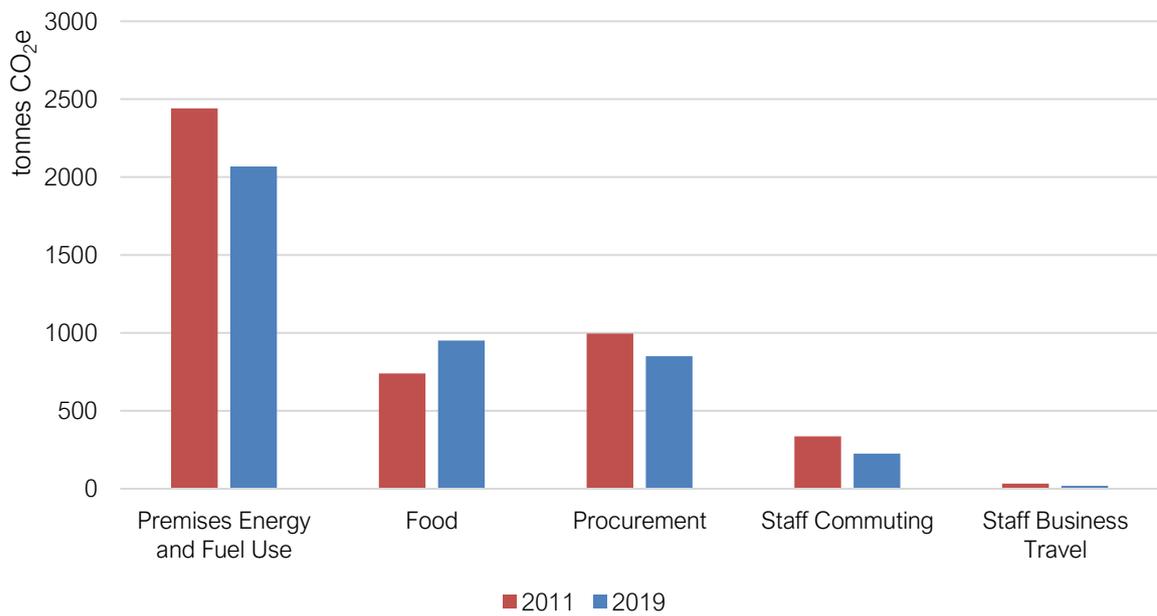


Figure 3: Breakdown of the 2018-19 and 2011 carbon footprints of Langdale Leisure (with the original 2011 footprint calculation)

2.2 Energy and Fuel (50% of total; 2,069 tonnes CO₂e)

Onsite energy and fuel use make up just over half (50%) of the total footprint. This comprises of LPG (55.8%), electricity (32.5%) and other fuels (wood chip biomass and on-site vehicle fuel) 11.7% of the total (Figure 4).

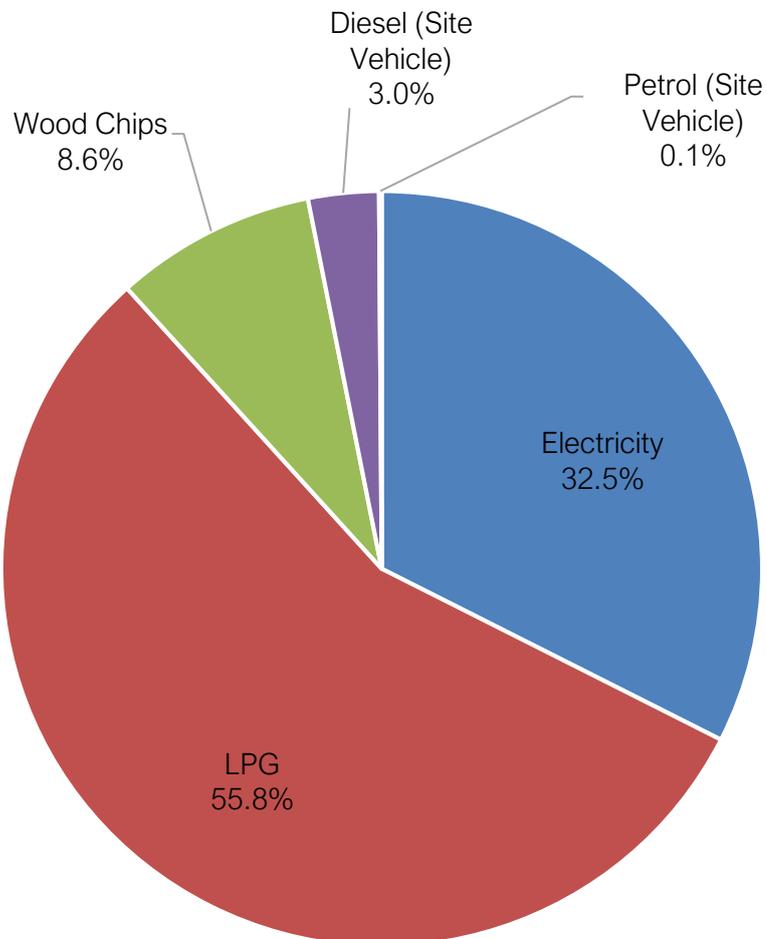


Figure 4: Breakdown of Langdale Leisure's footprint from premises fuel and energy use in 2018-19 (2,069 tonne CO₂e)

2.3 Food (23% of total; 951.2 tonnes CO₂e)

The 2018-19 food footprint has been estimated from approximate food weights obtained from a subset of invoices. As the methodology for calculation of the food footprint has changed significantly since 2011, it is difficult to make a reasonable comparison with previous years.

Nevertheless, Food remains the second largest component of the total footprint at 23%, 951 tonnes CO₂e. We estimate that Meat and Dairy contributed nearly three quarters of the footprint (71.8% of the total; Figure 5).

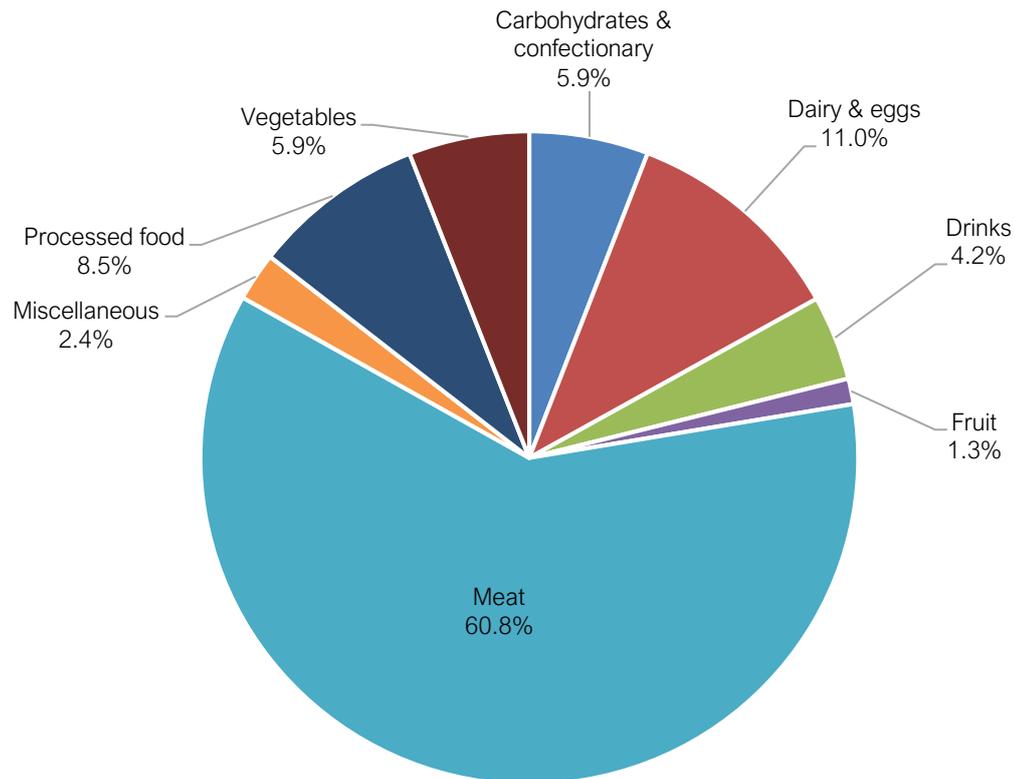


Figure 5: Breakdown of Langdale Leisure's estimated Food consumption footprint in 2018-19 (total footprint 951 tonnes CO₂e)

Our generalised LCA-based emissions factors assume all products to have taken a typical shipping route to the UK, and so there is scope to improve the footprint estimate further by investigating and factoring in bespoke transport routes. This is important for fruit and vegetables but much less so to meat and dairy products. For example, there is a dramatic difference in the footprint per kg between fruit and vegetable products that have been grown in unheated environments and have not travelled by air (typically around 250-400 grams CO₂e per kg) compared to those that have undergone either of those two processes (typically 2-5kg CO₂e per kg). Regardless, sourcing of 'low carbon' foods, local, seasonal produce, or goods that have been grown in an appropriate climate and shipped, remains a good rule of thumb to reduce climate impact.

2.4 Procurement (21%; 850.9 tonnes CO₂e)

We include in this category all purchases other than food, transport and energy.

- **Equipment repairs** was the largest contributing category (20.8%; Figure 6), covering repairs of equipment across all departments including Laundry, Fire Safety, Kitchen and Office.

- **Water** supply accounts for 14.7% of the Procurement footprint, and 3% of the total Langdale footprint.
- **Waste removal** contributes to only 1.2% of Procurement spend but is responsible for 6.1% of the Procurement footprint alone.
- **Other purchases** consist of purchase types with a footprint of fewer than 13.5 tonnes, condensed for clarity. This includes spends on Communications equipment, Advertising, Textiles, and IT Services. Although this section makes up only 9.3% of the Procurement footprint, it constitutes 15.6% of Procurement spend.

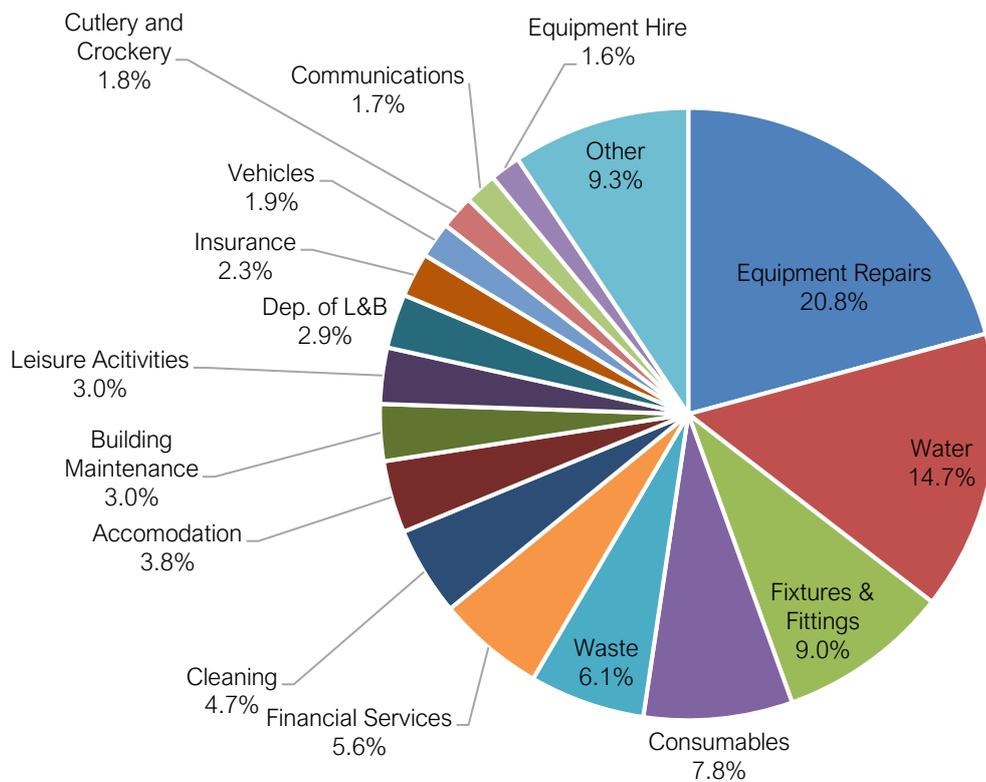


Figure 6: Breakdown of the carbon footprint of Langdale Leisure's procurement footprint in 2018-19. Total footprint was 850.9 tonnes CO₂e

2.5 Staff travel (6% of total; 245.3 tonnes CO₂e)

This category comprises of:

- Staff commuting: 5.5% of total, 225.6 tonnes CO₂e
- Staff business travel: 0.46% of total, 19 tonnes CO₂e

Staff travel is dominated by commuting car travel (76.4%; Figure 7). 95 of 181 staff surveyed drive to Langdale Leisure, with car journeys ranging from 0.1 to 69 miles. The remaining commuting footprint comprises of bus journeys. 69 staff surveyed choose the no carbon option of walking.

Staff business travel was split between land and air travel modes, with air travel contributing to 56.6% of the business travel footprint (4.4% of total Staff travel footprint). The second largest constituent of Staff business travel was personal car miles (6.5 tonnes CO₂e).

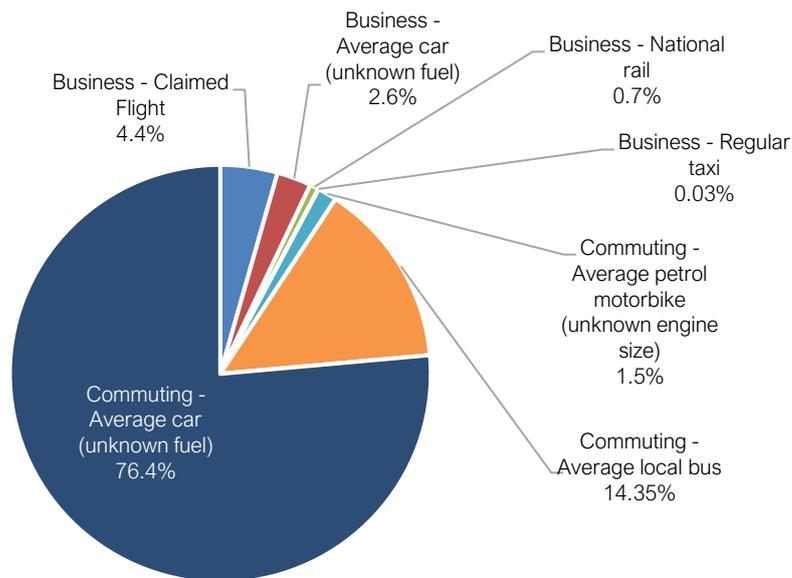


Figure 7: Breakdown of Langdale Leisure's Staff transport footprint (244.7 tonnes CO₂e total)

3 Methodology

3.1 Updates for 2019

SWC has made many changes to its assessment methodology since the last estimate of Langdale Leisure's footprint was carried out in 2011, which makes it difficult to draw meaningful comparisons between the years. We summarise the main differences below, and further explanation is given in sections 3.7 and 3.9.

Previous footprint estimates were based almost entirely on financial spend data, using a 122 sector environmentally-extended input output (EEIO) model. Our EEIO model is based upon publicly available accounts data, and since 2011 a number of industrial sectors have been condensed. The model for 2018 covers 105 industrial sectors.

For direct consumption data, e.g. Fuel Use, Energy Use, Transport miles, we have developed conversion factors based upon BEIS' 'Greenhouse gas reporting: conversion factors 2018', hybridised with our own EEIO model results to incorporate supply chain emissions.

We have also improved the food footprint assessment by estimating annual consumption weights from a selection of food invoices provided by Langdale Leisure. Four weeks that were deemed to be representative of each season were selected, and food weights recorded or estimated where not listed on the invoice. Footprints were calculated using generalised LCA-based emissions factors, assuming all products have been shipped to the UK (as opposed to the 'low carbon' option of local, in season sourcing, or 'high carbon' air freight options).

Staff commuting was extrapolated from survey data consisting of postcodes and transport modes. It was assumed that all staff travelled to work 5 days per week, for 46.4 weeks per year.

3.2 Footprinting principles

Whilst the term 'footprint' is used in various ways, we are using it to mean the sum of the direct emissions and the indirect emissions that arise throughout supply chains of activities and products. The inclusive treatment of supply chain emissions, as presented here, differs from standard production-based assessments but gives a more complete and realistic view of impacts, despite the complexities and uncertainties involved. Footprints of this kind are therefore essential metrics for responsible consumers.

As an example, the footprint of electricity consumption includes components for the emissions associated with fossil fuel extraction, shipping, refining and transport to power stations, as well as those resulting from the electricity generation process itself. It is worth noting that these factors are not included in standard conversion factors issued by Defra. To give another example, the footprint of vehicle travel includes, on top of components for direct vehicle emissions, components for the extraction, shipping, refining and distribution of fuel, components for the manufacture and maintenance of cars, and so on.

3.3 Boundaries of the study

The study covers the core activities of Langdale Leisure operation including its supply chains.

The following are specifically included in the scope of the study:

- direct emissions from the premises, and from transport vehicles including all those used for business transport and commuting,
- electricity,

- indirect emissions arising from the supply chains of business activities and purchases both tangible and intangible (these include food and other consumables, laundry, buildings and grounds maintenance, depreciation of buildings, and a variety of professional and financial services),
- indirect emissions resulting from fuel supply, electricity generation and from transport.

The following are specifically not included in the scope of the study:

- visitor travel,
- construction work other than buildings maintenance,
- rates, taxes and staff activities (other than whilst at work or travelling to work).

3.4 Inclusion of Kyoto greenhouse gases

This assessment considers all six gases covered in the Greenhouse Gas Protocol, expressed in terms of carbon dioxide equivalent (CO₂e), the sum of the weights of each gas emitted multiplied by their global warming potential (GWP) relative to carbon dioxide over a 100 year period.

3.5 Greenhouse Gas Protocol guidelines

We have followed the reporting principles of the Greenhouse Gas Protocol published by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI).

The Greenhouse Gas Protocol provides a choice of three scopes for emissions reporting. Scope 1 covers direct emissions from company owned vehicles and facilities. Scope 2 includes net emissions from energy imports and exports, such as electricity. Scope 3 includes other indirect emissions resulting from company activities, as detailed by the boundaries of the study. This report includes all Scope 1 and 2 emissions and an extensive treatment of Scope 3 emissions throughout supply chains of business activities and purchases.

3.6 Treatment of high-altitude emissions

High altitude aeroplane emissions are known to have a higher global warming impact than do their low altitude counterparts. Although the science of this is still poorly understood, this study has applied a multiplier of 1.9 to aircraft emissions, to take account of their higher impact. This is the figure currently suggested by the Intergovernmental Panel on Climate Change and is the figure recommended by BEIS. Some sources advocate applying multipliers to aviation emissions as high as four.

3.7 Reporting approach

For the estimation of **supply chain emissions** from products and services as well as in the production and transport of fuels, this report draws primarily upon environmentally-extended input-output analysis (EEIO).

EEIO combines economic information about the trade between industrial sectors with environmental information about the emissions arising directly from those sectors to produce estimates of the emissions per unit of output from each sector. The central technique is well established and documented (for example Leontief 1986, Miller and Blair 1985), In the UK, the main data sources are the combined supply and use matrix for 123 sectors provided by the Office of National Statistics (ONS), and the UK environmental accounts. The specific model used for this project was developed by Small World Consulting with Lancaster University. This model augments the basic approach to take account of such

factors as the impact of high altitude emissions that are not factored into the environmental accounts and the use of price indices to compensate for changes in the economy in the time lags that occur in the production of ONS data.

Three main advantages of EEIO over more traditional process-based life cycle approaches to greenhouse gas footprinting are worth noting:

- EEIO attributes all the emissions in the economy to final consumption. Although, as with process-based life cycle approaches, there may be inaccuracies in the ways in which it does this, it does not suffer from the systematic underestimation that process-based analyses incur through their inability to trace every pathway in the supply chains.
- EEIO has at its route a transparently impartial process for the calculation of emissions factors per unit of expenditure whereas cycle approaches entail subjective judgements over the setting of boundaries and the selection of secondary conversion factors.
- Through EEIO, it is possible to make estimates of the footprints resulting from complex activities such as the purchase of intangible services that life cycle approaches struggle to take into account. This report is therefore able to assess the impacts resulting from all business expenditure.

One of the limitations of EEIO in its most basic form is that it relies upon the assumption of homogeneity of the direct emissions and the demands placed on other sectors per unit of output within each sector. As an example, a basic EEIO model does not take account of the carbon efficiencies that may arise from switching expenditure on paper to a renewable source from a virgin source without reducing the actual spend. In order to mitigate this weakness, Small World applies adjustment multipliers to the EEIO emissions factors. These are established after consultation with the client to understand specific procurement practices within the business which could lead to higher or lower impacts than would be typical for a given expenditure within a sector. The extent of the adjustment is then determined by reference to process-based life cycle analysis and is appropriately documented. Overall, therefore, this report uses a hybrid methodology, drawing upon the strengths of both life cycle analysis and environmental input-output approaches.

Direct emissions associated with fuel consumption on the premises and staff transport have been calculated using conversion factors based on those provided by BEIS (2018) in their guidelines for company reporting on greenhouse gas emissions. As the BEIS figures do not take account of supply chain emissions (other than those produced at the point of electricity generation), SWC have developed hybridised emissions factors, incorporating the results of the EEIO model to take account of supply chain emissions.

3.8 Data collection

Premises fuel and electricity consumption data, staff travel, food invoices (4 weeks) and financial expenditure information were all provided by Langdale Leisure.

3.9 Uncertainties

Footprinting can only ever offer a best estimate rather than an exact measure, and the figures in this report should be viewed in that context. We have operated from the principle that it is more informative

to make best estimates of even the most poorly understood components of the footprint, and to discuss the uncertainty openly, than to omit them from the analysis.

3.9.1 Uncertainties over conversion factors

The areas in which the relationship between consumption and footprints is best understood are gas and electricity consumption. There is relatively good consensus over conversion factors to within around 10% in these areas. The next most certain group of conversion factors are those for travel and transport. In this category, those relating to aviation are the least well understood, due to uncertainties around the impact of high-altitude emissions and the paucity of detailed flight modelling for climate change impact studies.

There is greater uncertainty over supply chain emissions resulting from the purchase of goods and services. These are a feature of all footprint studies, the certainty behind which is frequently over-stated. The EEIO methodology adopted here removes the problem of systematic underestimation from which traditional life cycle approaches suffer. Nevertheless, as with all footprint studies, the best estimates contained in this report should be viewed as a broad guide.

3.9.2 Uncertainties over data

The data gathering methods are outlined above. The fuel consumption and financial expenditure data was well understood within the business and is thought to have a high degree of accuracy. Business travel records and staff commuting surveys provided good understanding of staff travel patterns. The areas of greatest uncertainty occurred in the estimation of the food footprint, which was extrapolated from four weeks' worth of delivery invoices to represent purchases made throughout the year. The four weeks selected were deemed to be representative of the seasons, but infrequent bulk purchases (e.g. alcohol) may not be well represented.

4 References

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