Department for
Energy Security
& Net Zero

Non-Domestic Building Stock in England and Wales

Part 3: Hospitality Sector Report

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Contents

List of Figures

List of Tables

Purpose

This report forms part of the response to the Non-domestic Building Survey commissioned by the Department for Business, Energy and Industrial Strategy (BEIS). Part 1 of the response sets out a description of the Non-domestic Building Stock in England and Wales, Part 2 focusses on the energy consumption characteristics of the stock, Part 3, this document, presents the findings of the pilot study in which a more detailed examination was undertaken of the Hospitality activity class, to assess the potential to augment the database, with additional datasets and analysis. The methods applied to the Hospitality activity class can provide new insights for other activity classes in the next phase of this project. In particular, by quantifying missing floor space, developing detailed profiles of space used for different activities within premises, constructions, building fabric and profiles of heating, ventilation and air-conditioning equipment, across activity classes. This detailed model was supplemented by primary research in the form of remote surveys supplemented with a small number of verification surveys to address questions for which no reliable or comprehensive secondary data set could be found.

A supplementary report examining the characteristics of large buildings not connected to the gas grid also forms part of the outputs of this project.

The overall research methodology is shown in Figure 1.

Since key activities within the Hospitality activity class are not valued for property taxation based on floorspace, there is no comprehensive record of floorspace within these activity classes. This report begins by setting out the results of the first mathematical estimation of the missing floorspace. This is followed by analysis of additional data, which is submitted by surveyors when lodging Commercial Energy Performance Certificates (CEPCs) and is not included in the certificates themselves and which has not previously been published. Finally, this report includes a summary of the methodology and results of surveys undertaken. To facilitate management of the surveys the 24 activities within the Hospitality activity class were consolidated into 5 sub-sectors, to enable intercomparison of primary and secondary data, with results presented by both activity class and sub-sector.

Figure 1 Research outline schematic
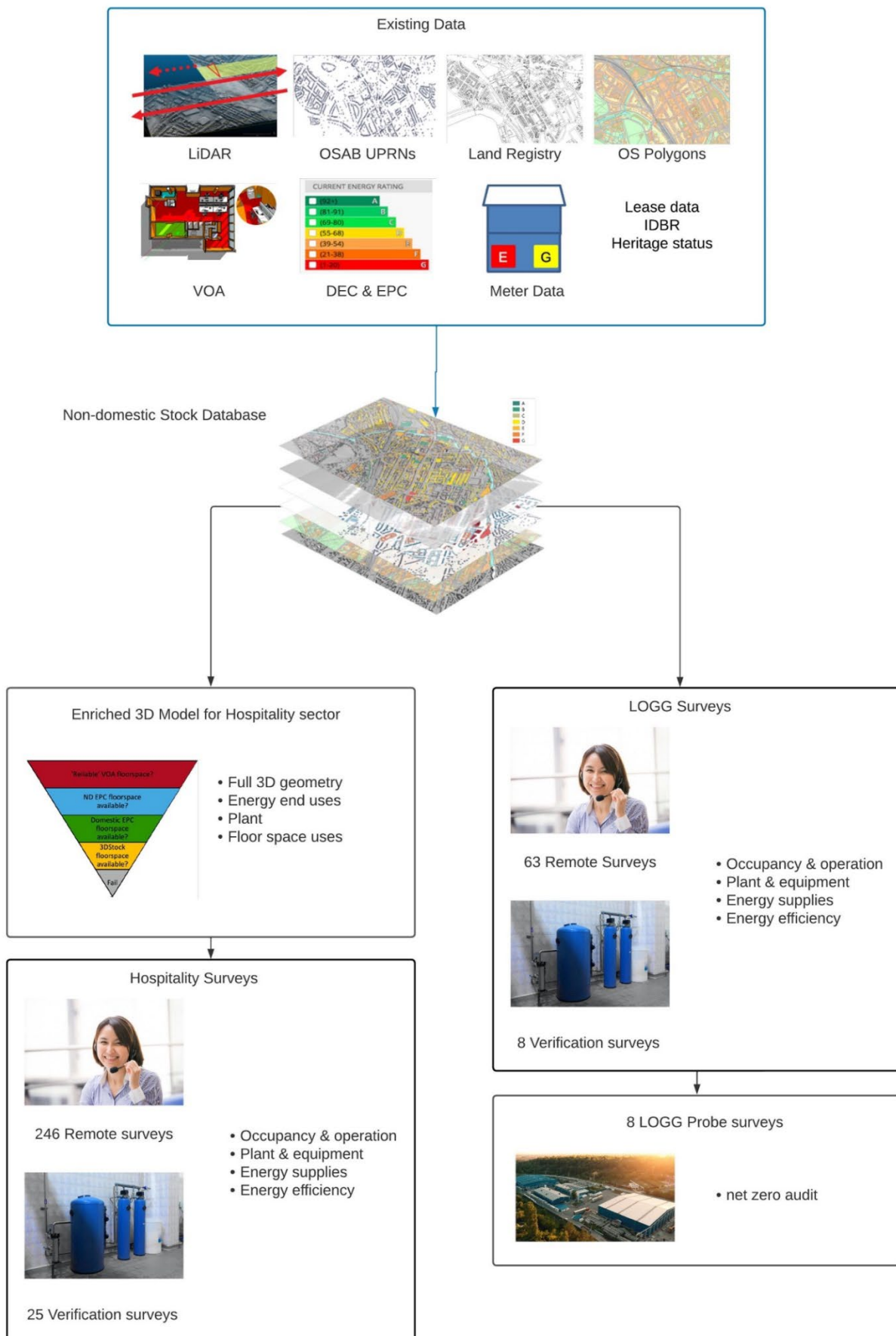
3DStock model of Hospitality

Parts 1 and 2 of this report have dealt with a detailed but 'lighter weight' model of non-domestic premises across England and Wales. Within this 'lighter weight' database, the geospatial location has been combined with data on floorspace from the Valuation Office Agency (VOA) and other more generalised data on building footprints and HMLR property boundaries. This made it possible to address some of the questions about the types of buildings in which non-domestic premises are located.

For this section, a full '3DStock[1]' model was generated for the premises that fall into the CaRB3 classification of 'Hospitality' and the analysis that follows uses this more detailed model.

Hospitality premises are found across England and Wales. In producing the 3DStock model, since it is hard to 'isolate' these buildings and model them without also taking into consideration building footprints in close proximity, this model also generated buildings and premises in close proximity to Hospitality premises. As a result, more premises than just Hospitality premises have been modelled, particularly in busy urban locations such as typical 'high street' locations. Nonetheless, the analysis in this section has only been run on the premises that are classified as 'Hospitality'.

The '3DStock' model was required and is considered to be an improvement on the methods employed for the 'lighter weight' model for a number of reasons:

- It uses the most detailed Ordnance Survey building polygon data (OS Mastermap Topographic[2] layer)

- It uses LiDAR data from the Environment Agency[3] to calculate the heights, volume and three-dimensional shape on each building footprint

- It allocates premises within this three-dimensional space onto the correct floor level(s) according to the available data

- For cases where premises might report more floorspace (via the VOA data) than is available within the primary building polygon that matches to the address, the model will 'explore' other available building polygons within the HMLR boundary, and include these if this extra floorspace fits within 'sensible' parameters. Using this method, premises with multiple buildings are matched more accurately

- Critically, this means that estimates of floorspace (in the primary building and any other associated building polygons) can be made, per floor level, by 'slicing' the model at logical intervals

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[1] 3DStock is the name given to a stock modelling approach. More details can be found in Evans, S., et al. (2017). "Modelling a whole building stock: domestic, non-domestic and mixed use." Building Research and Information 47(2): 156-172. https://doi.org/10.1080/09613218.2017.1410424
[2] Ordnance Survey MasterMap Topography Layer https://www.ordnancesurvey.co.uk/business-government/products/mastermap-topography visited 10/02/2023
[3] National LiDAR Programme https://www.data.gov.uk/dataset/f0db0249-f17b-4036-9e65-309148c97ce4/national-lidar-programme

There are a great many potential uses for the more detailed data that a '3DStock' model can offer. Some of the principal ones are:

1. Not all non-domestic premises have floorspace recorded by the VOA. This can result in misleading statistics when reporting the size and importance of different CaRB3 classes and CaRB3 activities. Two good examples here are 'Public Houses' and 'State Schools' (CaRB3 activities)

2. It is possible to explore in more detail the relationship between premises and buildings than has been possible in the 'lighter weight' model

3. Other geometric measurements can be extracted from a 3DStock model to provide estimates of the building geometry. These include:

    a. Floor area

    b. Exposed wall area versus party wall area

    c. Building volume

    d. Estimates of roof geometry (area, slope)

    e. Number of floors and vertical dimensions (average floor-to-floor heights)

All of these parameters are useful when assessing retrofit potential and when making (national or regional) estimates of quantities of materials that might be required to carry out specific retrofit measures on these non-domestic buildings.

Sector-specific considerations

The CaRB3 class of Hospitality has a number of different CaRB3 activities that are known to be given a valuation by the VOA using something other than floorspace as the principal metric. As a result, these premises have previously had their size under-reported whenever VOA floorspace was used as a variable (such as total floor area, median floor area, energy use intensities and so forth). Public Houses, Holiday homes, Hotels, Hostels, Camping and Caravan sites, Health Farms and Motels are some of the main examples of this. For example, within Hospitality, there are around 42K Public Houses, 64K Holiday homes and 5K 'Club, Institution [not sports club]' yet using the VOA floor area data the largest CaRB3 activity in Hospitality is 'Club, Institution [not sports club]' with 2.3 million m² of floor area (17% of all Hospitality floor area reported by the VOA).

At the same time, many CaRB3 activities within Hospitality *are* rated by floor area and in these cases, the data from the VOA are (in all likelihood) *more* accurate than the floor area measurements that a 3DStock model can generate. With this in mind, a method of 'graceful degradation' of floorspace data was conceived so that the best floorspace data could be used for each premises when available using a set of activity specific rules. This is described, in detail, in the section "Floorspace selection" and Figure 6 on page 19.

Testing the 3DStock floorspace

Before implementing these rules, some checks were carried out to identify which CaRB3 activities reported floorspace from the VOA which was considered 'valid', before comparing this to the 3DStock calculated floorspace. The chosen activities to run the tests on were: Restaurant; Café; Club, Institution [not sports club]' and 'Takeaway Food Outlet (Predominantly Off Premises)'. The results of the comparisons are shown in Table 1. This shows that the aggregate floor areas (average and median) between the two data sources are reasonably aligned. The data points behind this can be seen in scatter plots for each of these four activities in Figure 2, Figure 3, Figure 4 and Figure 5. Whilst the scatter plot comparisons between 3DStock and VOA data show outliers and 'imperfections', it is considered that the trend and aggregates demonstrate that 3DStock can provide a useful estimate of floorspace for a non-domestic model of the Hospitality class.

Table 1 Comparison of floor area data between VOA data and 3DStock for CaRB3 activities with 'sensible' floor areas in the VOA data.

CaRB3 activity	Number premises	Correlation coefficient [4]	Average VOA floor area	Average 3DStock floor area	Median VOA floor area	Median 3DStock floor area
Restaurant	7,332	0.44	256	282	200	194
Cafe	4,319	0.21	118	168	93	98
Club, institution [not sports club, probably]	5,176	0.83	463	464	392	377
Takeaway Food Outlet (Predominantly Off Premises)	1,332	0.31	87	102	78	79

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[4] The Postgres version of correlation coefficient was used (https://www.postgresql.org/docs/13/functions-aggregate.html) which can be considered to be the same as the Pearson correlation coefficient https://en.wikipedia.org/wiki/Pearson_correlation_coefficient

Figure 2 Scatter plot of VOA floor area (horizontal axis) against 3DStock floor area (vertical axis) for the CaRB3 activity 'Restaurant'
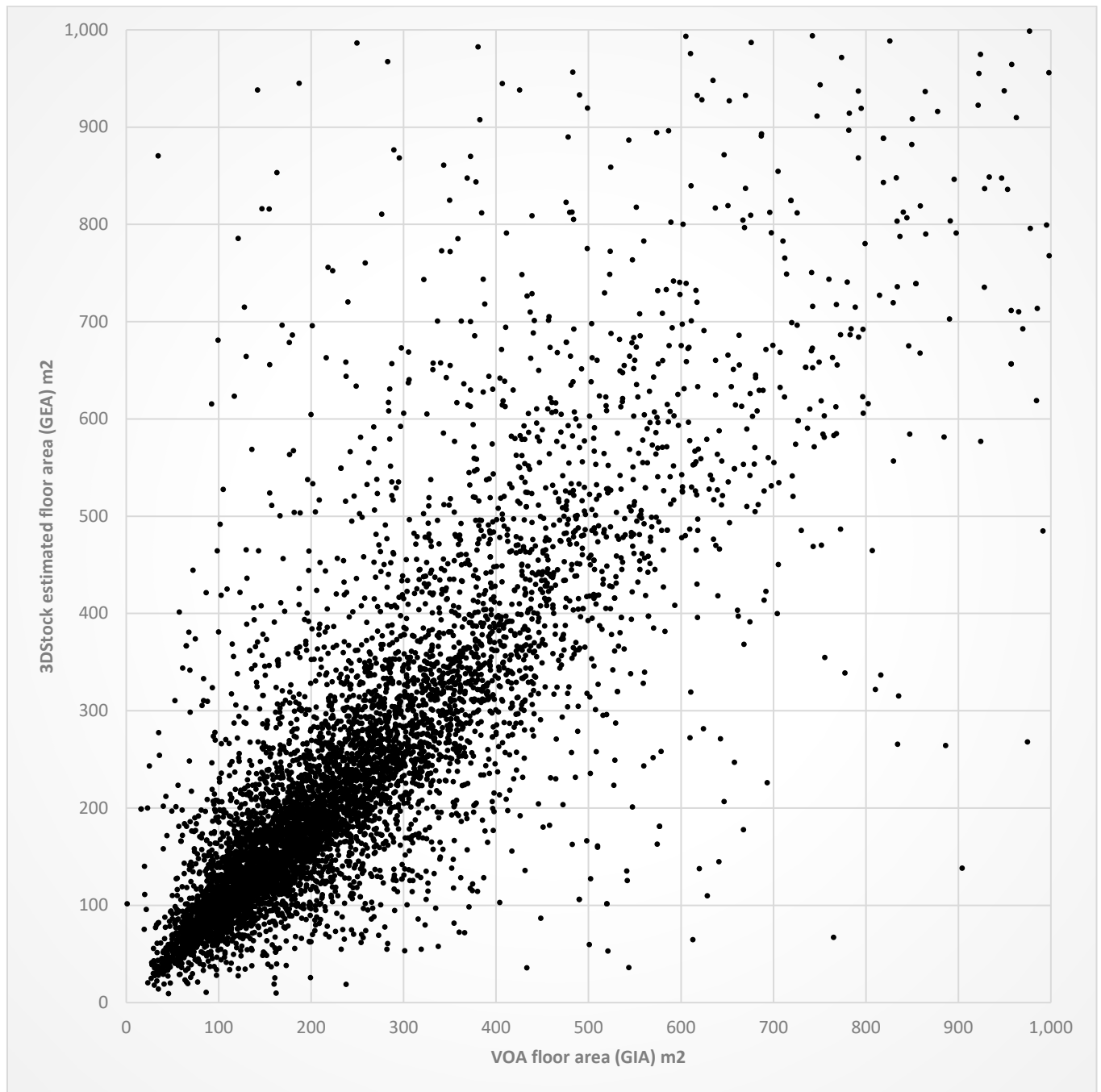
Figure 3 Scatter plot of VOA floor area (horizontal axis) against 3DStock floor area (vertical axis) for the CaRB3 activity 'Café'
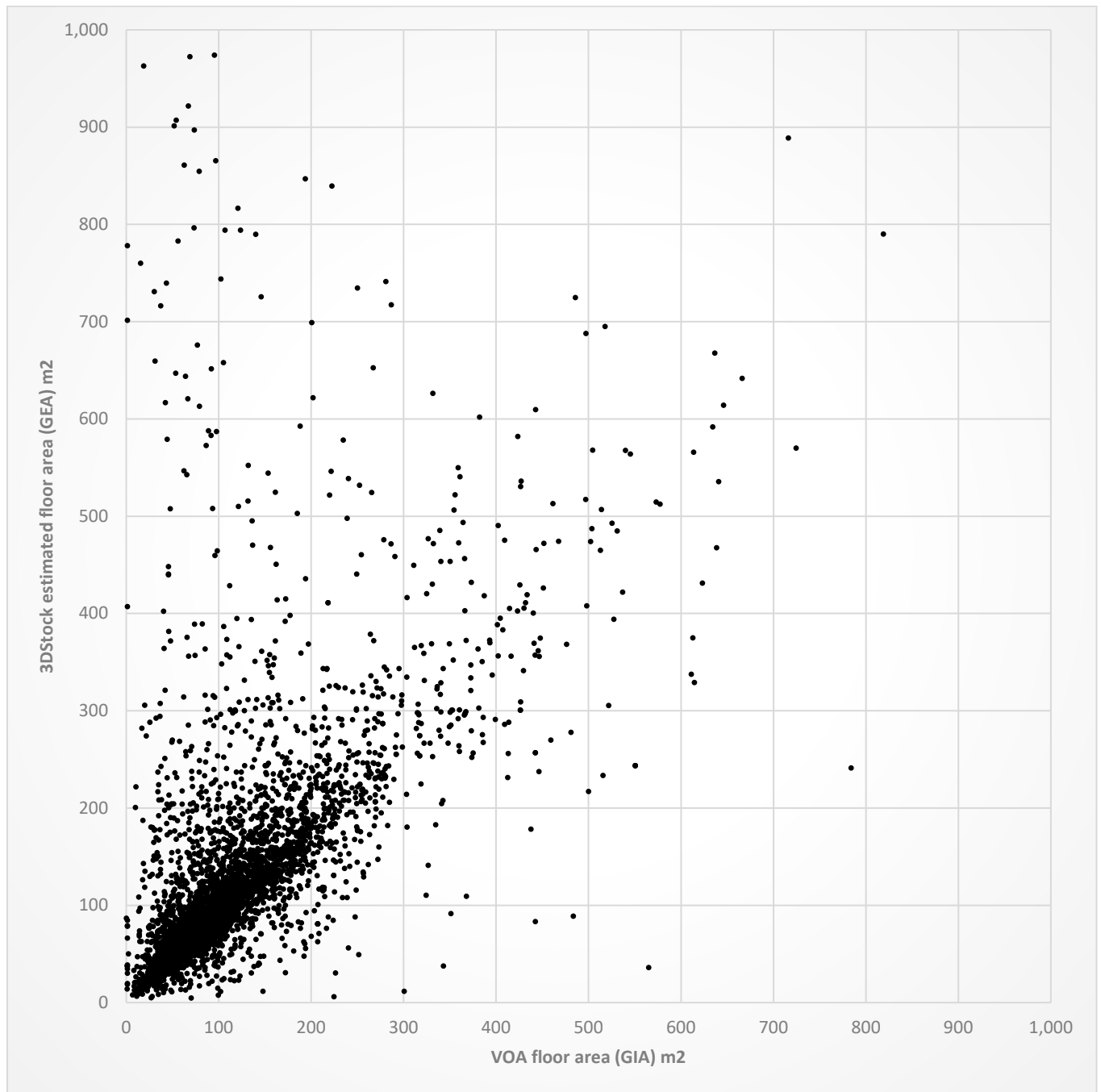
Figure 4 Scatter plot of VOA floor area (horizontal axis) against 3DStock floor area (vertical axis) for the CaRB3 activity 'Club, institution [not sports club, probably]'
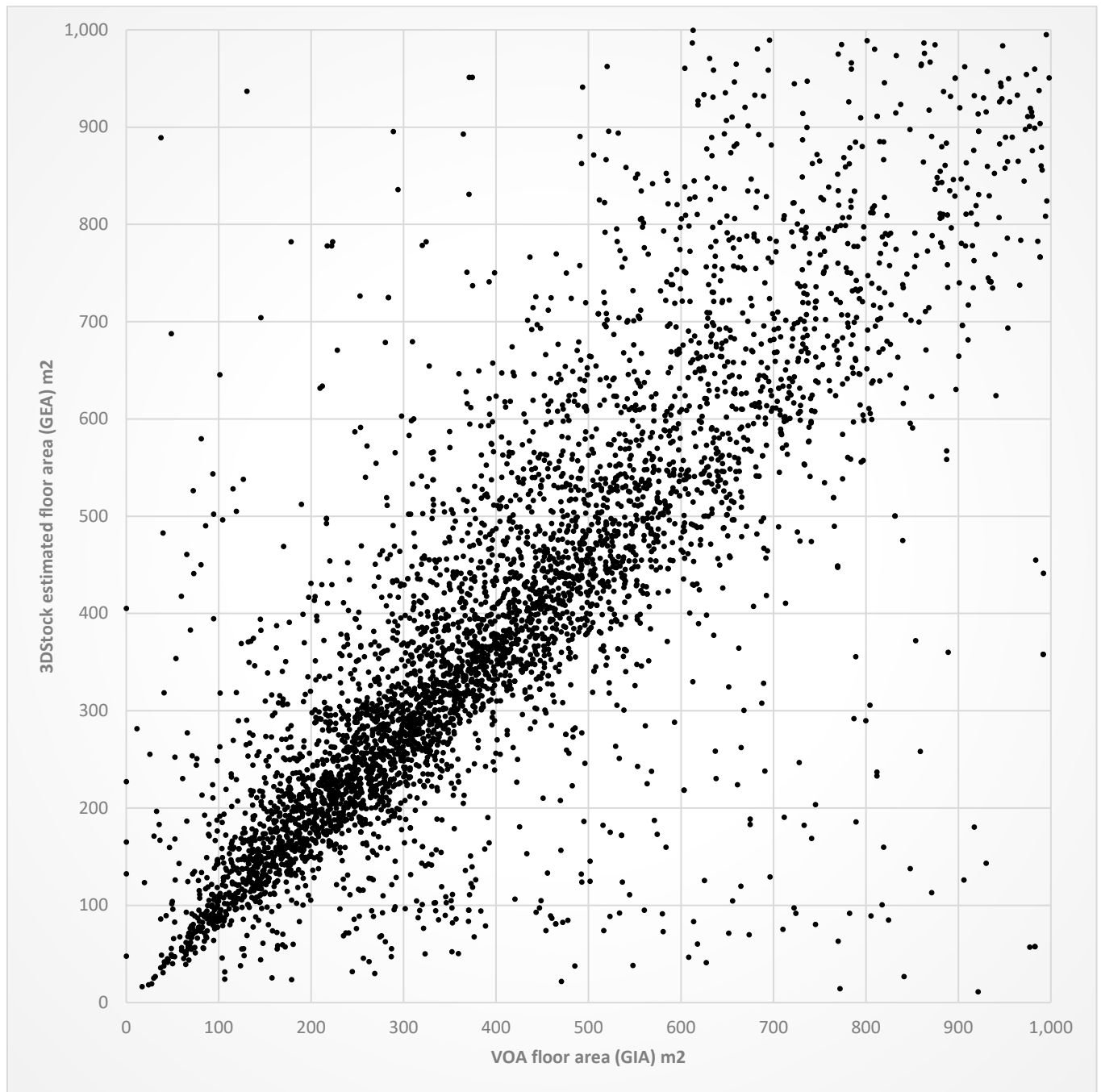
Figure 5 Scatter plot of VOA floor area (horizontal axis) against 3DStock floor area (vertical axis) for the CaRB3 activity 'Takeaway Food Outlet (Predominantly Off Premises)'
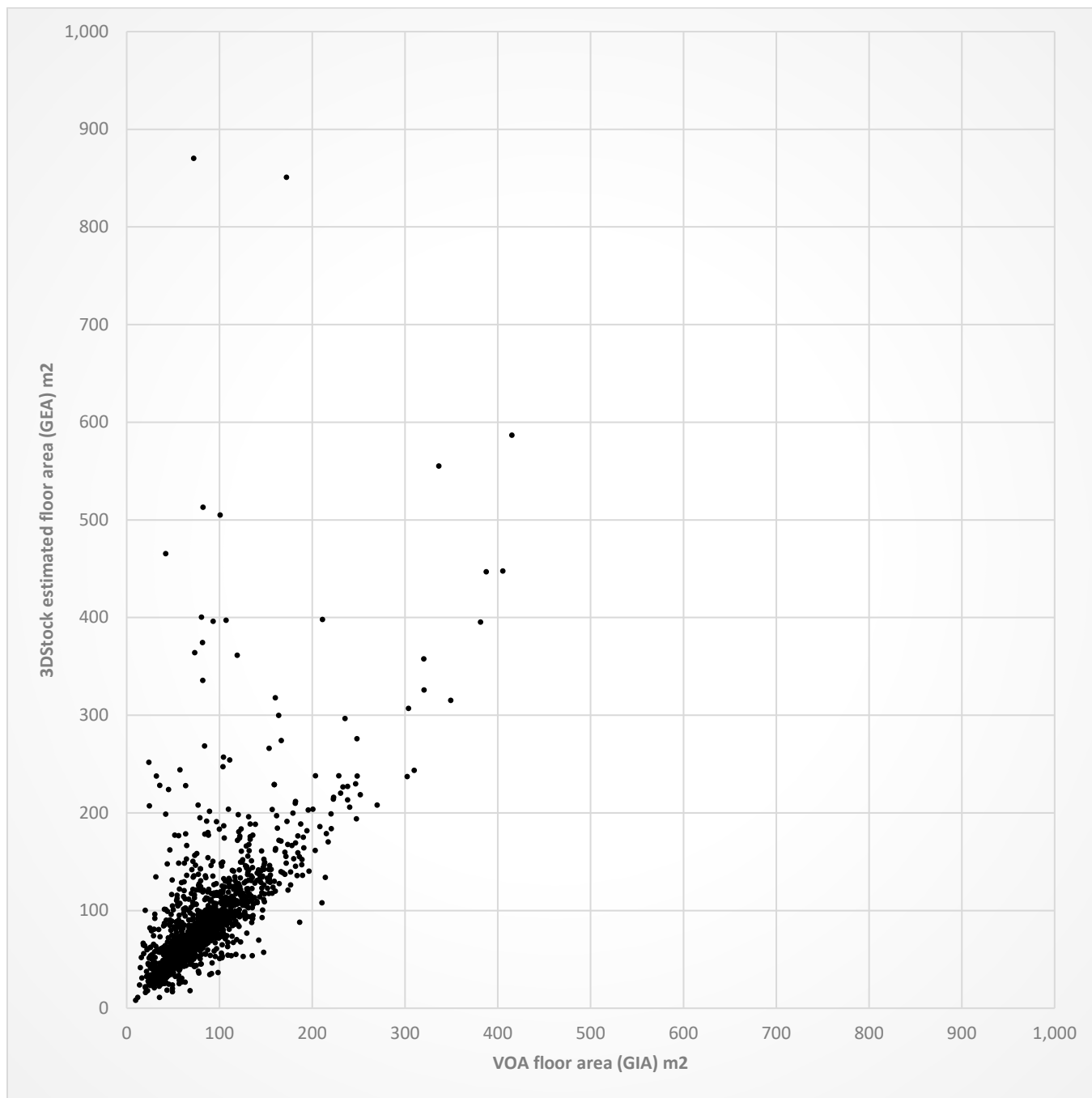
Hospitality activities – reliability of VOA floorspace

For a full explanation of the role of VOA floor area and the caveats surrounding data in this record type, please refer to 'Understanding 'floor area'' in Report 1.

In order to identify CaRB3 activities with unusable VOA floorspace data for the model, a query was run to produce aggregate floorspace statistics at the CaRB3 activity level (Table 2). The column showing average size per premises was then checked to identify activities where the average floor area was unfeasibly low. For example, 'Camping sites' reported an average floor area per premises of 2 m² which is considered unfeasible. This meant that these activities could be flagged as requiring a source of floor area data from somewhere other than the VOA (as shown in the column with the heading 'Flagged').

Table 2 Aggregate VOA counts and floorspace figures for CaRB3 activities within 'Hospitality'. The column 'Flagged' is used to identify activities which have unreliable floorspace statistics

Activity	Premises	Floorspace (m²)	Average size per premises (m²)	Flagged
Café	4,319	507,136	117	
Camping site	89	140	2	TRUE
Caravan park	1,098	-	-	TRUE
Chalet Park	60	852	14	TRUE
Club, institution [not sports club, probably]	5,176	2,372,136	458	
Coaching Inns	63	-	-	TRUE
Conference centre	43	6,296	146	
Country House Hotel	99	-	-	TRUE
Food Court	7	2,522	360	
Guesthouse, boarding house	3,508	9,877	3	TRUE
Health Farm	13	396	30	TRUE
Holiday accommodation (not: hotel, guesthouse, caravan)	19	55	3	TRUE
Holiday Home (Self Catering)	41,027	8,418	0	TRUE
Hostel	917	16,030	17	TRUE
Hotel (3 star and under)	2,244	2,921	1	TRUE
Hotel (4 star and above, or major chain)	2,330	-	-	TRUE
Lodge / Motel	126	298	2	TRUE
Nightclub, discotheque	403	187,944	466	
Public House/Pub Restaurant	16,894	16,140	1	TRUE
Restaurant	7,332	1,848,869	252	
Restaurant - Drive-in/thru	1,983	631,349	318	
Takeaway Food Outlet (Predominantly Off Premises)	1,332	115,019	86	
Timeshare Complex	30	-	-	TRUE
Wine bar	324	22,941	71	

Energy Performance Certificate (EPC) data

For the cases in Table 2 that are flagged as having unreliable VOA floorspace data, non-domestic EPC data were considered to be the next alternative floor area data source, since these floor areas are measured by EPC surveyors. This hypothesis was tested and shown to produce feasible floorspace aggregates for most CaRB3 activities apart from 'Holiday Home (Self Catering)', 'Guesthouse, boarding house' and 'Hostel', where it was noted that there were significant numbers of matches to *domestic* EPCs when non-domestic EPCs failed to match.

As a result, a method was developed to allow non-domestic EPC data to replace VOA floorspace data for those activities flagged in Table 2, with the exception of the three activities ('Holiday Home (Self Catering)', 'Guesthouse, boarding house' and 'Hostel'), which showed strong matching to domestic EPCs. In these three cases, domestic EPCs were added to the potential source of replacement floorspace data.

Floorspace selection

By bringing all of these datasets together and applying a hierarchical approach (illustrated in Figure 6), for each CaRB3 activity, it is possible to derive floorspace figures for the Hospitality CaRB3 class. The hierarchy essentially funnels towards the best recorded floor space, or calculated floor space, for each premises. The VOA floorspace data (red layer) are generally reliable, with a flag to indicate where this is true. If there is no VOA record of floor area, the algorithm moves to gather non-domestic EPC floor area data (blue), if this is available. If this fails and the model permits it for a few specific activities (such as 'Holiday Home (Self Catering)', the next step it to look for domestic EPC floor area (green). (Note that to avoid inaccurate matching, not all activities are allowed to substitute domestic EPC floor area). If no EPC data have been matched, then the calculated floor area derived from the 3DStock model (gold) is used. If all stages fail, there are no floor area data for the premises (grey).

Figure 6 The method of selecting the most appropriate floorspace data for non-domestic premises using CaRB3 activity and available data

'Reliable' VOA floorspace?
- Yes?
  - CaRB3 activity not flagged (e.g. Restaurant)

ND EPC floorspace available?
- Yes?
  - matched to most recent EPC (e.g. Public House)

Domestic EPC floorspace available?
- Yes?
  - premises flagged as possibly domestic and matches to most recent domestic EPC (e.g. Holiday home)

3DStock floorspace available?
- Yes?
  - Geometry available (but all of the considerations above have failed)

Fail
- Yes?
  - All of the above considerations fail:
  - (Note that a small percentage of premises may fail)

Applying this approach to the data results in the percentage split of premises shown in Figure 7. This shows that there is a great deal of variability in the sources of floor area at the individual CaRB3 activity level. For example, Café floorspace is almost entirely (99%) derived from the VOA floorspace with the remaining 1% coming from non-domestic EPCs (0.1%) and 3DStock floorspace (0.4%) with 0.2% of Café premises failing to match to any floorspace. Holiday homes (self-catering) by contrast derive 40% of their floorspace from domestic EPCs and 54% from 3DStock, with the remaining 0.6% coming from non-domestic EPCs and 6% failing to match to any source of floorspace.

The overall figures for Hospitality show that 94% of premises successfully produce floorspace using this method. The overall breakdowns are:

- 32% of premises can derive their floorspace from VOA

- 16% can derive their floorspace from non-domestic EPCs

- 33% can derive their floorspace from domestic EPCs

- 33% can derive their floorspace from 3DStock

- 6% fail to match to any suitable floorspace

Figure 7 Percentage of premises aggregated by their floorspace source for Hospitality, after selecting the most appropriate floorspace
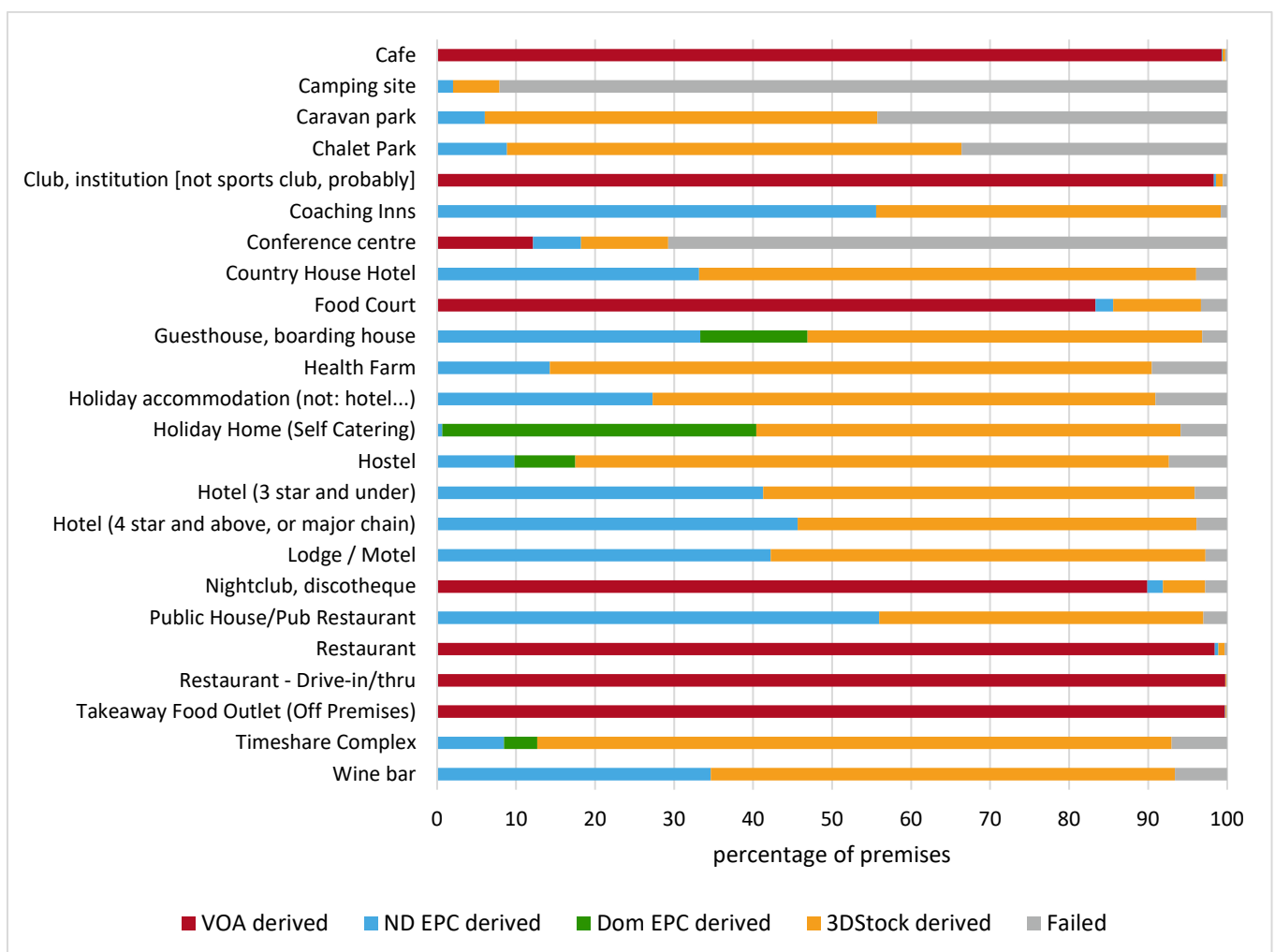
Implications for stock description

Using the methods described in the section entitled 'Floorspace selection', the total floorspace for Hospitality premises is 59.0 million m². This is a four-fold increase compared to the 14.9 million m² reported, using the VOA data alone, in Part 1 of these reports (Table 3). ND-NEED reports a similar floor area to the VOA data (13.3 million m^2) while BEES[5] reported a figure of 49.4 million m^2 based on extrapolating measured results for a much smaller number of surveyed premises. Since EPC floor areas are measured by accredited surveyors and cover a total of 57,842 Hospitality premises, supplemented by a further 64,579 premises derived from the 3DStock model, the figures presented here are believed to be more accurate. Table 3 below shows the differences between the model floorspace and the floorspace derived from the VOA alone, including a multiplier for this at the CaRB3 activity level. For some activities (like Café) there is no reported difference between the model floorspace and the VOA only derived floorspace, which means that the multiplier is set to a value of 1. For other activities, such as 'Public House/Pub Restaurant', the model reports a large increase in floor area compared to the VOA derived floor area, in this case resulting in a multiplier of 317.

Average and median floorspace are also reported per premises in Table 3. These can be compared between the CaRB3 activities. For example, 'Hotel (3 star and under)' has an average floor area of 807 m² and a median of 538 m² whilst 'Hotel (4 star and above, or major chain)' reports a much larger average floor area of 4,326 m² and a median of 2,764 m².

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[5] The Building Energy Efficiency Survey (BEES) 1014-2015 was commissioned by the UK Government Department for Business, Energy and Industrial Strategy. BEES set out to improve and update the evidence of how energy is used, and to provide an assessment of the abatement opportunities for all non-domestic premises across England and Wales.

Table 3 Floorspace aggregates for the CaRB3 activities within the Hospitality class, including comparisons between the model floorspace and the purely VOA floorspace. Average and median floorspace is reported based upon the model floorspace

CaRB3 activity	Premises	Total floorspace Millions m²		Multiplier	Aggregate model floorspace m²	
		Model	VOA alone		Average	Median
Cafe	15,984	1.8	1.8	1	114	89
Camping site	3,066	0.1	0.0	48	212	130
Caravan park	3,838	0.6	0.0	2,248	288	124
Chalet Park	226	0.0	0.0	47	265	149
Club, institution [not sports club, probably]	9,394	4.4	4.3	1	471	399
Coaching Inns	126	0.1			607	542
Conference centre	708	0.3	0.1	5	1,508	535
Country House Hotel	178	0.3	-		1,754	1,164
Food Court	90	0.0	0.0	3	345	73
Guesthouse, boarding house	7,820	1.9	0.0	105	252	216
Health Farm	21	0.1	0.0	88	3,465	1,768
Holiday accommodation (not: hotel, guesthouse, caravan)	77	0.1	0.0	2,192	1,710	749
Holiday Home (Self Catering)	64,206	5.9	0.0	360	98	73
Hostel	1,545	0.6	0.0	17	399	170
Hotel (3 star and under)	4,112	3.2	0.0	395	807	538
Hotel (4 star and above, or major chain)	3,449	14.3	0.0	18,070	4,326	2,764
Lodge / Motel	218	0.3	0.0	750	1,213	1,043
Nightclub, discotheque	1,328	0.6	0.5	1	469	316
Public House/Pub Restaurant	42,035	16.0	0.1	317	392	321
Restaurant	28,878	6.9	6.8	1	240	183
Restaurant - Drive-in/thru	2,413	0.8	0.8	1	318	297
Takeaway Food Outlet (Predominantly Off Premises)	4,750	0.4	0.4	1	82	74
Timeshare Complex	71	0.0			744	334
Wine bar	1,060	0.2	0.1	3	252	136
All activity combined	**195,593**	**59.0**	**14.9**	**4**		

Figure 8 visualises the total model floor area shown in Table 3. This shows that the five largest CaRB3 Hospitality activities are:

- 'Public House/Pub Restaurant' (16.0 million m² / 27%)

- 'Hotel (4 star and above, or major chain)' (14.3 million m² / 24%)

- 'Restaurant' (6.9 million m² / 12%)

- 'Holiday Home (Self Catering)' (5.9 million m² / 10%)

- 'Club, institution [not sports club, probably]' (4.4 million m² / 7%)

Figure 8 Total floorspace from the model for the different CaRB3 activities in Millions m²
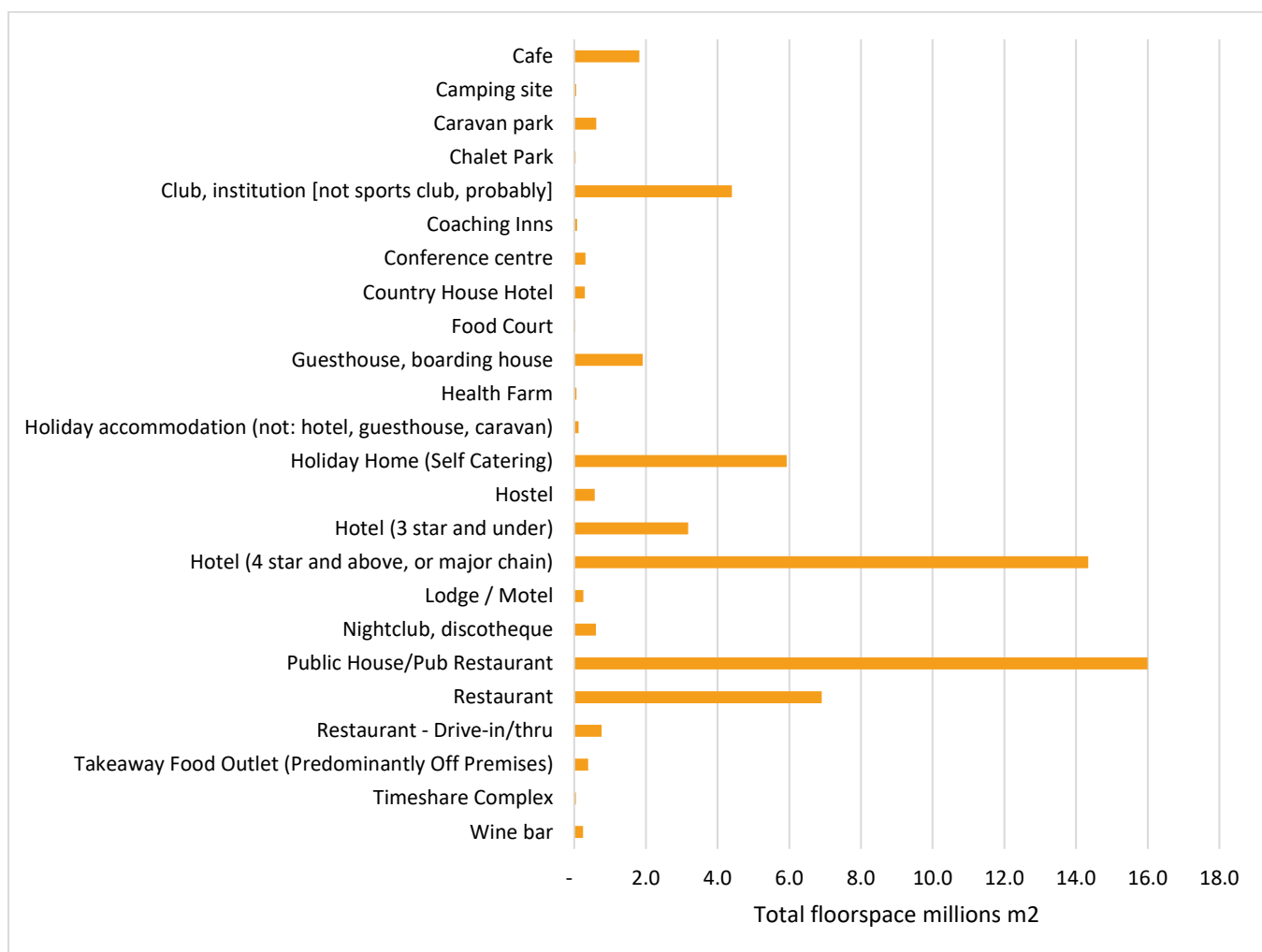
Figure 9 shows box and whisker plots of premises floor area for each CaRB3 activity. The vertical axis has been curtailed at 5,000 m² which limits two of the activities. 'Health Farm' has a 90th percentile of 8,978 m² whilst 'Hotels (4 star and above)' has a 75th percentile of 5,434 m² and a 90th percentile of 9,650 m². Figure 9 indicates that there are some big differences in floorspace statistics for the different CaRB3 activities in Hospitality, with median values including 'Holiday Home (Self Catering)' (73 m²), 'Public House/Pub Restaurant' (312 m²), 'Hotel (3 star and under)' (538 m²) and 'Hotel (4 star and above, or major chain)' (2,764 m²).

Figure 9 Premises floor area size[6] using model floor area, by CaRB3 activity
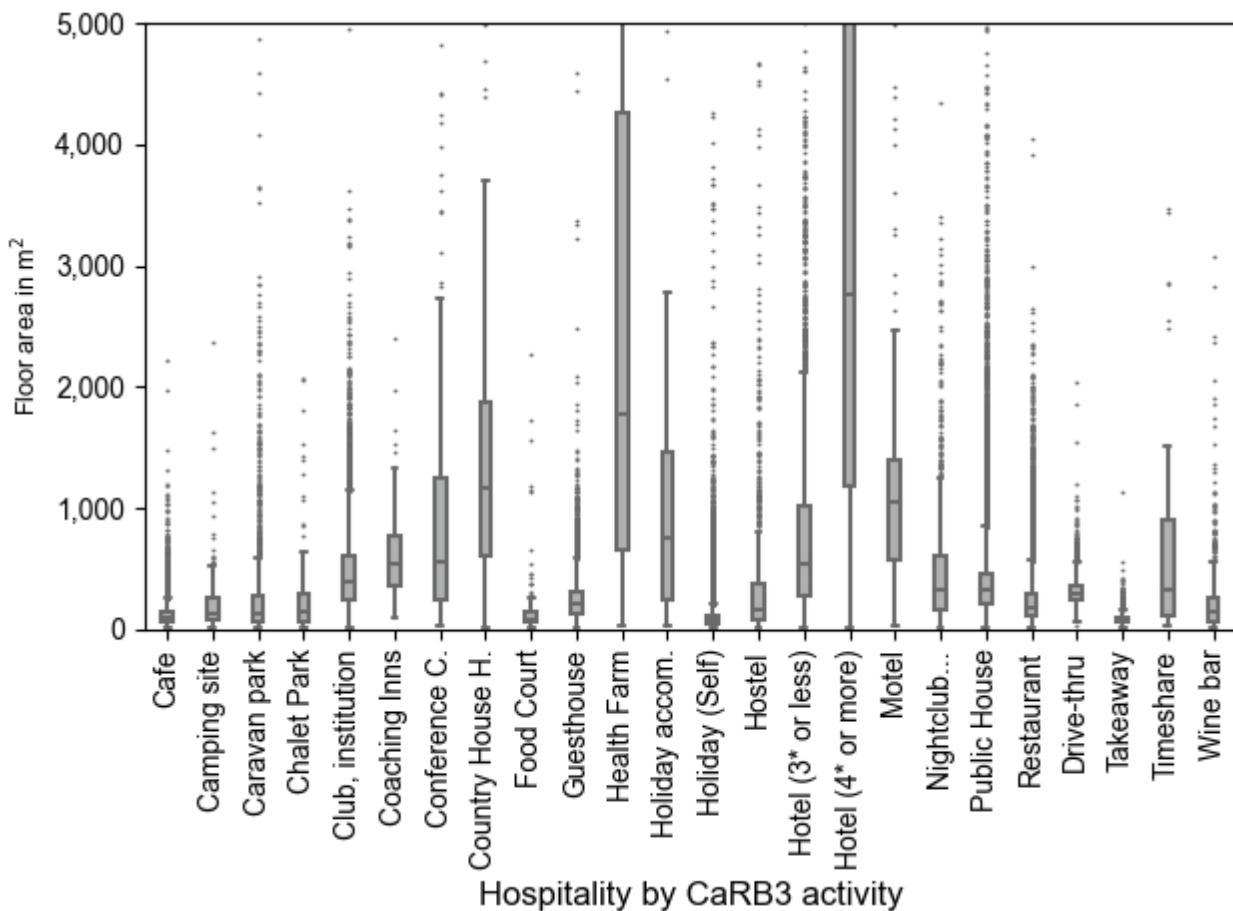
Until this point, the CaRB3 'Hospitality' class is the classification system's standard aggregation of the 24 CaRB3 activities. However, for the purpose of the remote and verification surveys, a condensed set of five survey 'sub-sector groups' was created for Hospitality and the 24 CaRB3 activities allocated to these accordingly. This arrangement is listed in Table 4 and can be seen graphically in the treemap shown in Figure 10. The statistics from this point onwards are reported by both CaRB3 activities and sub-sector groups wherever possible.

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[6] Note: In box and whisker plots, the 'box' columns, indicate the range of floor areas covered by the interquartile range of results (the middle 50 per cent of data points). The upper black bars extend to the 90th percentile, capturing a further 15 per cent of the total number of data points. The lower black bars span to the 10th percentile, also capturing 15 per cent of the total number of data points. Therefore, within each sector, 80 per cent of the total number of data points are displayed with outliers beyond this shown as individual dots.

Table 4 Aggregation of CaRB3 activity into survey sub-sector groups for the purpose of reducing the number of sub-sector / activities for Hospitality survey operation

Sub-sector	CaRB3 activity
Cafes/restaurants & Takeaways	Restaurant - Drive-in/thru
	Takeaway Food Outlet (Predominantly Off Premises)
	Cafe
	Food Court
	Restaurant
Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)	Country House Hotel
	Hotel (3 star and under)
	Hostel
	Health Farm
	Lodge / Motel
	Guesthouse, boarding house
	Hotel (4 star and above, or major chain)
Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club	Nightclub, discotheque
	Club, institution [not sports club, probably]
	Coaching Inns
	Public House/Pub Restaurant
	Wine bar
Self-catering accommodation	Chalet Park
	Caravan park
	Holiday accommodation (not: hotel, guesthouse, caravan)
	Timeshare Complex
	Holiday Home (Self Catering)
Not assigned[7]	Conference centre
	Camping site

[7] Conference centres were excluded from surveys due to their complexity and heterogeneity, camping sites were excluded since this project focusses on energy consumption in buildings.

Figure 10 Treemap of CaRB3 activities showing floorspace for Hospitality, grouped by sub-sector groups
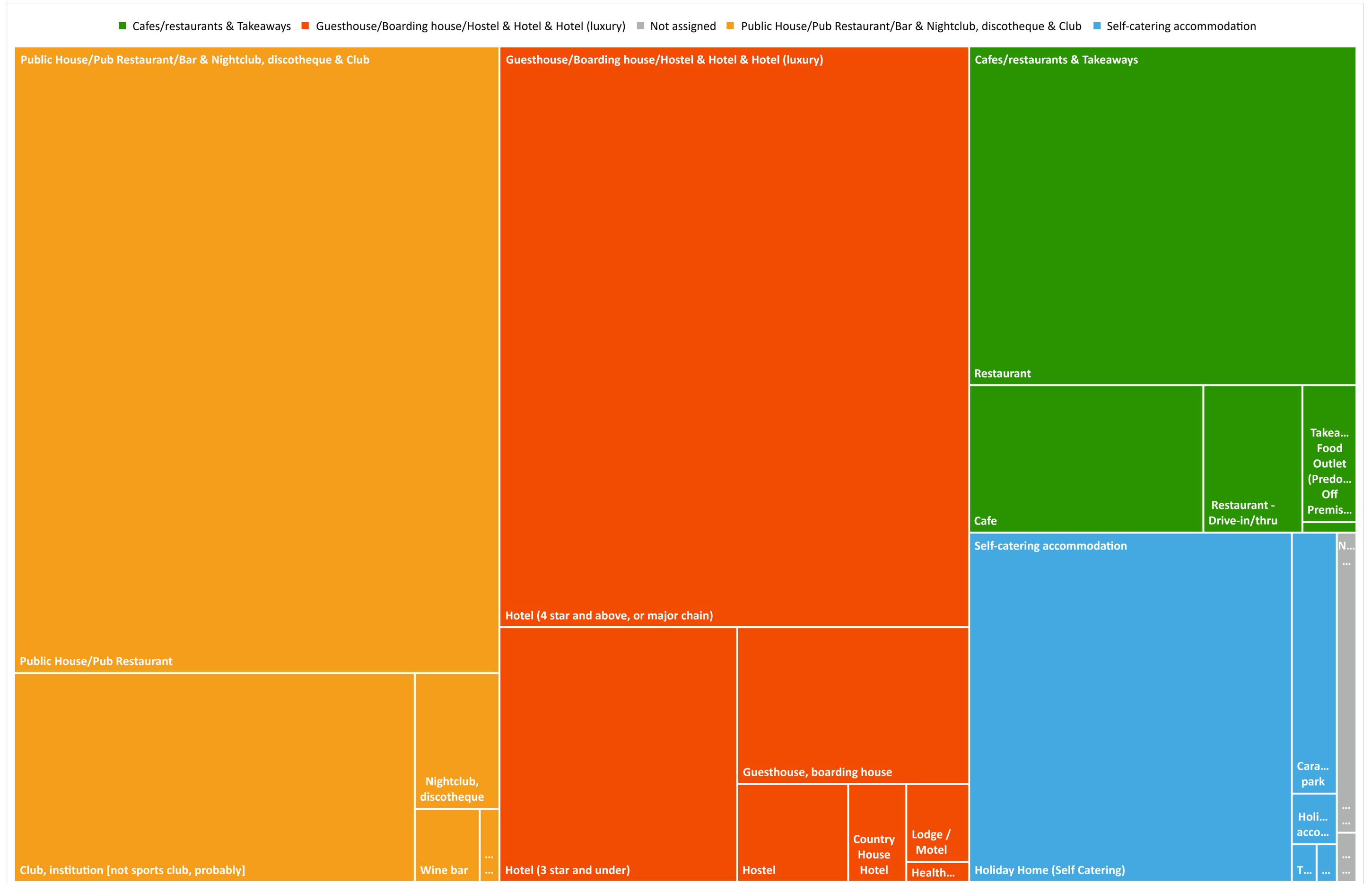
Figure 11 shows the floorspace statistics for the sub-sector groups in the same format as Figure 9. Note that the vertical axis has been shortened from 5,000 m² to 2,500 m² for the purpose of clarity. Whilst the aggregation of the CaRB3 activities into the five sub-sector groups simplifies the data it also smooths out some of the details with the result that the differences between the different CaRB3 activities, visible in Figure 9, are less noticeable with the median floorspace values for the five sub-sector groups being:

- Cafes/restaurants & Takeaways (137 m²)

- Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury) (321 m²)

- Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club (329 m²)

- Self-catering accommodation (74 m²)

- Not assigned (232 m²)

Figure 11 Premises floor area size using model floor area, by sub-sector aggregation
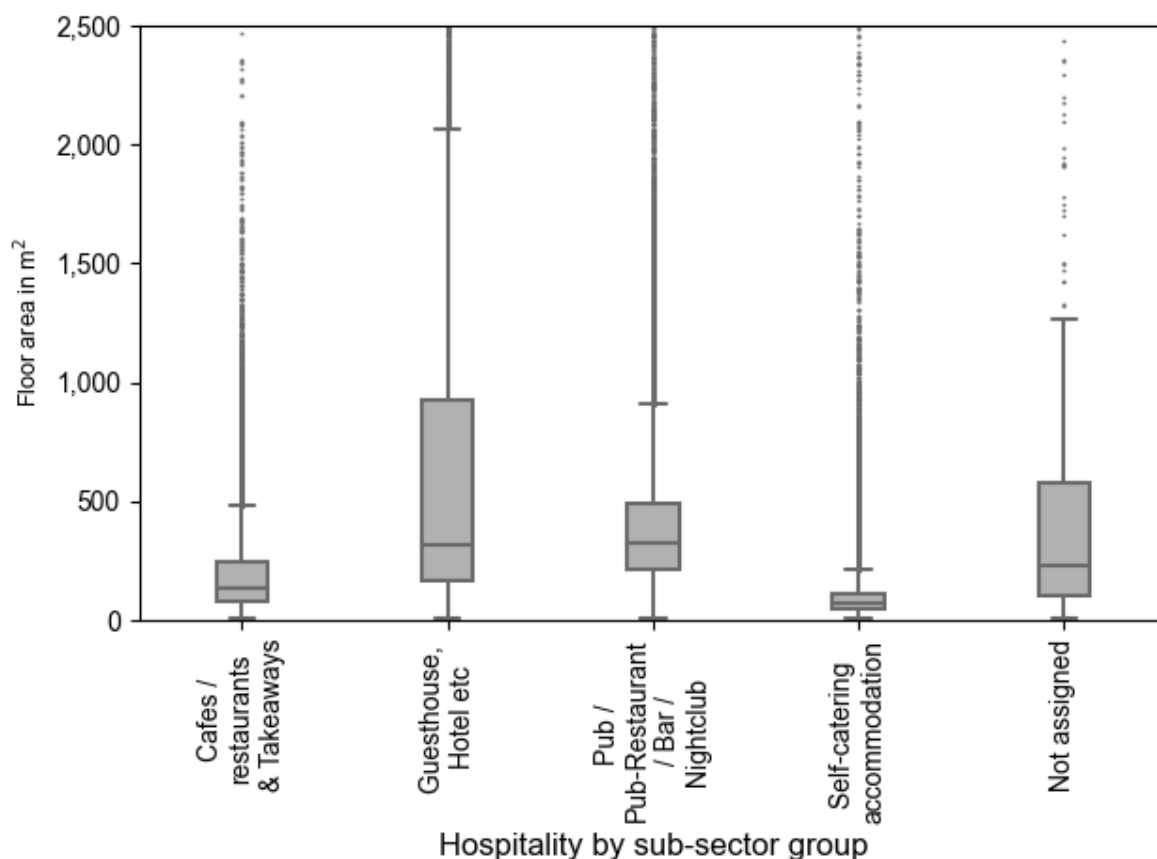
Hospitality and mixed-use buildings

An analysis of the mixture of activities that take place within each 'self-contained unit' (SCU)[8] within the 3DStock model was carried out to assess the numbers and percentages of mixed-use SCUs in the Hospitality sector. At the SCU/building level, Table 5 shows that 44% of buildings that contain Hospitality are entirely occupied by the single Hospitality premises, whilst 11% share the building/SCU with at least one other non-domestic premises. A relatively large

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[8] Please refer to "Extent of a non-domestic unit" in Part 1 of this report for a detailed explanation of the 'self-contained unit'

number of SCUs contain Hospitality premises along with at least one domestic address which accounts for 45% of all Hospitality SCUs

Table 5 Counts of 'Self Contained Units' (SCUs) that contain at least one Hospitality premises, classified by the mixing of premises at the SCU level

All SCUs	Occupies the whole building	Occupies part of building (shared with other non-domestic)	Part of building (shared with at least one domestic address)
168,113	74,654	18,030	75,706
	44%	11%	45%

The breakdown of mixed use can also be analysed at the *premises* level such that the counts and floor areas of different CaRB3 activities can be compared. Figure 12 shows the Hospitality premises at the CaRB3 activity level with the percentage of mixing across each activity (as a percentage of all premises for the CaRB3 activity). This shows that 80% of 'Restaurant – Drive-in/thru' premises are in SCUs where they occupy the whole building whilst only 8% of 'Food Court' premises occupy a whole building. Around 90% of Food Court premises share the building with other non-domestic premises. These two situations are logical, in that 'Food Courts' by their very nature are generally contiguous with one or more premises providing food services, whilst drive in/thru restaurants are on sites with easy vehicular access requiring plenty of space around the building. Public House, Coaching Inn and Takeaway Food outlets are the activities which have the largest percentage of premises that share the building with domestic addresses. Again, this is what may be seen in reality, where public houses have accommodation above, as do many takeaways found on high streets etc.

Figure 12 Mixed use counts of Hospitality premises (at the premises level) shown as a percentage of each CaRB3 activity
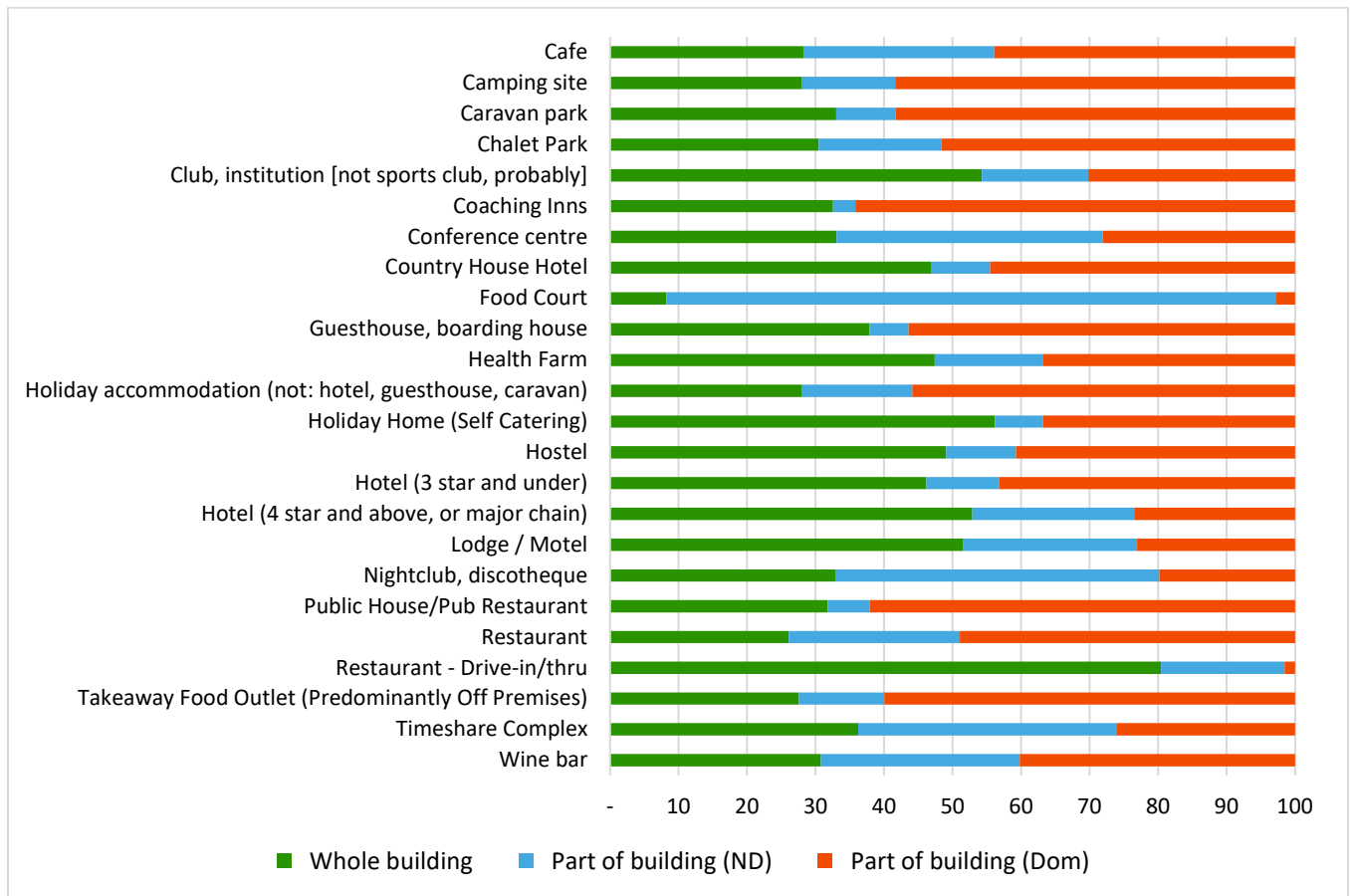
Figure 13 shows the same analysis as Figure 12 but using the floorspace of each Hospitality premises instead of the counts of premises. 'Restaurant – Drive-in/thru' (80%), Health Farm (71%) and Country House Hotel (68%) have the largest percentage of floor area assigned to premises that occupy the whole SCU. Food Court (75%) represents the largest percentage of floor area sharing the SCU with other non-domestic premises. For premises that shared a SCU with at least one domestic address, 60% of Coaching Inn floorspace falls into this category, followed by Takeaway Food Outlet (57%), Public House (54%) and 'Guesthouse, boarding house' (51%).

Figure 13 Mixed use floorspace (of Hospitality premises at the premises level) shown as a percentage of all floorspace in each CaRB3 activity
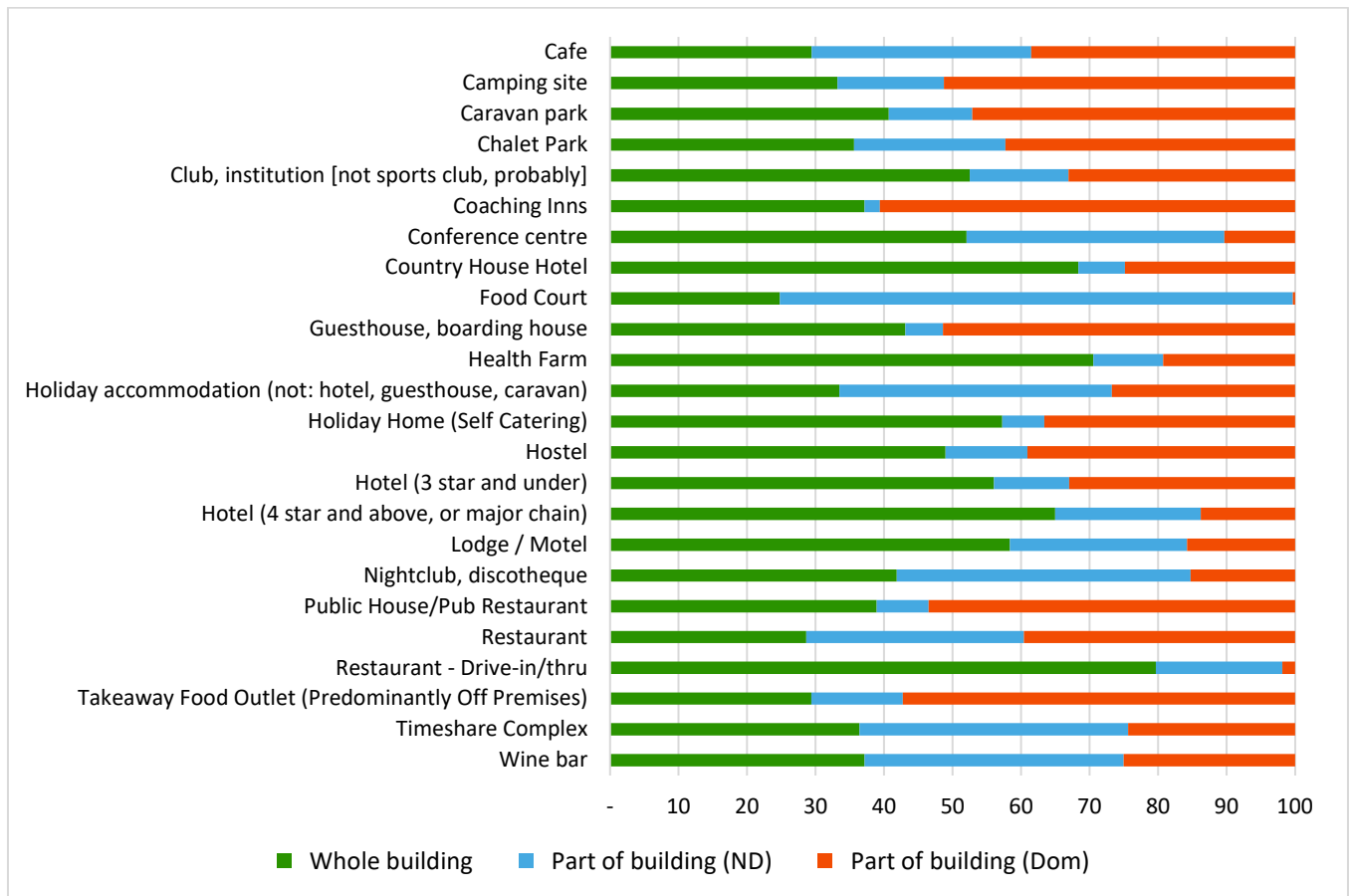
Figure 14 shows the same data as Figure 12 only this time it has been aggregated by the sub-sector groups to show counts of premises (as a percentage of all premises in the aggregation) in the different building classifications. Likewise, Figure 15 shows the same data as Figure 13 but aggregated by the sub-sector groups to give the percentage floorspace split by the different building classifications. These charts both show that by counts and by floorspace, the sub-sector group 'Cafes/restaurants & Takeaways' has the fewest cases of occupying a 'Whole building' with less than 1/3rd of these premises being in that situation. Self-catering accommodation is most likely to occupy a whole building based upon the counts of premises, but 'Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)' are dominant when this is measured by floor area (Figure 15) 'Public House/Pub Restaurant/Bar & Nightclub,

discotheque & Club' have the highest percentage of both premises and floorspace that share a building with at least one domestic address.

Figure 14 Mixed use counts of Hospitality premises (at the premises level) shown as a percentage of each sub-sector group
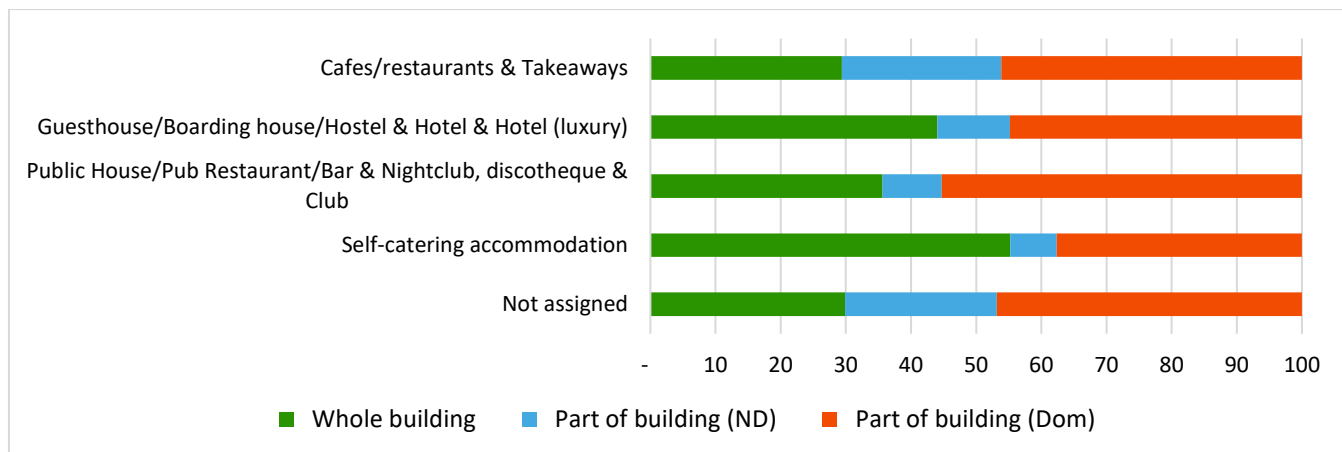
Figure 15 Mixed use floorspace (of Hospitality premises at the premises level) shown as a percentage of all floorspace in each sub-sector group
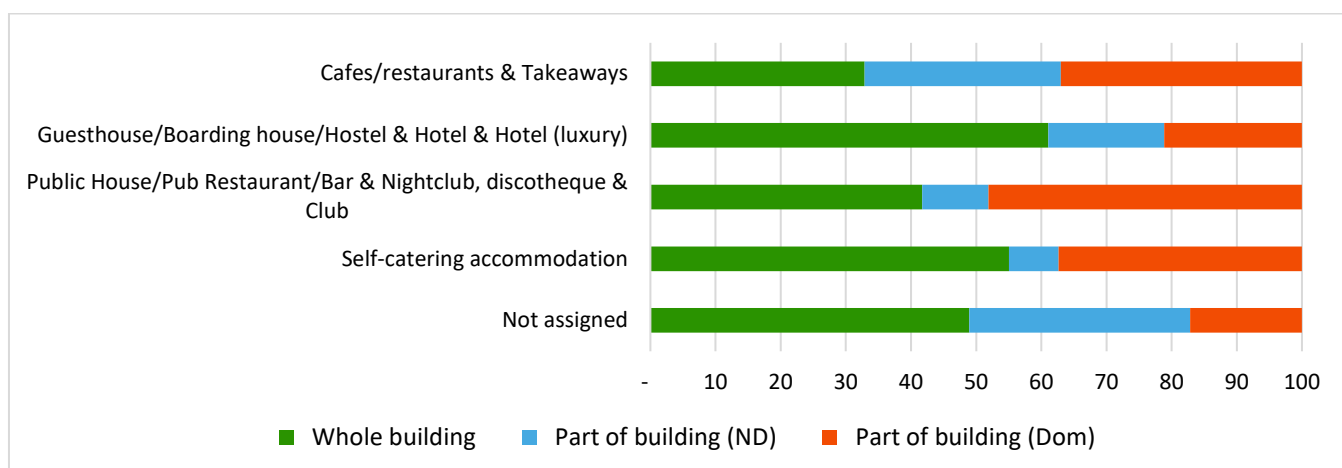
Hospitality and Heritage constraints

A dataset of Conservation Areas for both England and Wales was combined so that the location of premises within conservation areas could be identified for all Hospitality premises in both England and Wales. The same was done for Listed buildings. It was then possible to link these data to the Hospitality premises to identify those that are within a conservation area or a listed building or any combination of the two. The results are shown for the percentage of premises and percentage of floorspace for both CaRB3 activity and the sub-sector groups in Figure 16, Figure 17, Figure 18 and Figure 19.

Figure 16 Percentage distribution of premises by CaRB3 activity, using the Listed building status and Conservation areas, combined to classify the premises
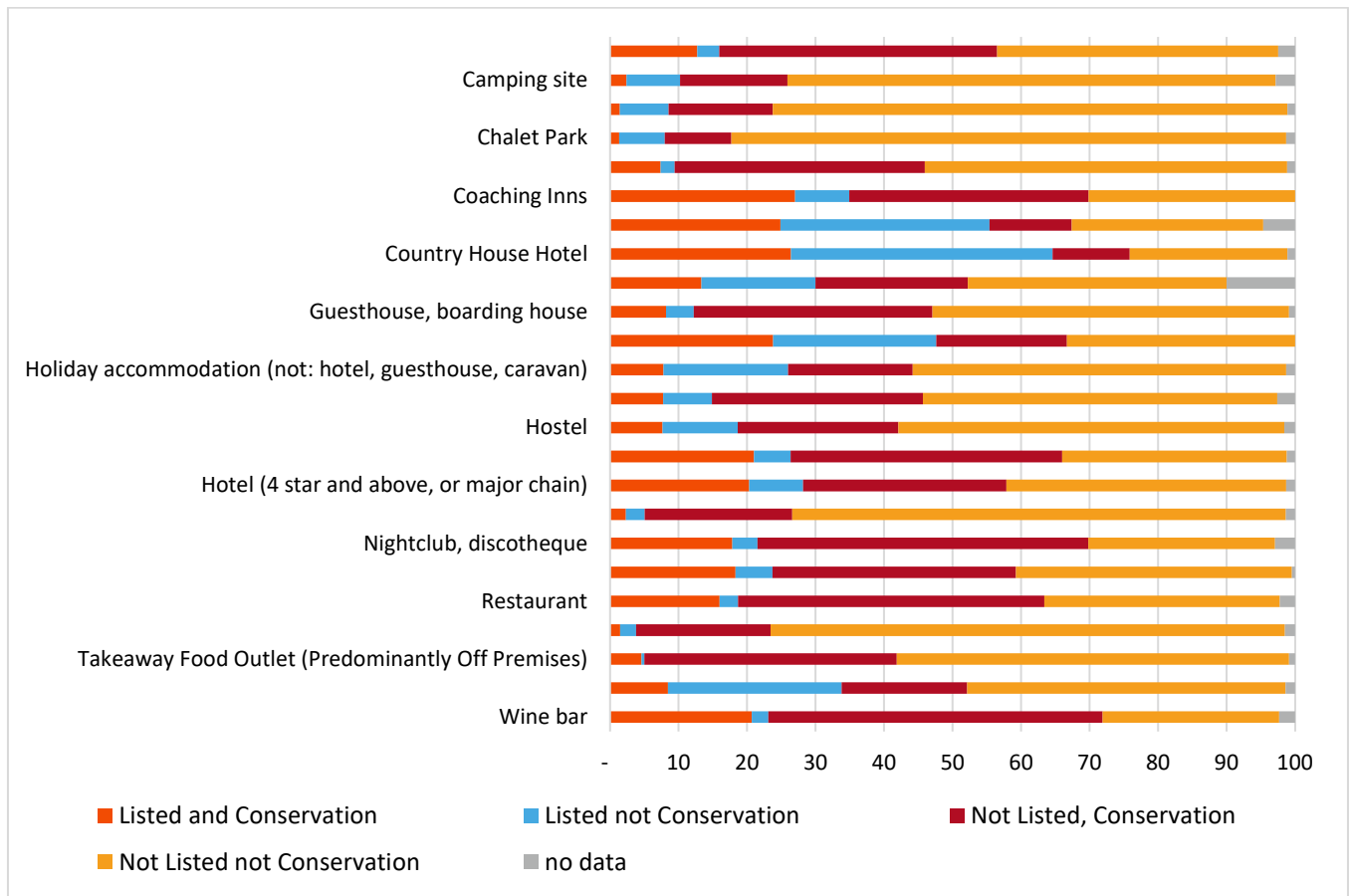
Figure 17 Percentage distribution of floorspace by CaRB3 activity, using the Listed building status and Conservation areas, combined to classify the premises
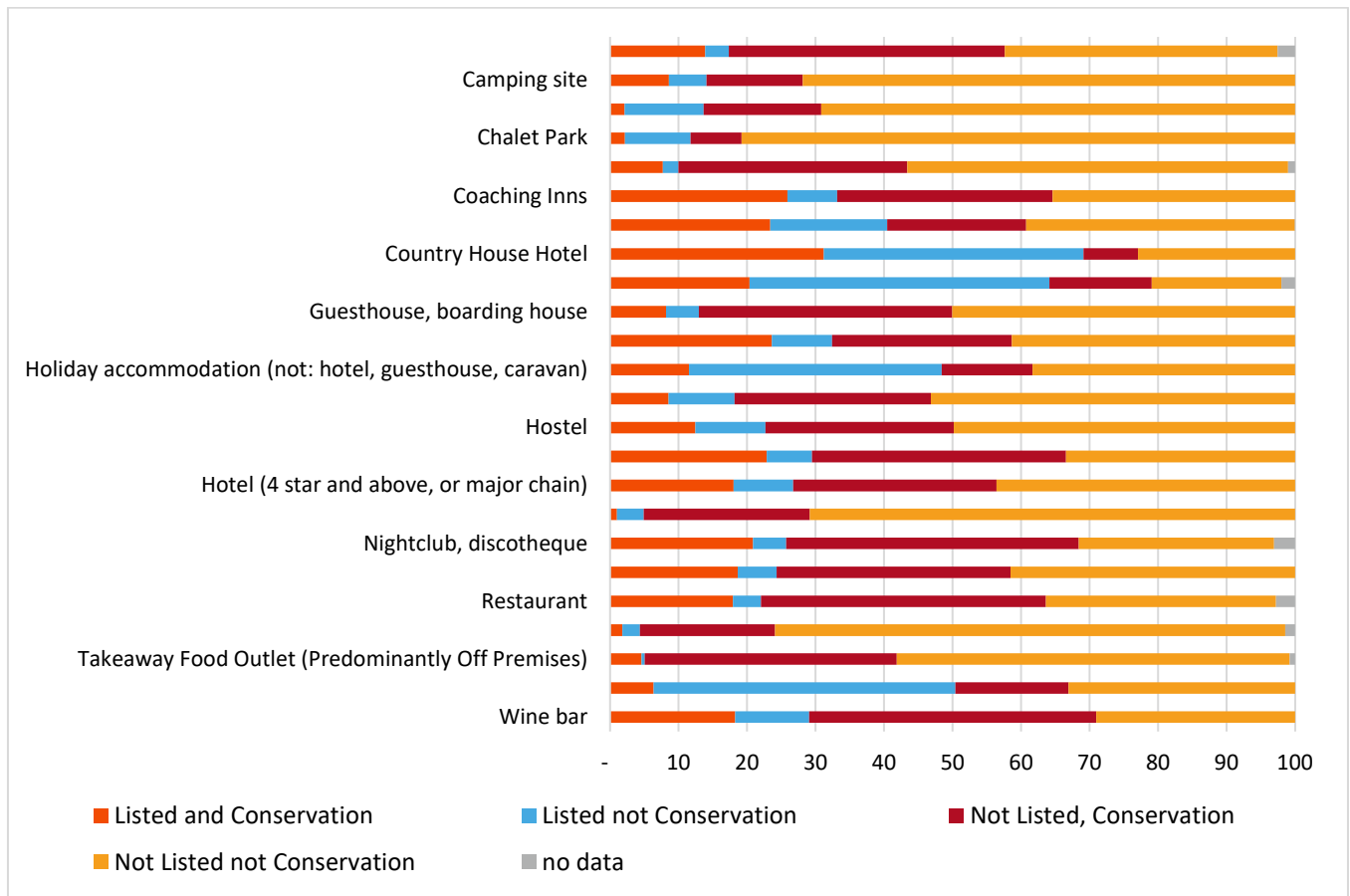
For the CaRB3 activities in Figure 16 and Figure 17; when the combination of any heritage constraint is considered (by combining the first three categories and excluding the 'Not Listed not Conservation' and the 'no data' category) then Country House Hotels have the largest percentage of premises (76%) and floorspace (77%) in this categorisation, whilst 'Restaurant - Drive-in/thru' and 'Chalet Park' have the lowest (+/- 20%)

For the sub-sector groups shown in Figure 18 and Figure 19 all the categories (apart from the 'Not assigned' category) have around 50% of premises or floorspace within the first three classifications (either 'Listed and Conservation' or 'Listed not Conservation' or 'Not Listed, Conservation').

Figure 18 Percentage distribution of premises by sub-sector group, using the Listed building status and Conservation areas, combined to classify the premises
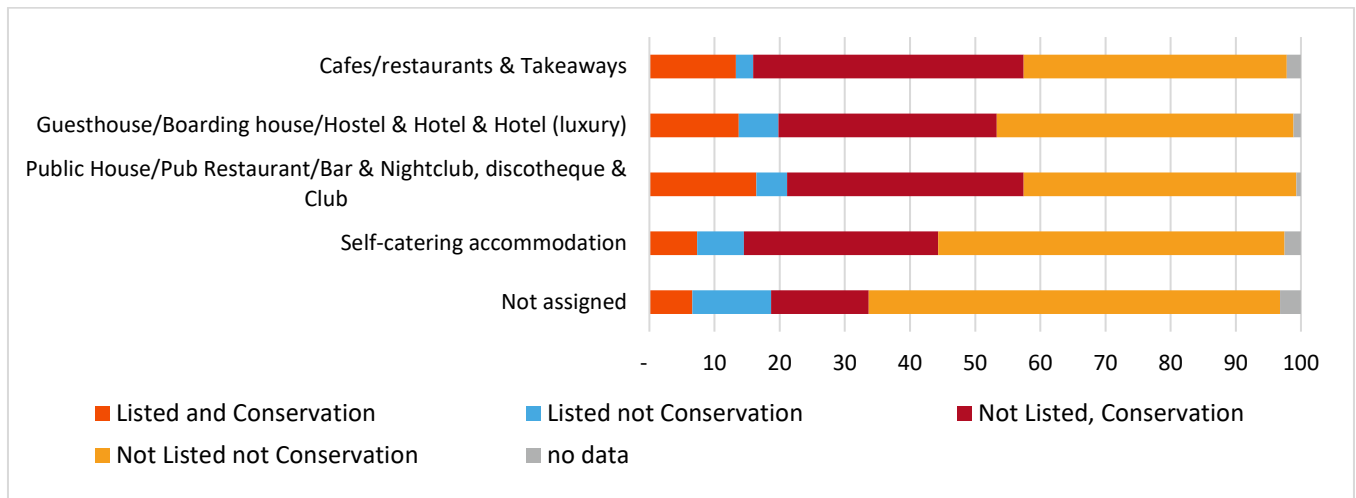
Figure 19 Percentage distribution of floorspace by sub-sector group, using the Listed building status and Conservation areas, combined to classify the premises
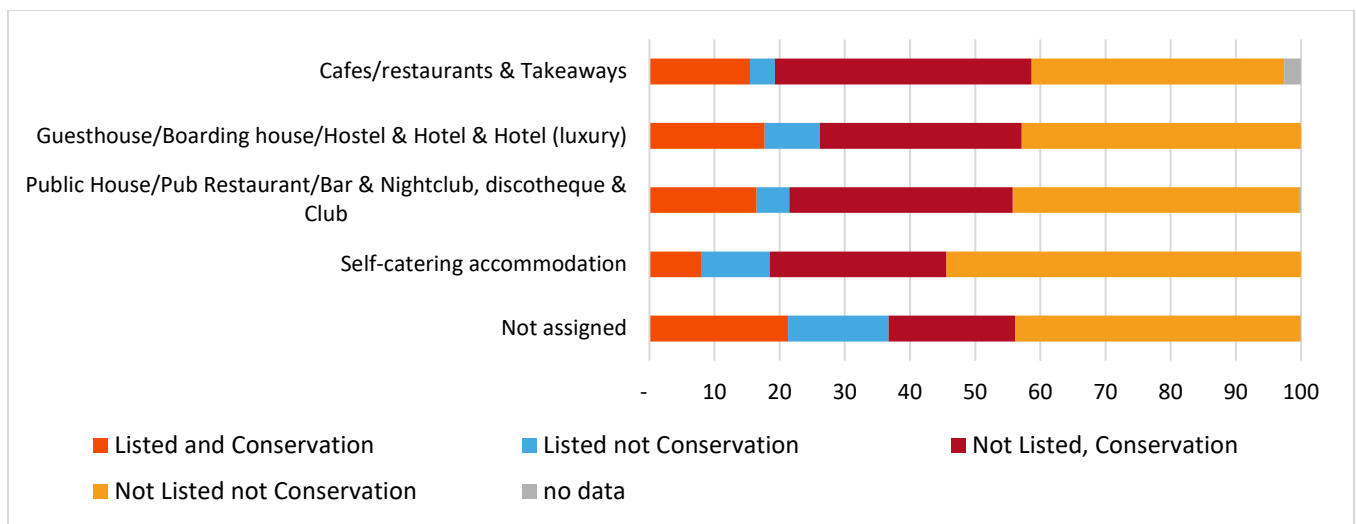
For Figure 16, Figure 17, Figure 18 and Figure 19 those premises that are in buildings, which are Listed and/or within Conservation areas, will have limitations on the work that could normally be carried out on the property without planning permission. This will vary and would need to be treated at the individual premises level, but these restrictions might preclude measures that would be considered to improve the energy efficiency of the property. Examples here would be: replacing doors and windows; adding solar panels; or installing external wall insulation. In some cases, internal modifications are also subject to controls. As a result, it seems likely to be more problematic and expensive to improve the energy efficiency, and/or harder to achieve large energy use reductions, in properties that have heritage constraints. For the Hospitality class, this represents significant numbers of premises and floor area.

Implications for energy consumption characteristics

Energy consumption by energy type and CaRB3 activity

Energy meter data matches to premises in the 24 CaRB3 activities are aggregated to the CaRB3 class as shown in Figure 20. Collectively, Hospitality consumed 13,026 GWh of delivered electrical energy and gas combined. Of this 6,736 GWh (52%) was electrical consumption and 6,290 GWh (48%) was gas consumption. Overall, this represents around 11% of the total energy consumed by all non-domestic CaRB3 classes. The three largest activities accounted for 70% of total consumption in Hospitality. These were:

- Public House/Pub Restaurant (4,155 GWh, 32%)

- Hotel (4 star and above, or major chain) (2,953 GWh, 23%)

- Restaurant (1,961 GWh, 15%)

Figure 20 Energy consumption, by energy type and CaRB3 activity (Hospitality), 2019
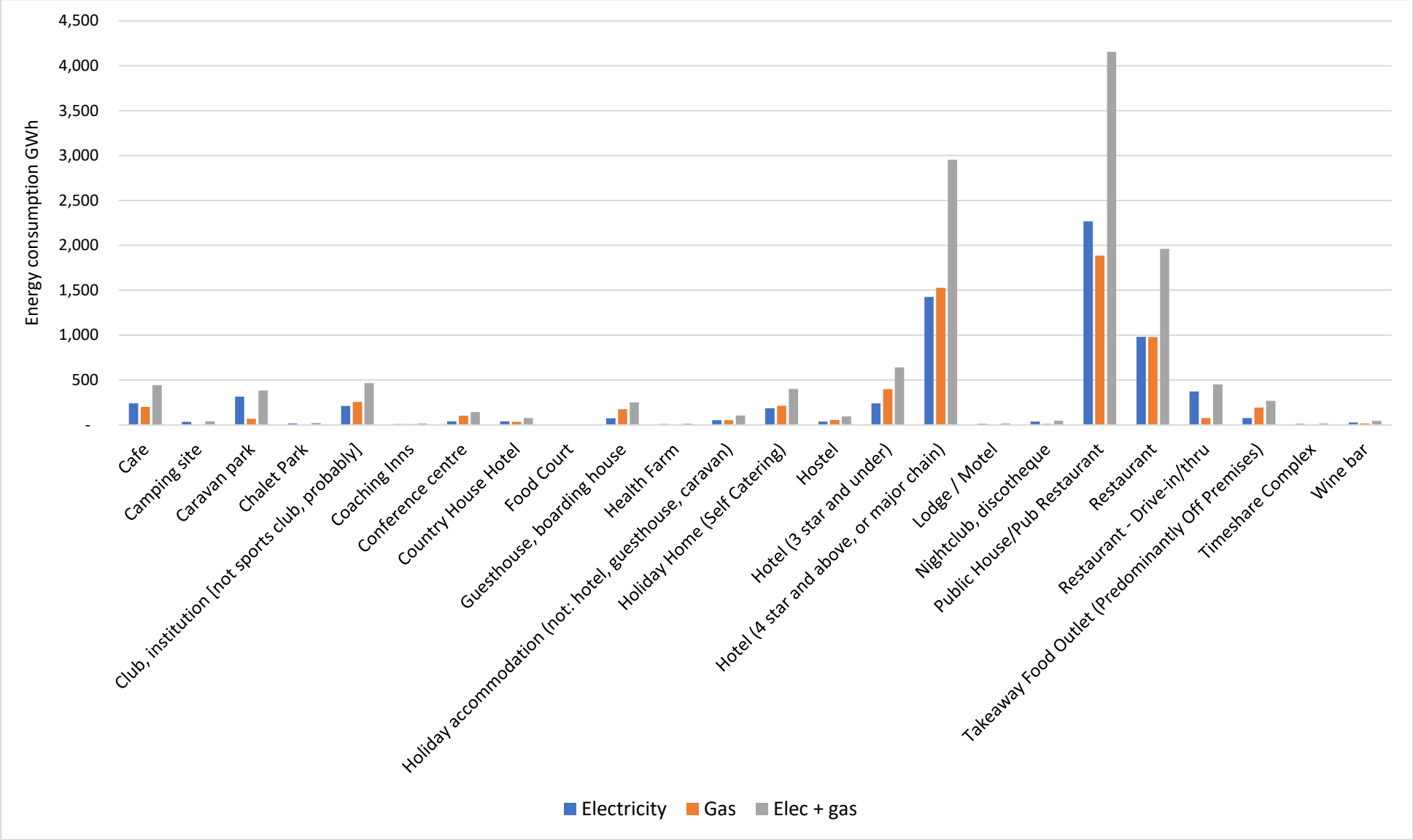
The same data are shown in Figure 21 but aggregated into the five survey sub-sector groups. This shows that 'Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club' have the largest total energy consumption (4,735 GWh) followed by 'Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)' (4,046 GWh). 'Cafes/restaurants & Takeaways' represents 3,130 GWh of total energy.

The 'Self-catering' group, (despite having the largest number of premises (68,418) in Hospitality) represents a much lower total energy consumption than the three largest groups with 931 GWh total energy.

Figure 21 Energy consumption, by energy type and sub-sector group (Hospitality), 2019
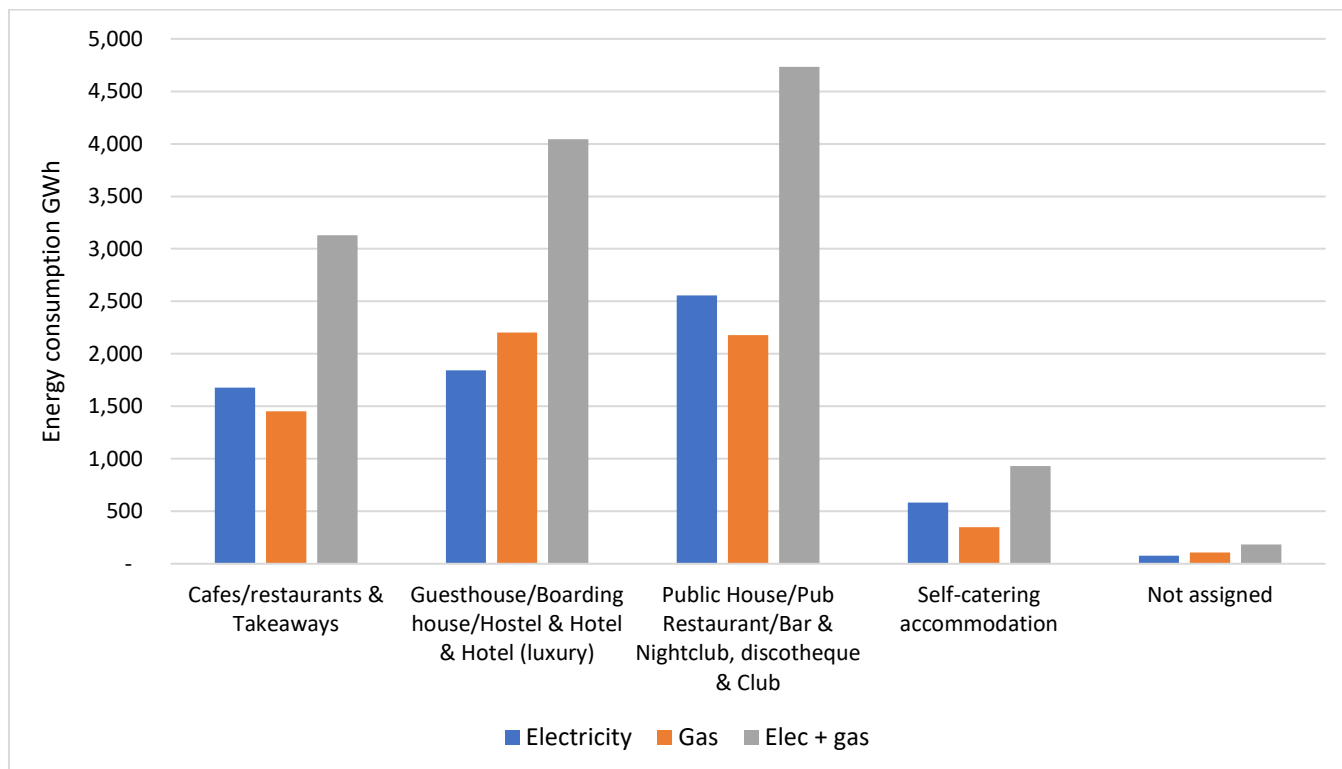
Distribution of total energy intensity by sub-activity

Energy use intensity (EUI) is reported as energy use per m² of GIA floor area *per year* (kWh/m²). This indicator allows comparison between premises and sectors even when they are of different sizes. EUI calculations need floorspace as well as energy data. For Hospitality, using the model floorspace described in the Floorspace selection section means that EUIs for sub-activities like Public House and Hotels are more likely to give realistic estimates than when VOA floor area is used.

The results for total (electricity and gas) energy are shown in Figure 22. These show that the top three median total energy use figures are:
- Restaurant - Drive-in/thru (863 kWh/m²)
- Takeaway Food Outlet (Predominantly Off Premises) (764 kWh/m²)
- Food Court (617 kWh/m²)

Figure 22 Distribution of total energy intensity (per year), by CaRB3 activity (Hospitality), 2019
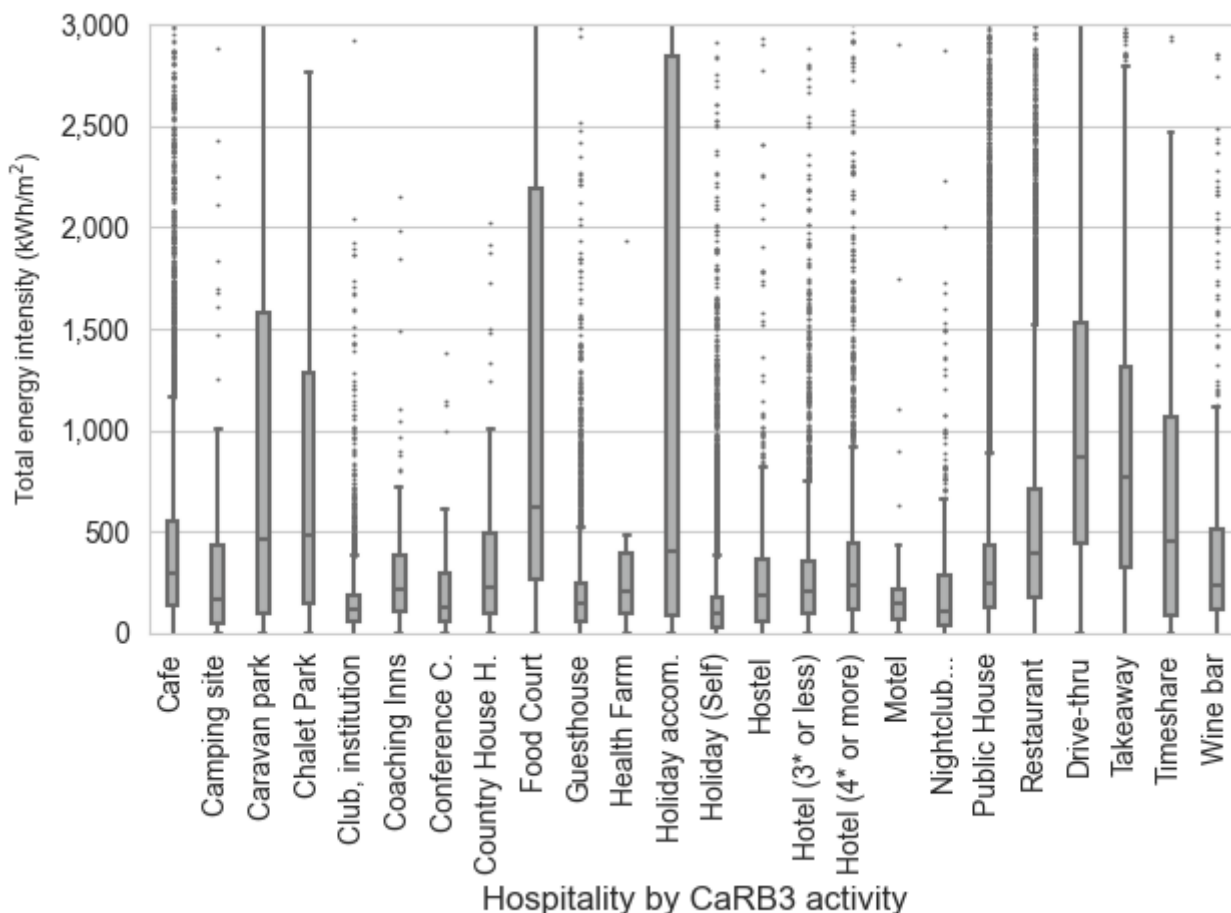
When these different CaRB3 activities are grouped into the sub-sector groups, described in Table 4, then the results of the same query are shown in Figure 23. 'Cafes/restaurants & Takeaways' have the largest median total energy EUI of 396 kWh/m² whilst 'Self-catering accommodation' has a median EUI of 98 kWh/m², the lowest.

For a discussion of the differences found between calculating the total EUI using the model output floor areas, versus areas derived from only VOA data, for each CaRB3 activity, please see Annex 1 Calculating energy use intensities without using modelled floor areas.

Figure 23 Distribution of total energy intensity (per year), by sub-sector group (Hospitality), 2019
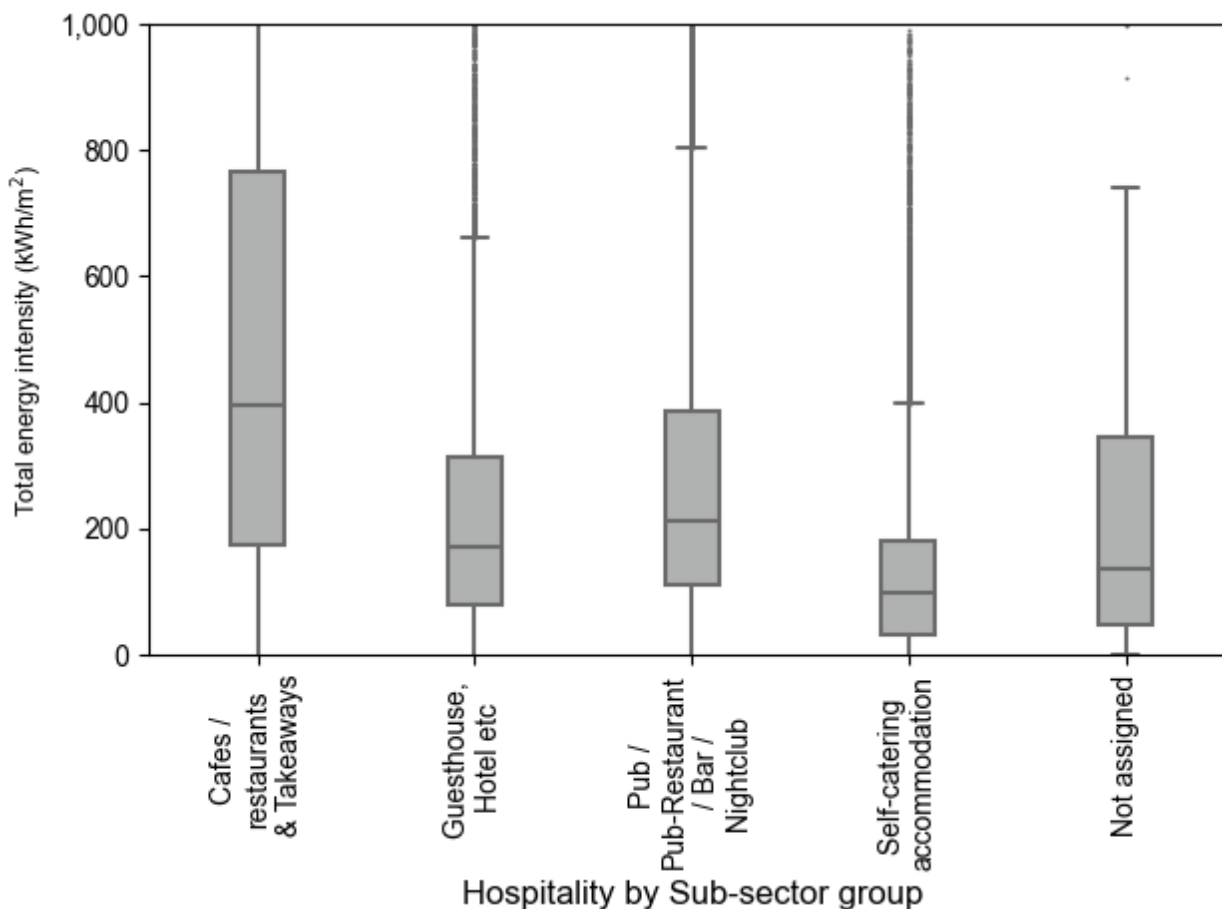
Distribution of electrical energy intensity by activity, (premises that have non-electrical end uses)

The electrical energy use intensity (EUI) is shown, for both CaRB3 activity and the sub-sector groups in Figure 24 and Figure 25, for premises that also use non-electrical energy. This is determined by establishing whether the premises also have a connection to a gas meter, or if there is another fuel listed in the VOA data for the premises (other than electricity). The top three median EUI values for CaRB3 activity are:

- Restaurant - Drive-in/thru (897 kWh/m²)

- Food Court (596 kWh/m²)

- Chalet Park (477 kWh/m²)

Figure 24 Distribution of electrical energy intensity (per year) by CaRB3 activity (Hospitality), for premises that have non-electrical end uses, 2019
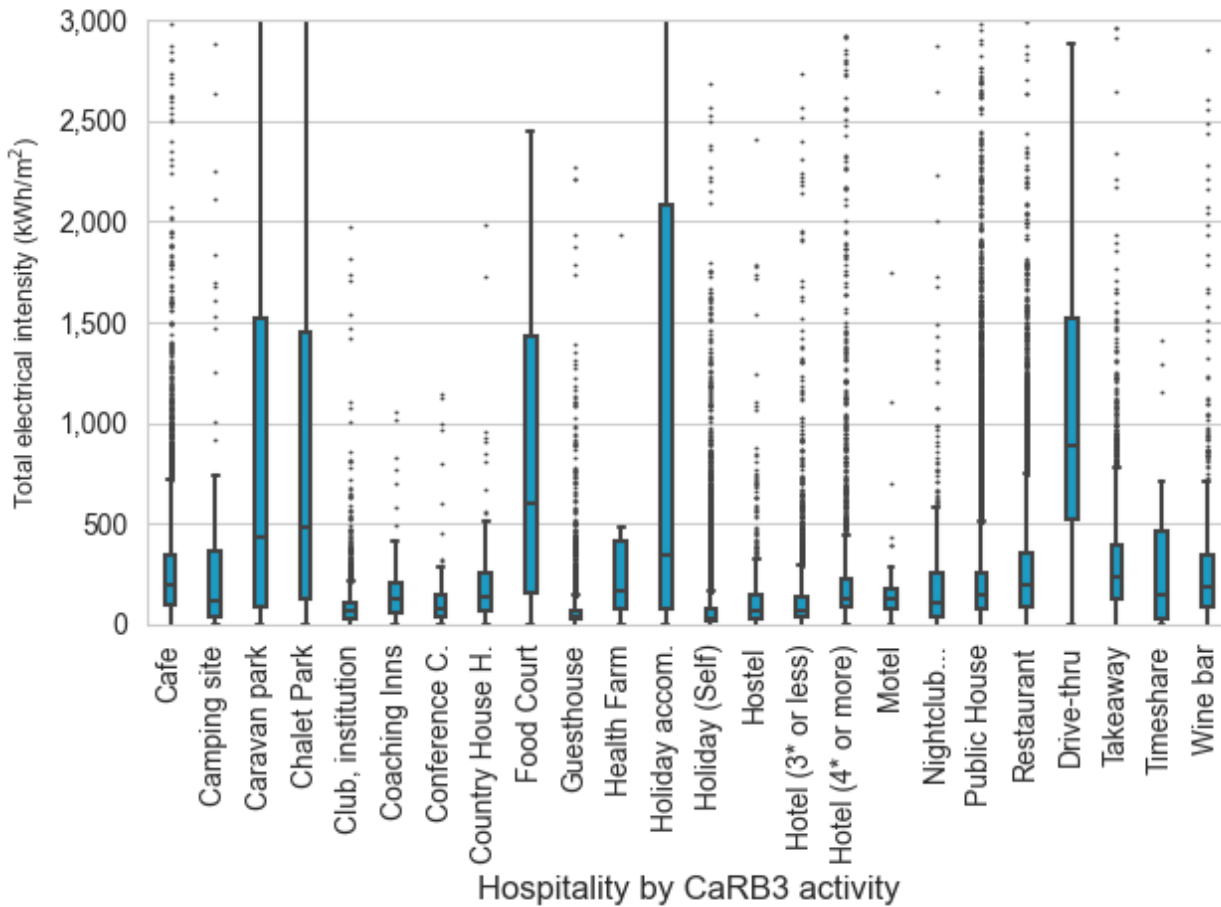
For Figure 25, the largest median EUI is 208 kWh/m² for 'Cafes/restaurants & Takeaways' followed by 127 kWh/m² for 'Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club'.

Figure 25 Distribution of electrical energy intensity (per year) by sub-sector group (Hospitality), for premises that have non-electrical end uses, 2019
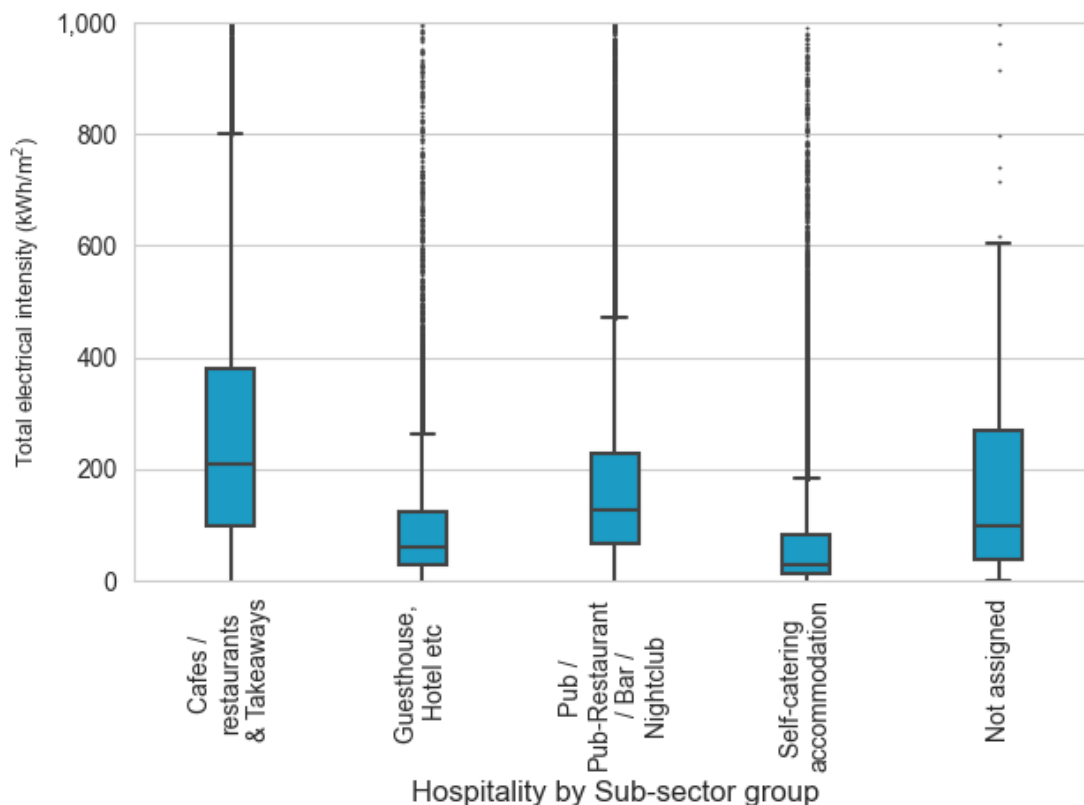
Distribution of electrical energy intensity by activity, (all-electric premises only)

The data in Figure 26 and Figure 27 are very similar to the data shown in Figure 24 and Figure 25, except the premises selected have no gas meter and no other fuel listed in the VOA data. This method is used to establish that they use electricity as their only fuel. For the CaRB3 activities the top three median electrical EUIs are:

- Food Court (880 kWh/m²)

- Restaurant – Drive-in/thru (868 kWh/m²)

- Chalet Park (455 kWh/m²)

The highest EUI median value when aggregated to the sub-sector groups is for 'Cafes/restaurants & Takeaways' (230 kWh/m²), followed by 'Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club' (136 kWh/m²).

Figure 26 Distribution of electrical energy intensity (per year) by CaRB3 activity (Hospitality), for all-electric premises only, 2019
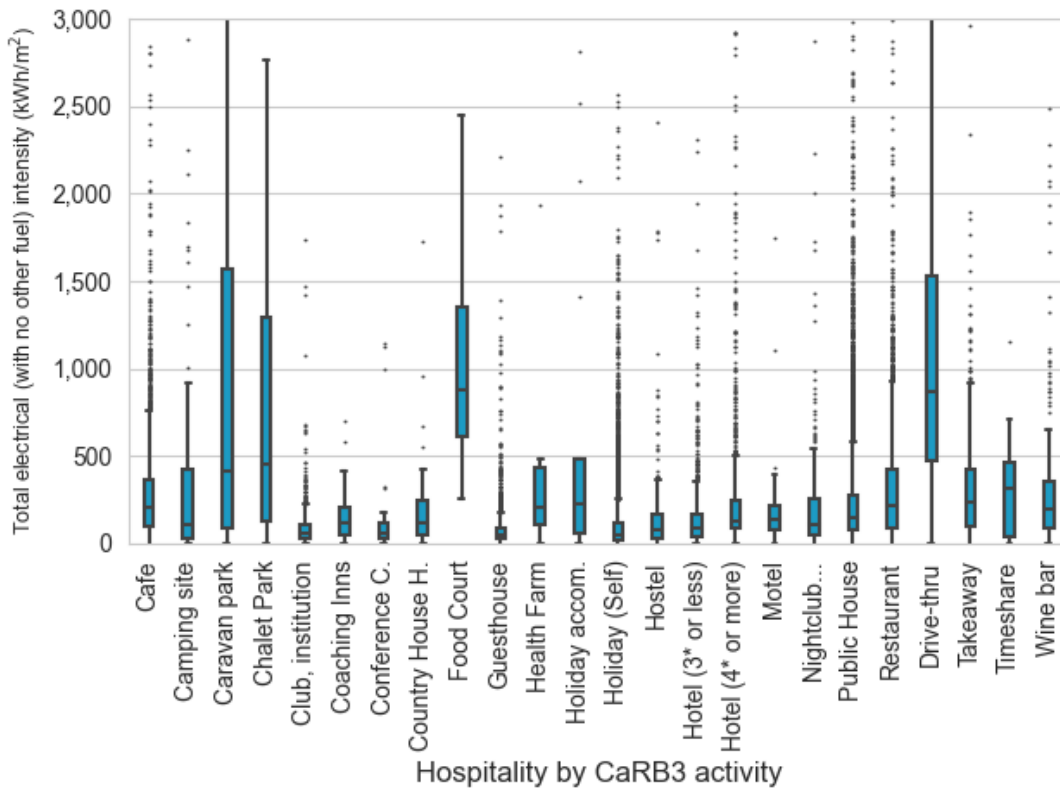
Figure 27 Distribution of electrical energy intensity (per year) by sub-sector group (Hospitality), for all-electric premises only, 2019
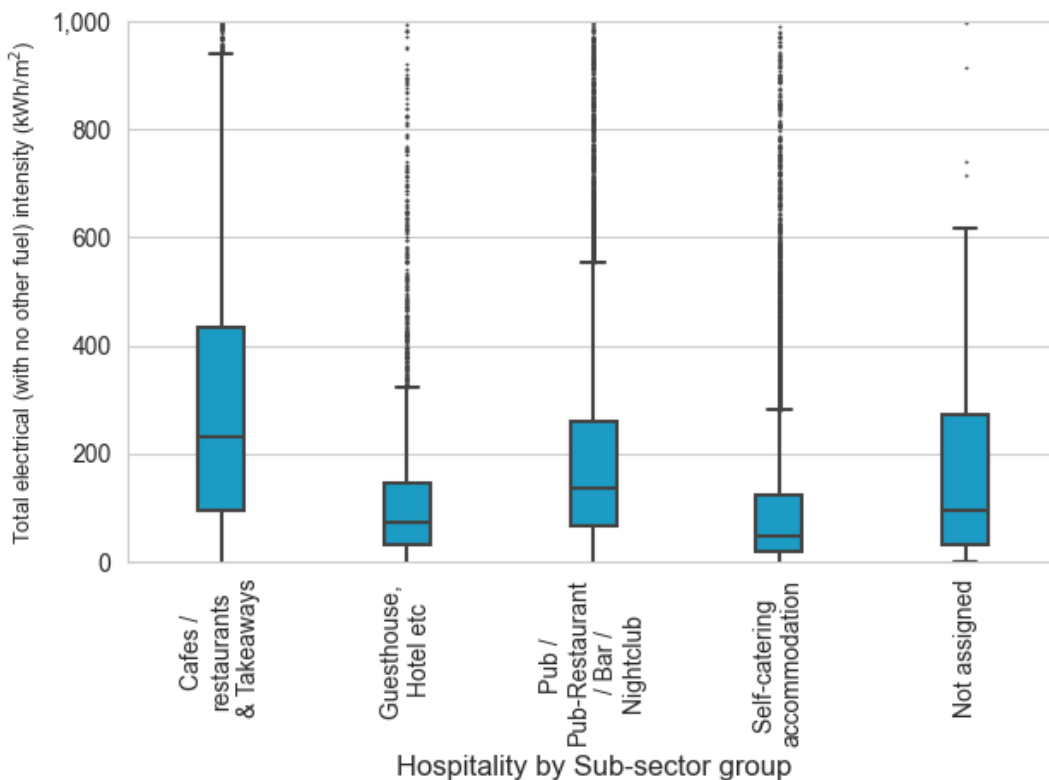
Distribution of non-electrical energy intensity by activity

Figure 28 and Figure 29 show the EUI of gas use across the CaRB3 activities and survey sub-sector groups. The median values tend to be larger than for the electrical energy EUIs already discussed. For example, from Figure 28:

- Café 212 kWh/m² median gas EUI versus 209 kWh/m² (median electrical for all-electric premises)

- Public House/Pub Restaurant 164 kWh/m² median gas EUI versus 150 kWh/m² (median electrical for all-electric premises)

- Restaurant 308 kWh/m² median gas EUI versus 219 kWh/m² (median electrical for all-electric premises)

Figure 28 Distribution of non-electrical energy intensity (per year), by CaRB3 activity (Hospitality), 2019
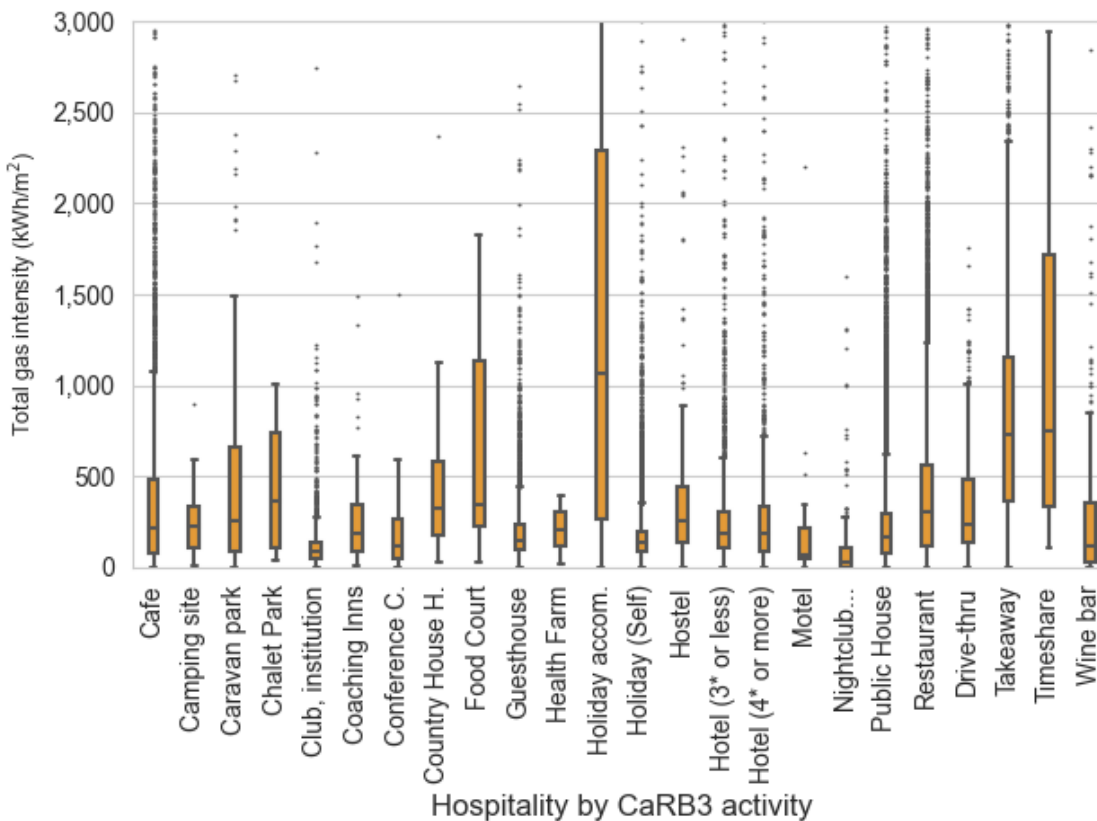
Figure 29 Distribution of non-electrical energy intensity (per year) by sub-sector group (Hospitality), 2019
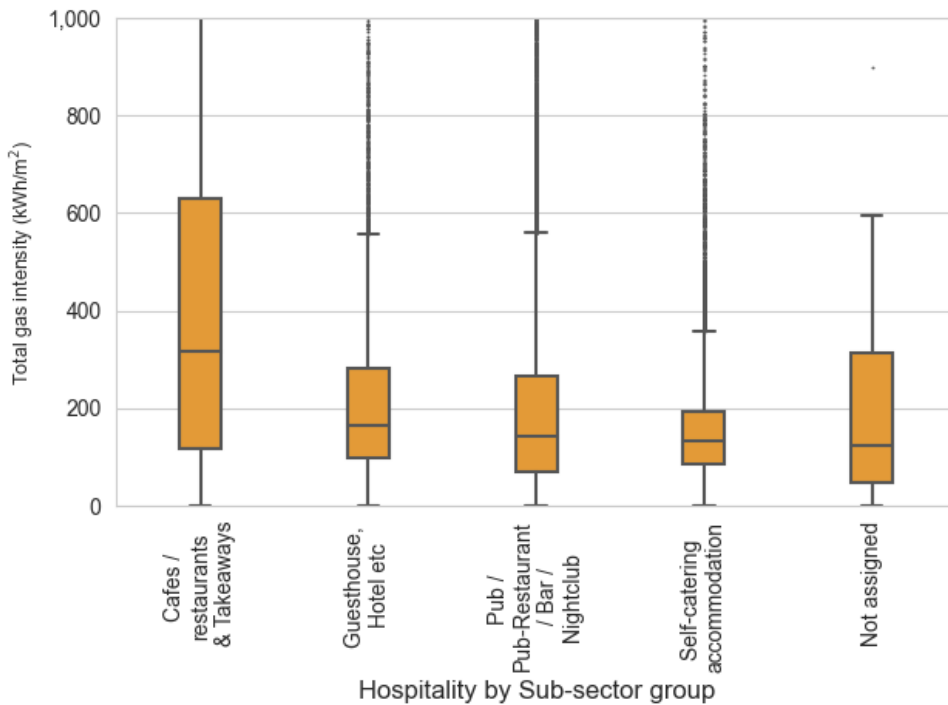
Total energy intensity by floor area banding

Floor area banding has been used to examine total energy use intensity (EUI) in Hospitality and is shown in Figure 30. This shows that there is relatively little variation in median EUI across the different floor area bands.

Figure 30 Total energy intensity (per year) by floor area (m²) banding, 2019
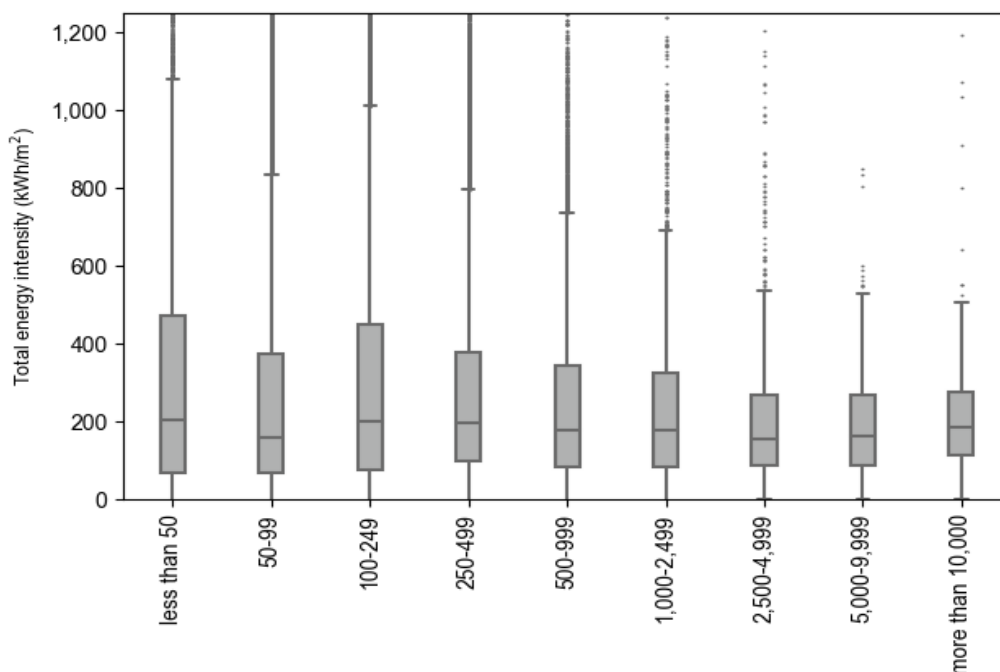
Total energy intensity by rurality

The ONS rural and urban classification of Output Areas has been incorporated into the model to enable the location of premises to be analysed according to this classification. Data on the location of the premises were linked to the output areas to achieve this. Using this method, it is possible to aggregate the sub-sector groups in Hospitality by those that are in urban locations and those which are in rural locations. This is shown for total energy use intensity in Figure 31 where the letter '(U)' represents urban and the letter '(R)' represents rural premises. It can be seen that for all of the sub-sector groups, urban premises had a higher median total energy EUI than rural premises in the same sub-sector group. For example:

- 'Cafes/restaurants & Takeaways'

    o Urban location: 409 kWh/m² (median total energy EUI)

    o Rural location: 315 kWh/m² (median total energy EUI)

- 'Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)'

    o Urban location: 182 kWh/m² (median total energy EUI)

    o Rural location: 147 kWh/m² (median total energy EUI)

- 'Pub / Pub-Restaurant / Bar / Nightclub'

    o Urban location: 219 kWh/m² (median total energy EUI)

    o Rural location: 198 kWh/m² (median total energy EUI)

- 'Self-catering accommodation'

    o Urban location: 121 kWh/m² (median total energy EUI)

    o Rural location: 87 kWh/m² (median total energy EUI)

Figure 31 Total energy intensity (per year) by sub-sector group split into 'Urban' (U) and 'Rural' (R), 2019
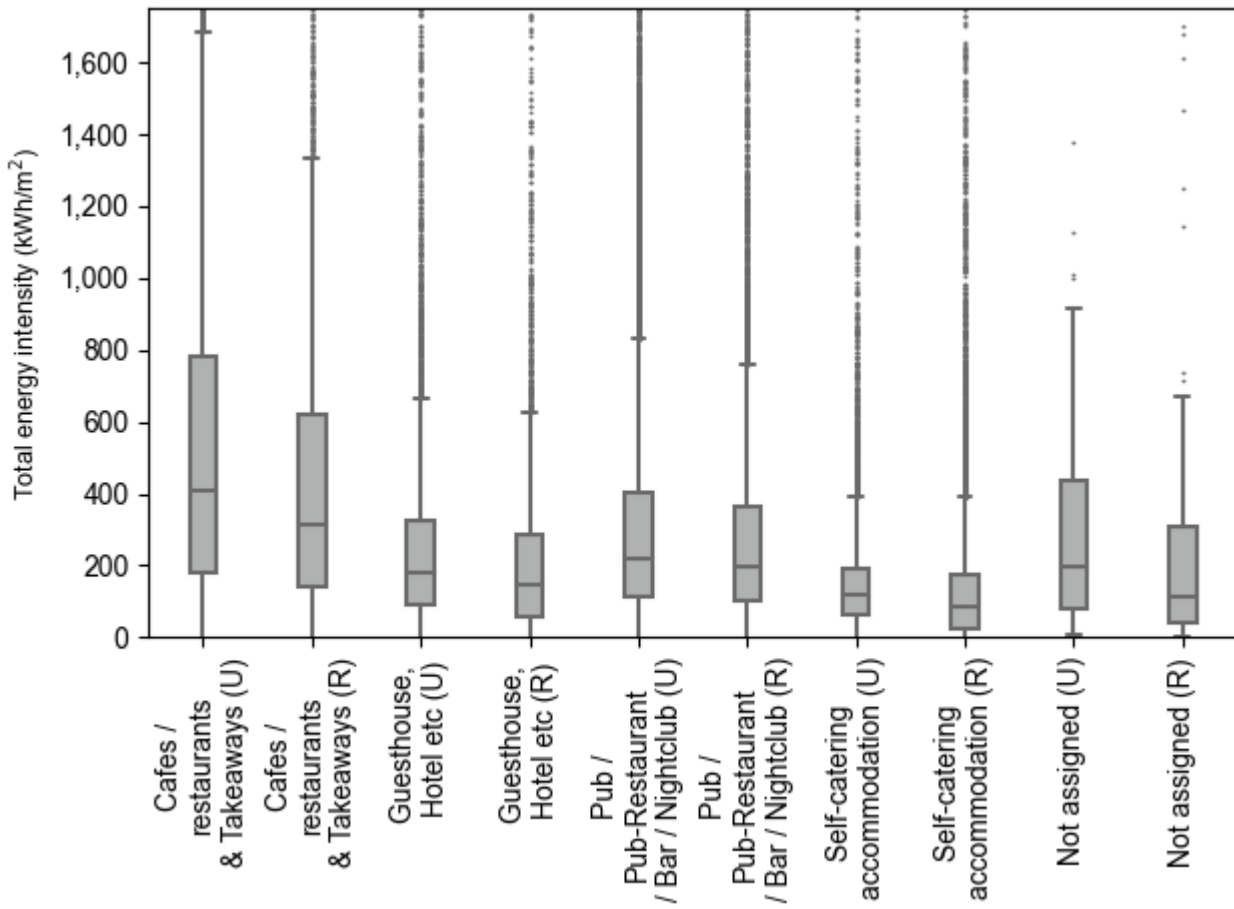
Detailed Energy Performance (EPC) data

Using the detailed non-domestic EPC data, it is possible to explore a greater number of parameters than are available via the public release of non-domestic EPC data. These include a range of different variables, covering many characteristics of the individual premises. Note that whilst these analyses are reported here as 'energy consumption' they are modelled via the EPC data and should be seen as distinct from the energy meter data detailed in Part 2 of this report.

Note that, because not all premises have an EPC, the analyses presented here may not be perfectly representative of the whole stock of each CaRB3 Hospitality activity or survey subsector. This is a constraint of the EPC data, resulting from the fact that an EPC has only been *required* for new buildings/premises constructed since 2008, or for premises that have been sold, or newly-rented since that year (although there are a number of other triggers for a non-domestic EPC).

In addition, the CaRB3 activity 'Holiday Home (self-catering)' may be under-represented in the following analyses, as these premises more usually link[9] to domestic EPCs than non-domestic EPCs and the level of (detailed) analysis shown is not possible using domestic EPC data.

Energy consumption by end use breakdowns, by sector (Hospitality)

Within the detailed EPCs[10], a range of different energy consumption values (usually in kWh/m²) are available for the Hospitality premises which link to these non-domestic EPCs. These include kWh/m² values for:
- Building energy demand for heating – calculated by considering
    - building characteristics for the heat transfer by transmission
    - building characteristics for the heat transfer by ventilation
    - heat gains from internal heat sources and solar heat sources
    - the gain utilisation factor for heating
- Building energy demand for cooling – calculated by considering
    - building characteristics for the heat transfer by transmission
    - building characteristics for the heat transfer by ventilation
    - heat gains from internal heat sources and solar heat sources
    - the loss utilisation factor for cooling
- Auxiliary - the product of the auxiliary power density and annual hours of operation of the HVAC system from the NCM Activity Database (e.g., the hours when the heating set-point is above the set-back temperature based on the daily/weekly/annual schedules

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[9] See Figure 6 for the proportions of domestic EPCs linking to Hospitality
[10] iSBEM User Guide v5.6.b https://www.uk-ncm.org.uk/page.jsp?id=13

from the NCM Activity Database). Auxiliary power density is calculated as the sum of the pump and fan power density

- Lighting - calculated according to CEN EN 15193-1. Inputs to this calculation include lighting power, duration of operation including the impact of occupancy, and terms to deal with the contribution of daylight under different control regimes.

- Equipment – equipment energy demand is included in EPC calculations in order to account for heat gain from equipment. It is excluded from the electricity supply calculation as it is deemed to be an occupant rather than building characteristic.

By matching these EPC records to Hospitality premises, it is possible to aggregate these results by both CaRB3 activity and the sub-sector group as is shown in the figures below. A link to an EPC does not guarantee that a variable will have a value for all of the above data; for example, not all Cafés have cooling.

Heating Energy Demand

Figure 32 and Figure 33 show the EPC predicted EUIs for heating energy demand aggregated by CaRB3 activity (Figure 32) and by sub-sector group (Figure 33). The same approach has been followed for the subsequent figures in this section. The analyses shown at the CaRB3 activity level give more granularity and show, for example, that 'Public House/Pub Restaurant' has a much higher median EUI of 209 kWh/m² compared to 'Nightclub, discotheque' (73 kWh/m²); but, when these activities are aggregated in the sub-sector group data the 'Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club' group has a median EUI of 206 kWh/m² for all of these CaRB3 activities combined, which is somewhat masking the diversity.

There are some notable differences in the median EUIs at the sub-sector group level, in particular, with Cafés/restaurants & Takeaways having much lower EUIs for heating than the other categories:

- 'Cafés/restaurants & Takeaways' (116 kWh/m²)

- 'Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)' (193 kWh/m²)

- 'Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club' (206 kWh/m²)

- 'Self-catering accommodation' (160 kWh/m²)

Figure 32 Heating energy demand by CaRB3 activity
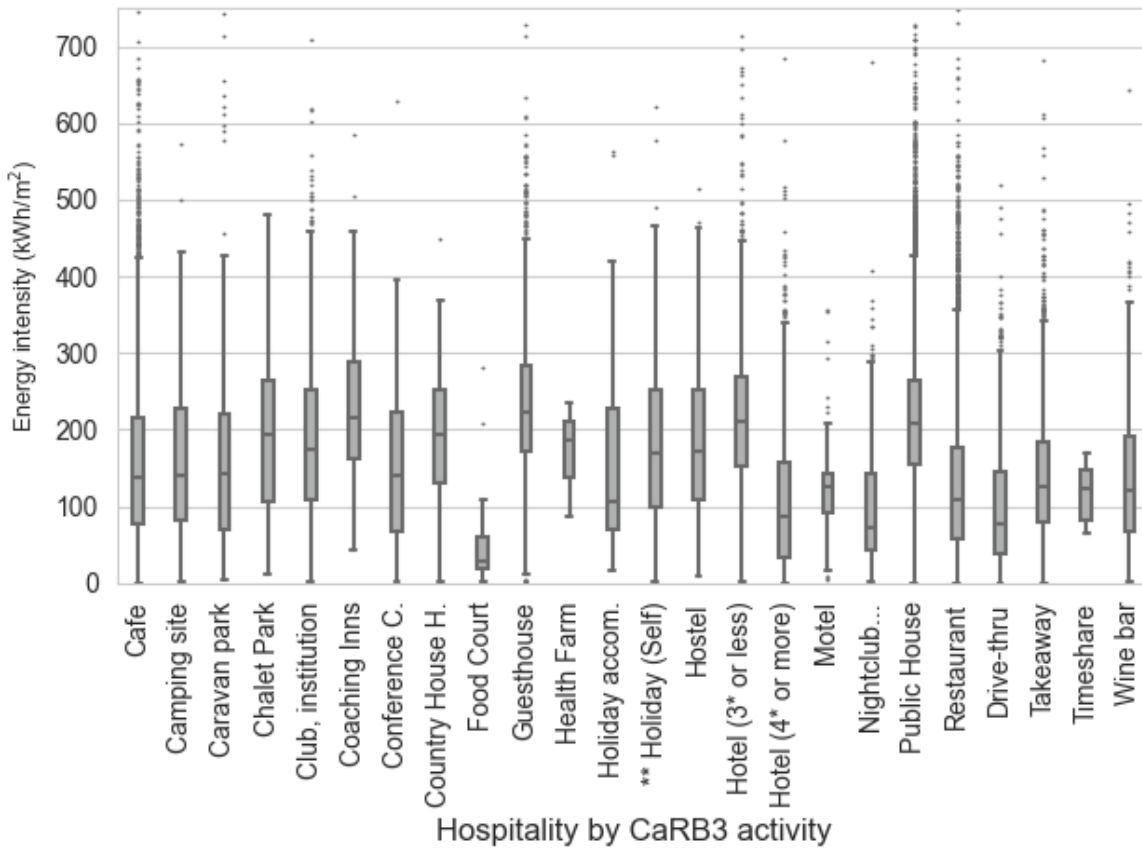
Figure 33 Heating energy demand by sub-sector group
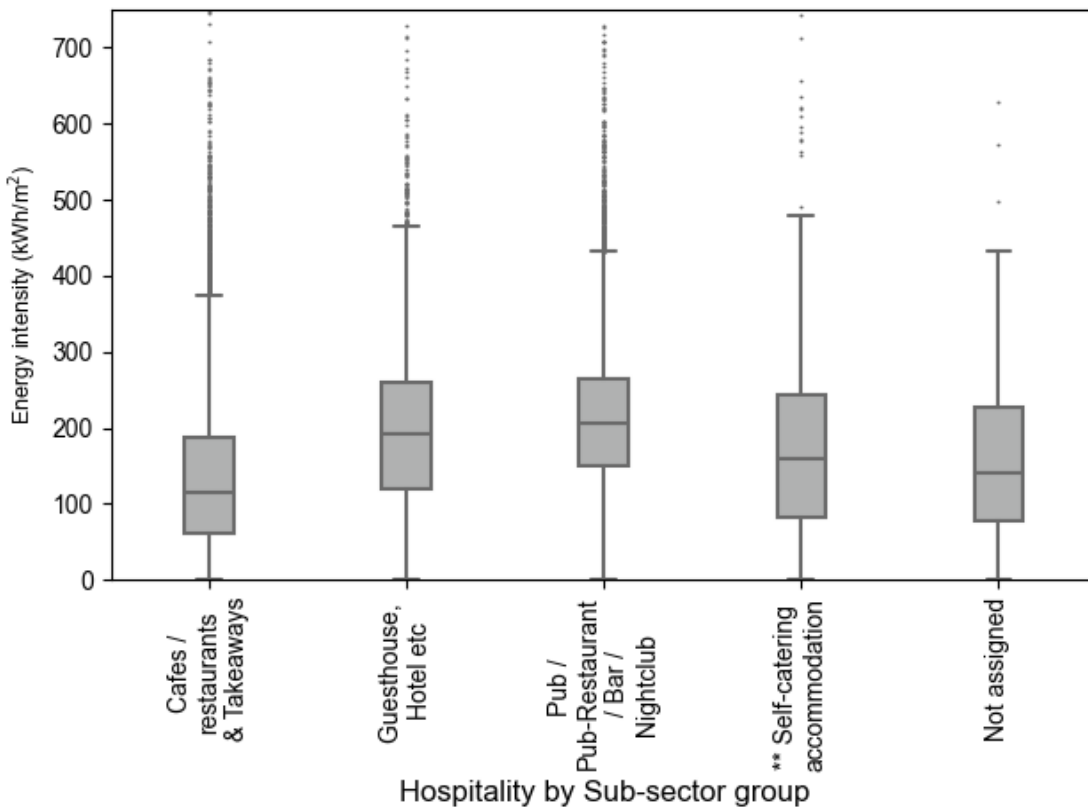
Cooling Energy Demand
Figure 34 Cooling energy demand by CaRB3 activity
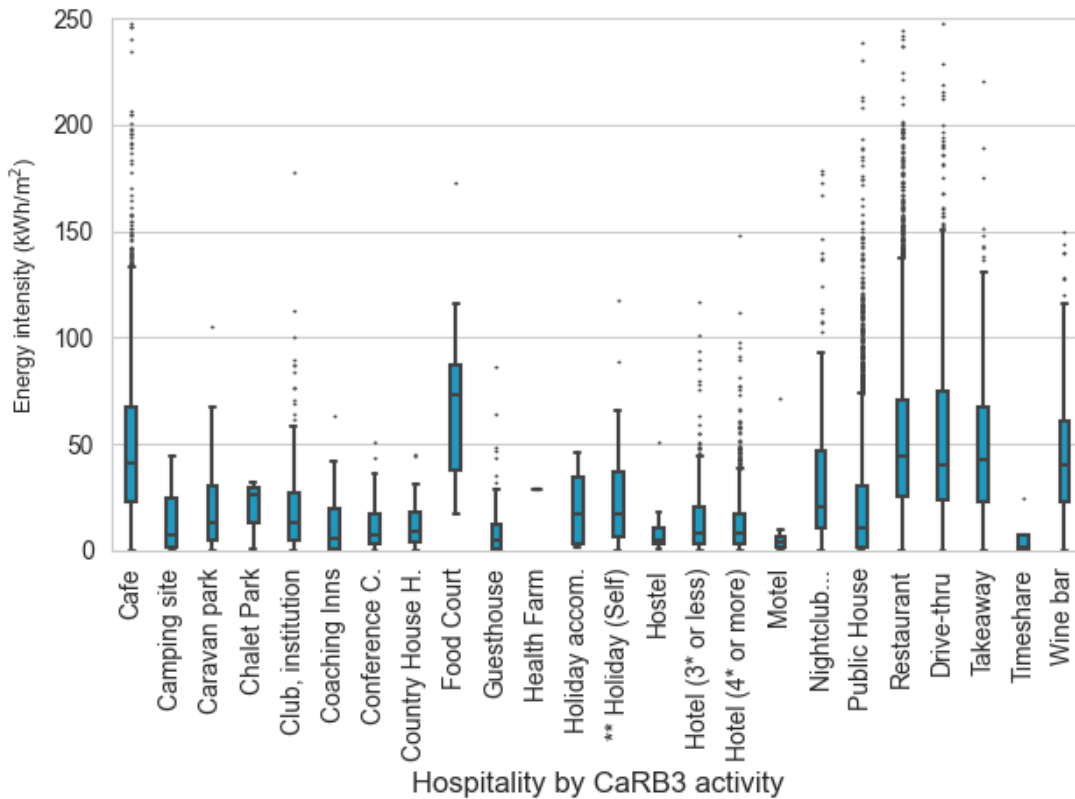
The EPC variable for cooling energy demand is shown in Figure 34 and Figure 35. These energy use intensities suggest that premises where food preparation is an important part of the activity have higher demand for cooling, with the highest median EUIs being for:

- Food court (73 kWh/m²)

- Restaurant (45 kWh/m²)

- Takeaway Food Outlet (Predominantly Off Premises) (43 kWh/m²)

- Café (41 kWh/m²)

Figure 35 Cooling energy demand by sub-sector group
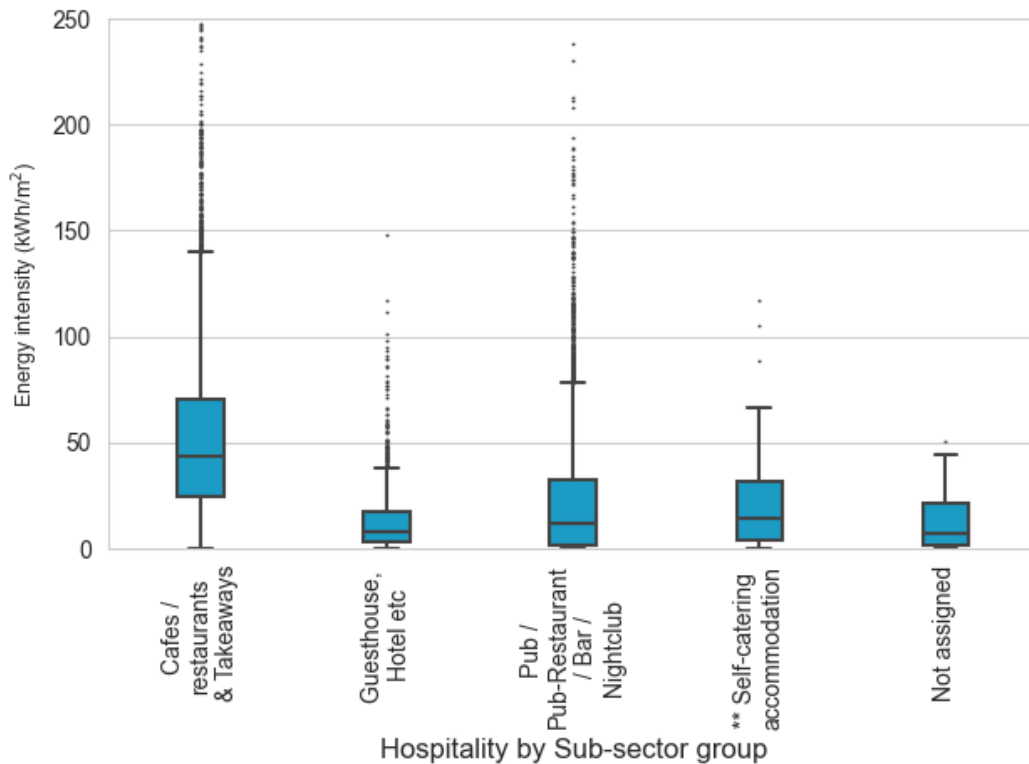
Auxiliary Energy Demand

The EPC variable for auxiliary energy demand is shown in Figure 36 and Figure 37. The largest median energy use intensities are for:

- Food court (89 kWh/m²)

- Restaurant - Drive-in/thru (81 kWh/m²)

- Lodge / Motel (32 kWh/m²)

- Takeaway Food Outlet (Predominantly Off Premises) (32 kWh/m²)

Figure 36 Auxiliary energy demand by CaRB3 activity
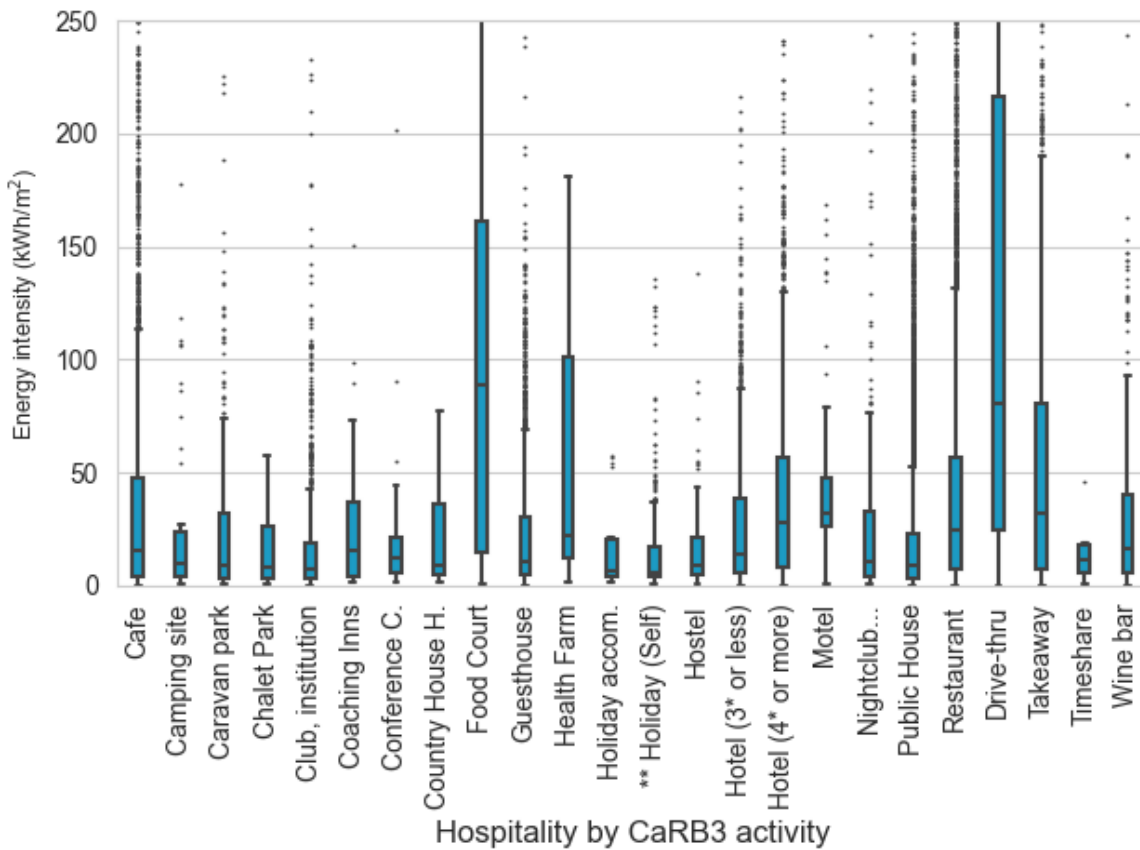
Figure 37 Auxiliary energy demand by sub-sector group
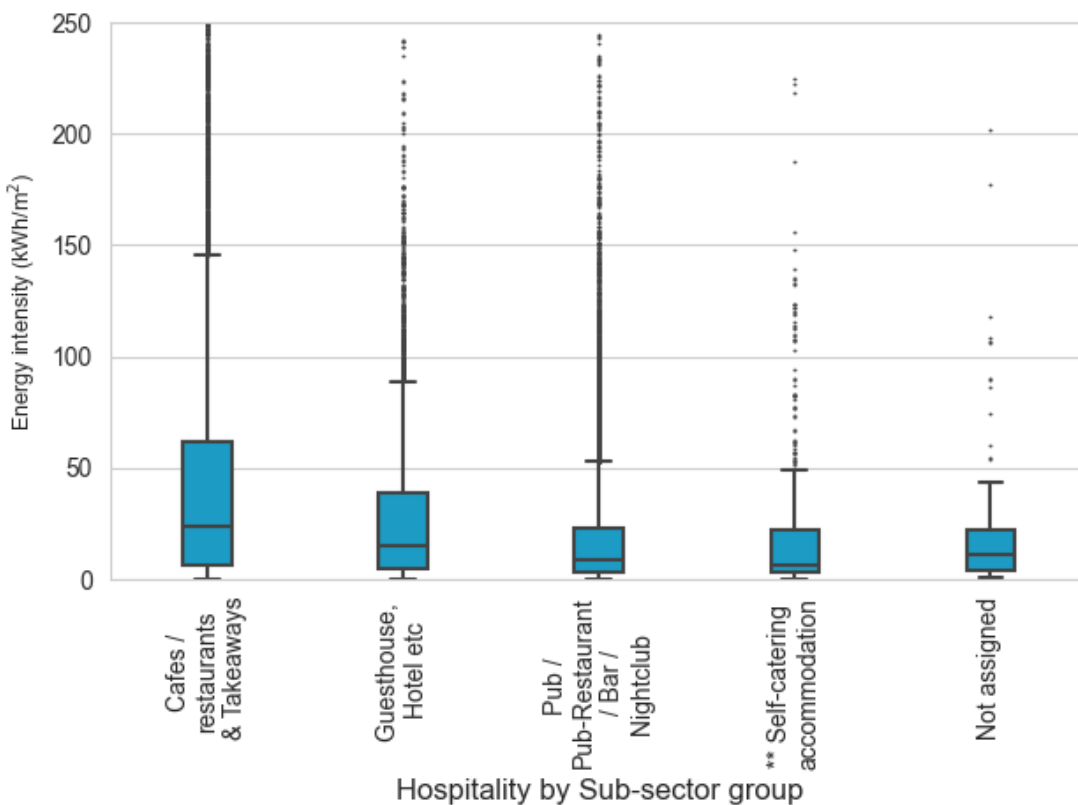
Lighting Energy Demand

The EPC data for lighting energy demand are analysed in Figure 38 and Figure 39. The median EUIs show a large amount of variation across the different CaRB3 activities. The largest median EUIs are for:

- Wine bar (110 kWh/m²)

- Takeaway Food Outlet (Predominantly Off Premises) (107 kWh/m²)

- Restaurant (105 kWh/m²)

- Food Court (103 kWh/m²)

- Café (103 kWh/m²)

- Public House/Pub Restaurant (88 kWh/m²)

Figure 38 Lighting energy demand, by CaRB3 activity
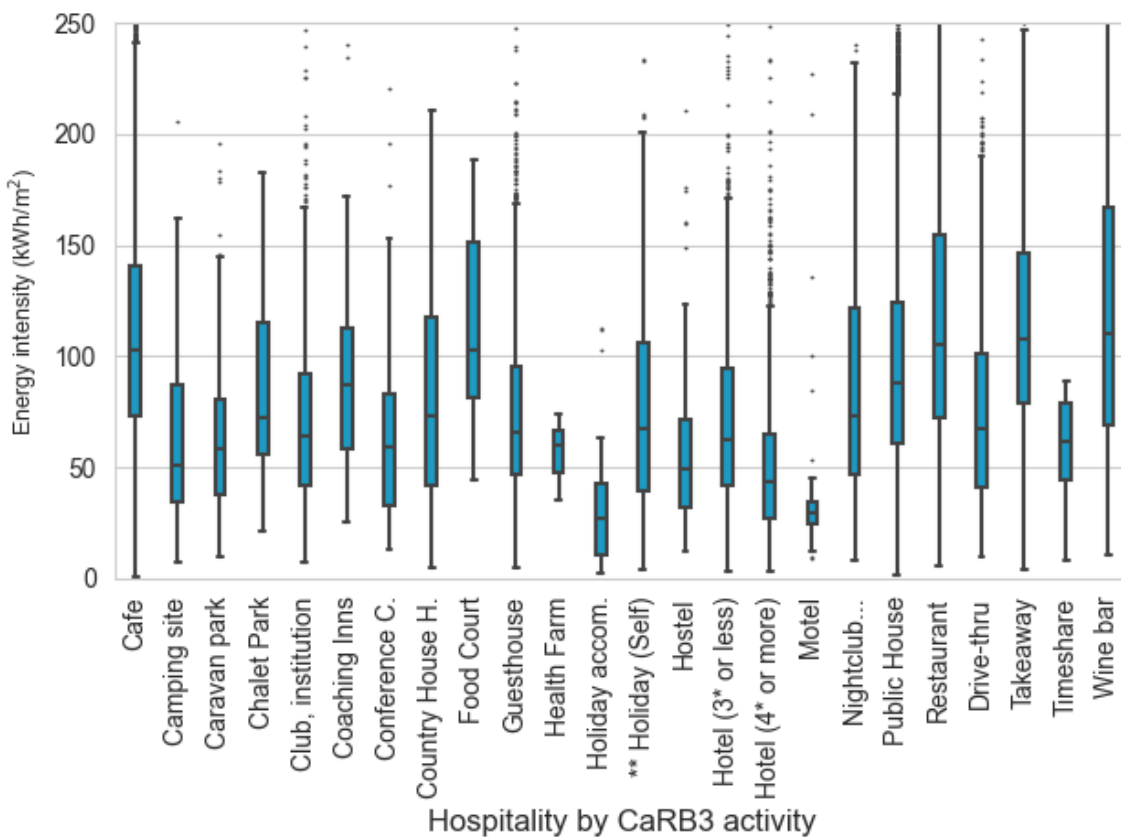
Figure 39 Lighting energy demand by sub-sector group
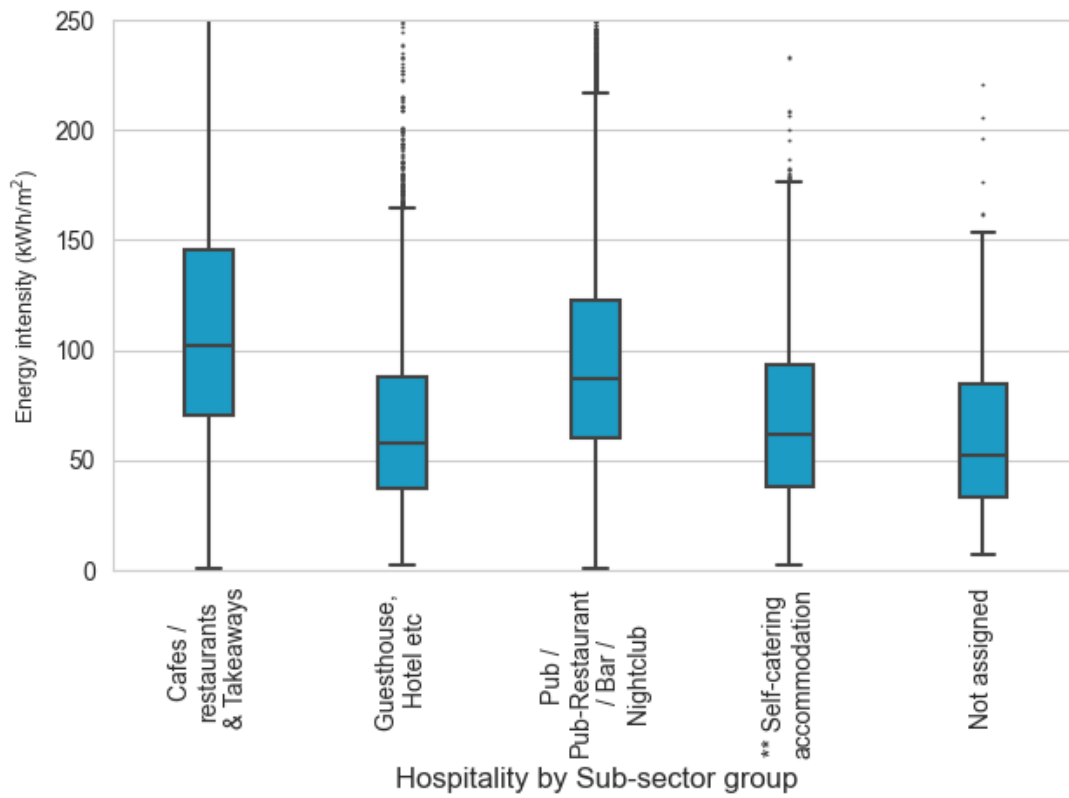
Equipment

The EPC data for 'Equipment' is shown in Figure 40 and Figure 41. The median EUI varies between different activities with the highest median EUIs being:

- Food Court (134 kWh/m²)

- Restaurant - Drive-in/thru (124 kWh/m²)

- Restaurant (106 kWh/m²)

- Café (103 kWh/m²)

- Takeaway Food Outlet (Predominantly Off Premises) (103 kWh/m²)

- Wine bar (91 kWh/m²)

Figure 40 Equipment by CaRB3 activity
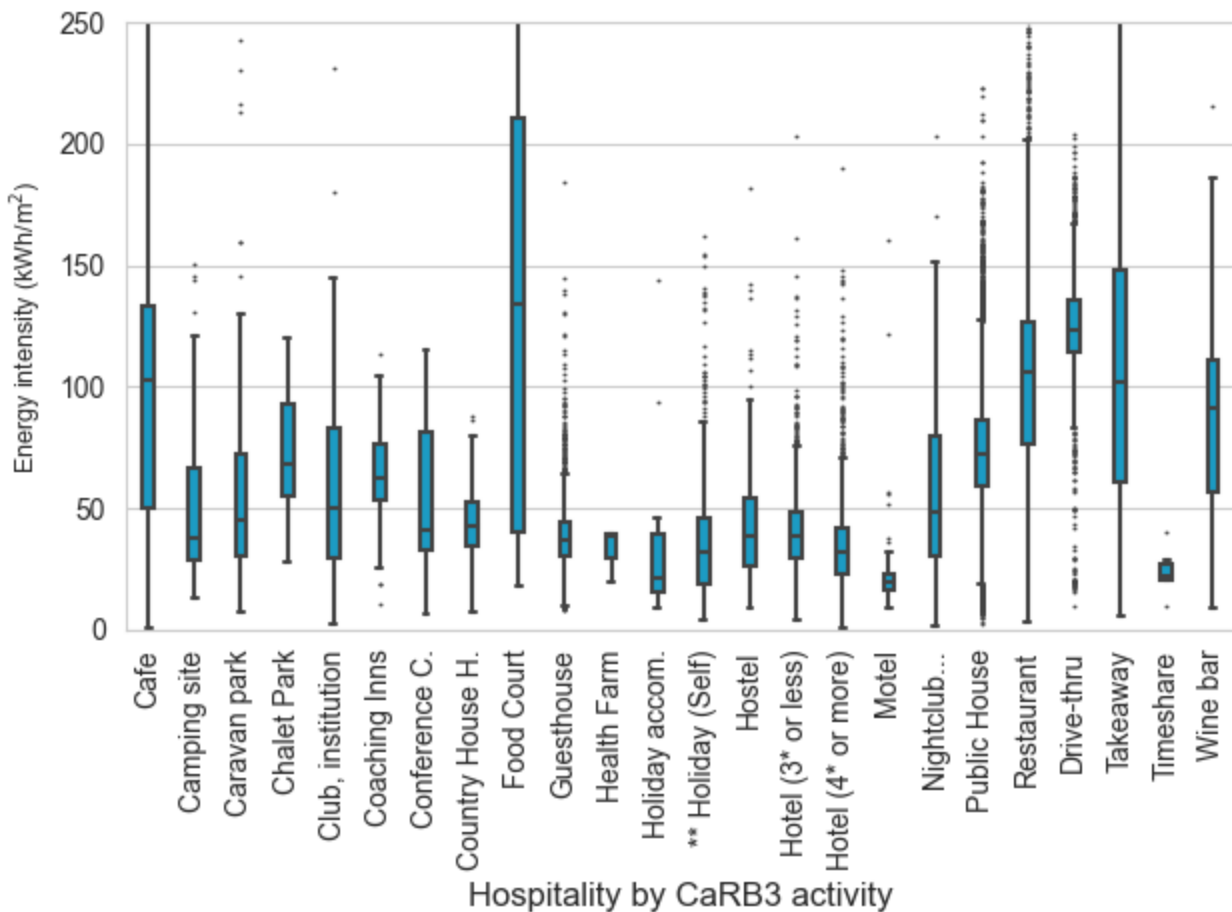
Figure 41 Equipment by sub-sector group
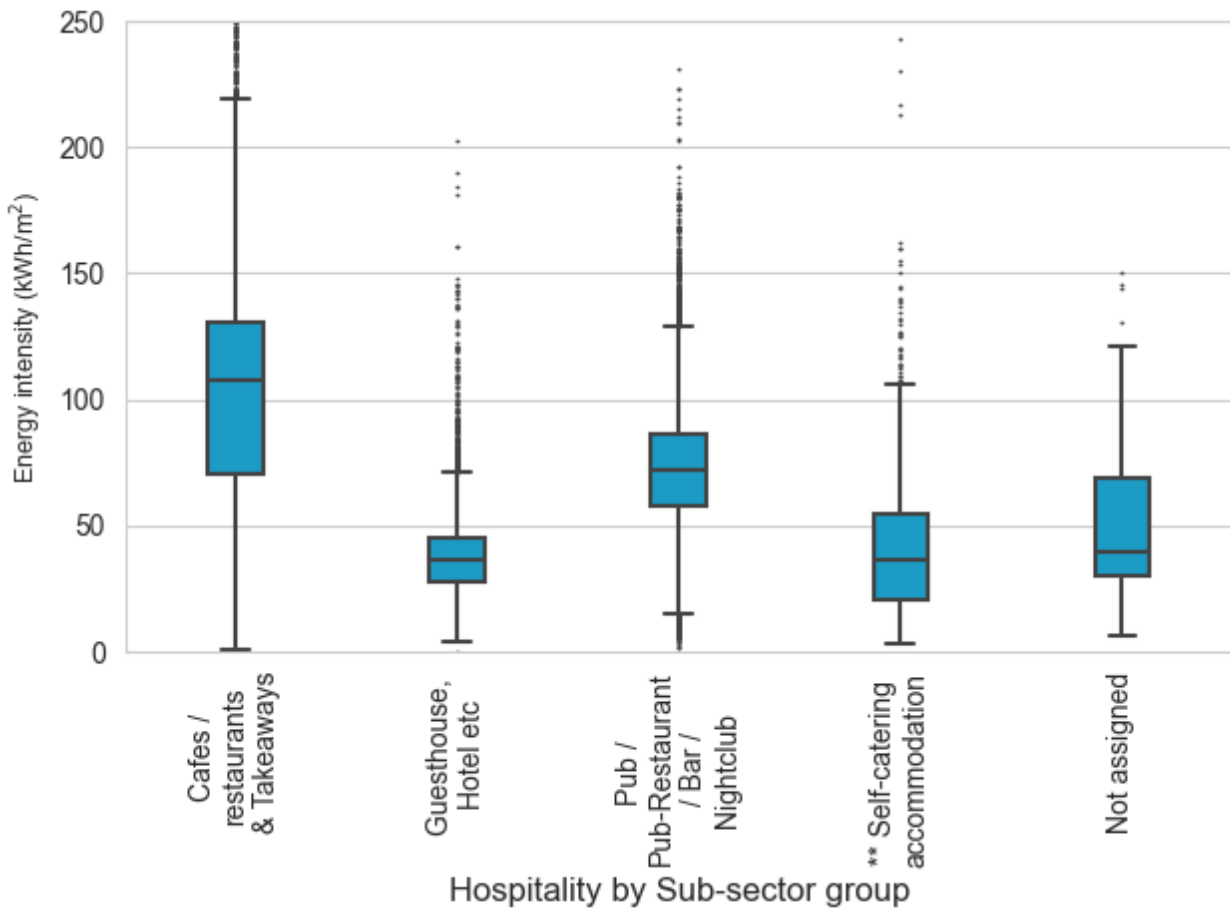
Mean energy intensity by end use breakdowns by activity (Hospitality)

The EPC data have been queried to produce the mean and median energy intensity by end use breakdowns, by sector, as shown in Table 6 and Table 7.

Table 6 Average and Median EPC EUIs for the different CaRB3 activities (kWh/m²)

CaRB3 activity	Avg Heating	Median Heating	Avg cooling	Median cooling	Avg Auxiliary	Median Auxiliary	Avg Heating	Median Heating	Avg cooling	Median cooling	Avg Auxiliary	Median Auxiliary	Avg Heating	Median Heating
Cafe	160	138	52	41	38	15	117	103	95	103	201	167	286	253
Camping site	175	140	15	7	32	9	63	51	53	37	609	411	324	143
Caravan park	170	143	19	13	41	9	66	58	56	45	691	222	302	144
Chalet Park	204	193	19	26	17	8	90	72	73	68	982	235	240	216
Club, institution [not sports club, probably]	188	173	20	13	19	7	73	64	56	50	256	239	157	122
Coaching Inns	232	215	13	6	25	15	92	87	64	62	326	331	170	149
Conference centre	168	140	13	7	20	12	67	59	53	41	162	168	132	105
Country House Hotel	186	194	13	9	22	9	81	73	43	43	367	390	122	119
Food Court	60	29	69	73	114	89	113	103	128	134	134	27	313	274
Guesthouse, boarding house	234	222	11	4	23	11	74	66	38	37	410	406	132	105
Health Farm	170	188	29	29	68	22	56	60	33	39	333	333	234	240
Holiday accommodation (not: hotel, guesthouse, caravan)	175	106	20	17	17	7	37	27	33	22	358	388	104	55

Non-Domestic Building Stock in England and Wales – Part 3: Hospitality

CaRB3 activity	Avg Heating	Median Heating	Avg cooling	Median cooling	Avg Auxiliary	Median Auxiliary	Avg Heating	Median Heating	Avg cooling	Median cooling	Avg Auxiliary	Median Auxiliary	Avg Heating	Median Heating
Holiday Home (Self Catering)	180	169	25	17	17	6	82	68	38	32	291	277	166	123
Hostel	191	172	9	5	17	9	59	49	46	38	329	330	121	81
Hotel (3 star and under)	233	210	14	8	27	14	70	62	40	38	410	389	140	111
Hotel (4 star and above, or major chain)	108	87	13	8	42	28	53	44	35	32	283	269	159	128
Lodge / Motel	127	125	7	4	43	32	35	30	23	20	277	271	324	326
Nightclub, discotheque	103	73	35	21	30	10	93	73	56	48	184	147	246	222
Public House/Pub Restaurant	215	209	22	11	19	9	96	88	73	72	281	272	153	134
Restaurant	130	108	53	45	44	24	119	105	100	106	185	151	271	248
Restaurant - Drive-in/thru	101	76	53	40	123	81	76	67	123	124	166	150	301	304
Takeaway Food Outlet (Predominantly Off Premises)	140	126	51	43	59	32	119	107	106	102	106	72	272	249
Timeshare Complex	117	123	7	1	15	11	57	61	24	22	305	305	200	128
Wine bar	142	122	46	40	36	16	124	110	83	91	211	189	279	253

Table 7 Average and Median EPC EUIs for the different sub-sector groups (kWh/m²)

CaRB3 Sub-sector group	Avg heating	Median heating	Avg cooling	Median cooling	Avg auxiliary	Median auxiliary	Avg lighting	Median lighting	Avg equipment	Median equipment	Avg gas	Median gas	Avg supplied	Median supplied
Cafes/restaurants & Takeaways	137	116	53	44	49	24	115	102	100	107	178	145	277	253
Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)	199	193	13	8	29	15	67	58	38	36	375	367	143	112
Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club	212	206	23	12	19	9	95	87	73	72	279	270	156	136
Self-catering accommodation	176	160	21	14	25	6	75	62	45	37	392	266	212	132
Not assigned	171	140	14	7	26	11	65	53	53	40	281	178	231	118

Heating Ventilation and Air Conditioning (HVAC) systems by sub-sector (Hospitality)

Using the EPCs linked to Hospitality premises it is possible to combine the 'Main-Heating-Fuel' field and the 'Building Environment' field to produce a composite to describe each premises. There are a number of different heating fuels listed in the EPCs, so for those less frequent examples these were aggregated into 'Other (lower carbon)' and 'Other (fossil fuel)' to reduce the number of different classifications:

- Natural Gas

- Grid Supplied Electricity

- Oil

- LPG

- Other (lower carbon):

    o Biomass

    o District Heating

    o Waste Heat

    o Grid Displaced Electricity

    o Biogas

- Other (mostly fossil fuel):

    o Dual Fuel Appliances (Mineral + Wood)

    o Coal

    o Other

    o Anthracite

    o Smokeless Fuel (inc Coke)

Floorspace for all of the EPC data for each sub-sector group was aggregated, for each combination of fuel and building environment listed above, as a percentage of all EPC floor area for the matched records. This is shown for the major combinations in Figure 42, where combinations each representing < 5% of the floor area in the sub-sector grouping has been aggregated into the category 'all other each <5%'. Table 8 provides a lookup for the abbreviations used in Figure 42 and Figure 43 and further demonstrates the diversity of service systems in the stock.

Table 8 Lookup table for abbreviations in Figure 42 and Figure 43

Chart abbreviation	HVAC description
Elec. AC	Grid Supplied Electricity : Air Conditioning
Elec. HMV	Grid Supplied Electricity : Heating and Mechanical Ventilation
Elec. HNV	Grid Supplied Electricity : Heating and Natural Ventilation
Elec. MMMV	Grid Supplied Electricity : Mixed-mode with Mechanical Ventilation
Elec. MMNV	Grid Supplied Electricity : Mixed-mode with Natural Ventilation
Elec. UNC	Grid Supplied Electricity : Unconditioned
Gas AC	Natural Gas : Air Conditioning
Gas HMV	Natural Gas : Heating and Mechanical Ventilation
Gas MMMV	Natural Gas : Mixed-mode with Mechanical Ventilation
Gas MMNV	Natural Gas : Mixed-mode with Natural Ventilation
Gas NV	Natural Gas : Heating and Natural Ventilation
LPG AC	LPG : Air Conditioning
LPG HNV	LPG : Heating and Natural Ventilation
LPG MMMV	LPG : Mixed-mode with Mechanical Ventilation
LPG MMNV	LPG : Mixed-mode with Natural Ventilation
LPG MV	LPG : Heating and Mechanical Ventilation
Oil AC	Oil : Air Conditioning
Oil HMV	Oil : Heating and Mechanical Ventilation
Oil HNV	Oil : Heating and Natural Ventilation
Oth. Fossil AC	Other (fossil fuel) :Air Conditioning
Oth. Fossil HNV	Other (fossil fuel) :Heating and Natural Ventilation
Oth. Fossil UNC	Other (fossil fuel) :Unconditioned
Oth. LowerC AC	Other (lower carbon) :Air Conditioning
Oth. LowerC HMV	Other (lower carbon) :Heating and Mechanical Ventilation
Oth. LowerC HNV	Other (lower carbon) :Heating and Natural Ventilation
Oth. LowerC MMMV	Other (lower carbon) :Mixed-mode with Mechanical Ventilation

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Figure 42 Percentage of floor area for major heating, ventilation and air conditioning (HVAC) combinations in the Hospitality sector, by survey sub-sector group.
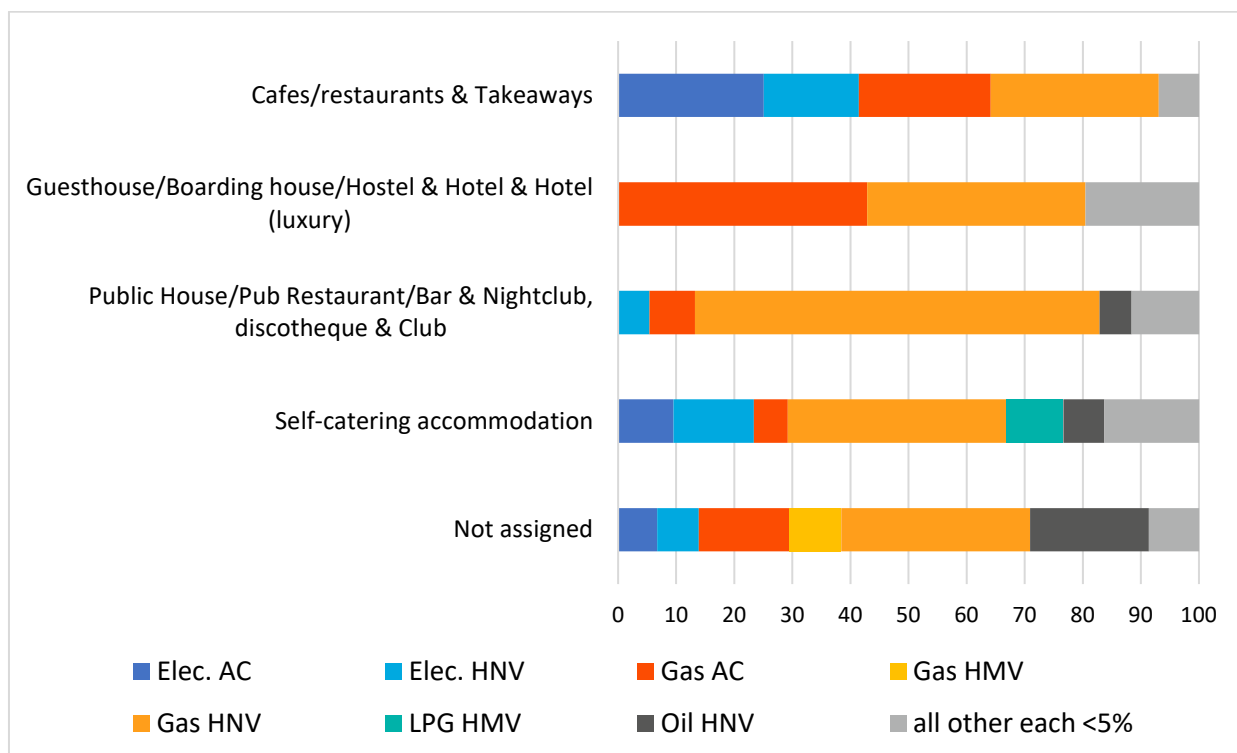
Figure 42 presents a somewhat simplified view of the various combinations of HVAC systems found in Hospitality premises, with EPCs. The figure shows that these premises are dominated by seven HVAC classifications. However, there is a considerable amount of floor area in the 'all other each <5%' classification, particularly (almost 20%) in 'Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)'. To illustrate the extent of diversity within the category 'all other each <5%', Figure 43 shows a similar analysis to unpack the category. Even this figure requires the use of yet another grouping of HVAC systems into 'all other each <1%', to enable legibility.

In combination, Figure 42 and Figure 43 indicate that, even with the aggregations described above, there is still a large number of different combinations in the Hospitality premises that have been matched to EPC data. Many of these, such as LPG in the 'Mixed-mode with Natural Ventilation' building environment represent very few premises and a tiny percentage of the overall matched EPC floorspace (less than 0.1% of Cafés/restaurants and Takeaways floorspace for example). Others represent much larger percentages. For example:

- 'Grid Supplied Electricity and Air Conditioning' (Elec.AC) represents 25% of all Cafés/restaurants and Takeaway EPC floorspace

- 'Natural Gas and Air Conditioning' (Gas AC) represents 43% of all 'Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)'

- 'Natural Gas and Heating and Natural Ventilation' (Gas HNV) represents a large percentage of almost all sub-sector groups including:

  o 29% of Cafés/restaurants & Takeaways

  o 38 % of Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)

  o 70% of Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club

- 38% of Self-catering accommodation

- 'Oil and Heating and Natural Ventilation' (Oil HNV) represents 20% of the 'Not assigned' category which is mostly made up of 'Conference Centre' and 'Camping Site'

Figure 43 Percentage of floor area for minor (< 1%) heating, ventilation and air conditioning (HVAC) combinations in the Hospitality sector, by survey sub-sector group.
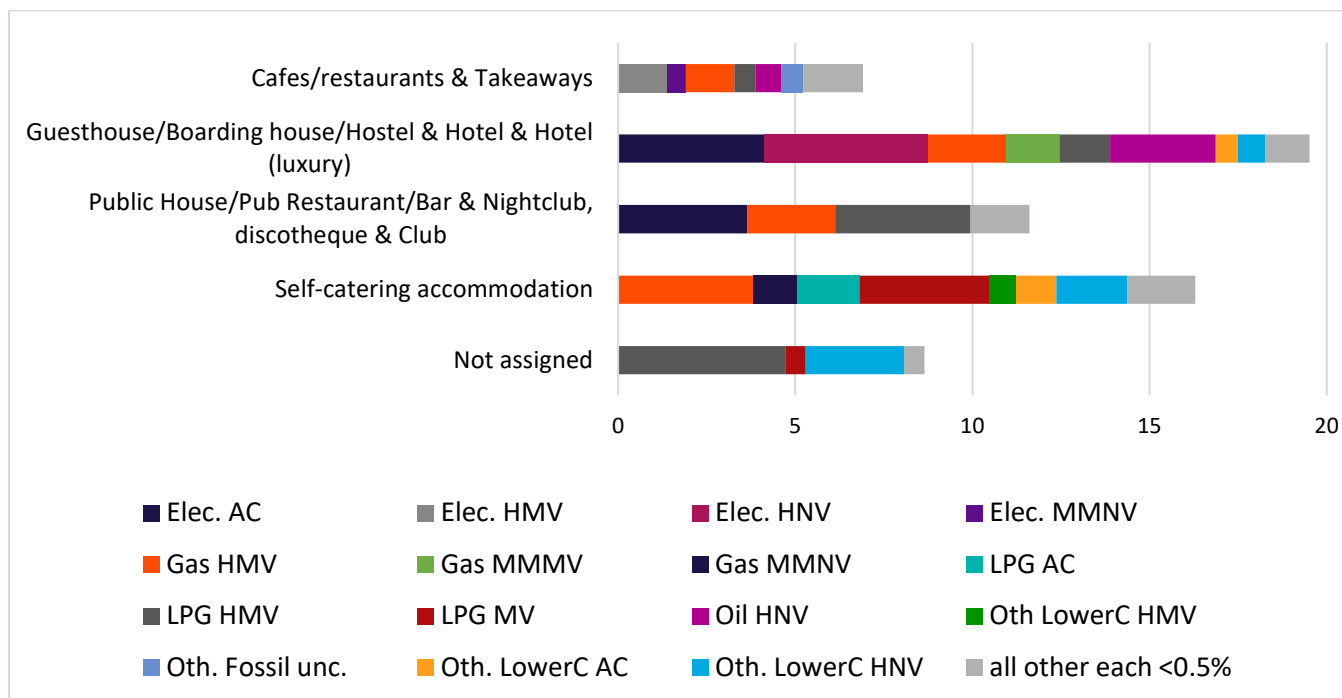
EPC sub-activity floorspace

Within the detailed non-domestic EPC data, the individual floorspace for different sub-activities are recorded. This can be thought of as being similar to the summary valuation line entries – the records of activities in any sub-divisions within VOA premises – in the VOA data for premises. Within the EPC, a Café for example might have:

- 50 m² assigned to code '1030' (which translates as 'Eating / drinking area')

- 5 m² assigned to code '1036' ('Toilet')

- 10 m² assigned to code '1031' ('Food preparation area')

- 20 m² assigned to code '1032' ('Store Room')

As might be expected, there is a large number of these codes. The data for each code has been extracted from the EPCs for the Hospitality premises that match to an EPC. From here it was possible to aggregate these codes by both CaRB3 activity and sub-sector group in order to identify the dominant sub-activity per aggregation, which in turn makes it possible to see what the aggregate proportion of say 'Food preparation area' is for the CaRB3 activity 'Café' as a whole. This is particularly useful for activities which do not have (accurate) floorspace measurements in the VOA SMV records (for example, Hotels and Pubs) since it provides detailed insight into the sub-activities within these premises. The percentages of Hospitality premises with EPC data are:

- 34% Cafés/restaurants & Takeaways

- 35% Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)

- 45% Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club

- 1% Self-catering accommodation (note: 38% domestic EPCs)

- 3% Not assigned

Since not all non-domestic premises have an EPC, these analyses may not be fully representative of the whole stock. Nonetheless, with nearly 50,000 non-domestic (Hospitality) EPCs to draw data from, this analysis provides a robust and unique insight into the sub-activities that make up the EPCs.

The diversity of combinations of premises activities and their sub-activities, in the EPCs, results in more than 700 codes for 124 different EPC activity types. To deal with this diversity and to allow for the visualisation of the data, the descriptions have been classified into 'activity groups', as shown in Table 8, together with their summed floor areas in non-domestic EPCs matched to premises in Hospitality.

Table 9 Groupings of EPC activity types, with summed EPC floor areas in the Hospitality CaRB3 class

Activity group	EPC floor area (m²)	Activity group	EPC floor area (m²)
Accommodation	6,574,043	Performance (stage)	60,416
Car Parking	52,985	Plant	340,827
Changing room	6,766	Reception	241,052
Changing room with showers	88,059	Sales chilled	15,772
Circulation	2,925,498	Sales electrical	4,474
Computing	4,735	Sales general	371,636
Display	11,214	Sport	162,449
Eating/drinking	6,708,693	Staff/common room/lounge	431,370
Food/Drink preparation	1,645,752	Storage	2,311,592
Hall/lecture theatre/assembly area	397,223	Storage chilled	19,455
Ice rink	950	Storage cold	39,954
Industrial process	10,425	Swimming pool	111,791
Laboratory	290	Teaching	8,404
Laundry	62,395	Toilet	1,013,150
Medical imaging	7	Waiting room	224
Medical theatre	0	Warehouse	48,356
Medical ward	2,210	Washing	449,354
Office/Consulting	1,054,672	Workshop	28,077

The percentages of EPC floorspace, per EPC activity group, per CaRB3 activity are shown in Figure 44, which is also described in Table 10. In the figure, 'accommodation' indicates spaces where people might be expected to sleep, including hotel rooms, demonstrating that in the Hospitality class, the bulk of the 'accommodation' appears in premises types that would be expected to have accommodation, such as hotels, boarding houses, motels etc. However, there are some records for accommodation in 'Public House/Pub Restaurant' (to be expected) and even 'Cafes' (perhaps less expected). 'Eating/drinking' is significant (> 35%) in what might be termed catering establishments, such as 'Cafés', 'Public House/Pub Restaurant', 'Restaurant', 'Restaurant Drive-in/thru', 'Clubs, institutions' , 'Wine bar' and even 'Nightclub, discotheque' However, in 'Food Court', 'Sales general' is completely dominant (44%), which is interesting, given that food courts can be spaces used for eating and drinking, surrounded by takeaway food outlets, such as in shopping centres.

In 'Takeaway Food Outlet (Predominantly Off Premises)', close to a third (29%) of floorspace is 'Food preparation' which helps explain the high EUIs for this type of premises already shown in

Table 6. Also of note is the space given over to 'Storage' and to 'Circulation' in many premises types, accounting for 17% of floor space in Takeaways and Hostels, respectively.
The 'All Other' category is the sum of all activity groups that each form less than one percent of the total Hospitality EPC floor space.

To align with the Hospitality sector surveys, the same analysis is shown in Figure 45 for the survey subsectors. This gives the impression that 'Eating/drinking' is dominant in 'Cafes/restaurants & Takeaways', but this somewhat hides the extent of 'Food preparation' in the 'Takeaway Food Outlet (Predominantly Off Premises)', shown in Figure 44. Again, 'accommodation' constitutes large areas of premises strongly associated with the Hospitality sector, whilst 'Circulation' becomes more prominent in the sub-sectors, than in the individual CaRB3 classes. The larger percentage of EPC floor area allocated to the 'All Other' category indicates complexity within the 'Self-catering accommodation' category.

Figure 44 Percentages of EPC total area, per activity group, per CaRB3 activity. Hospitality class.
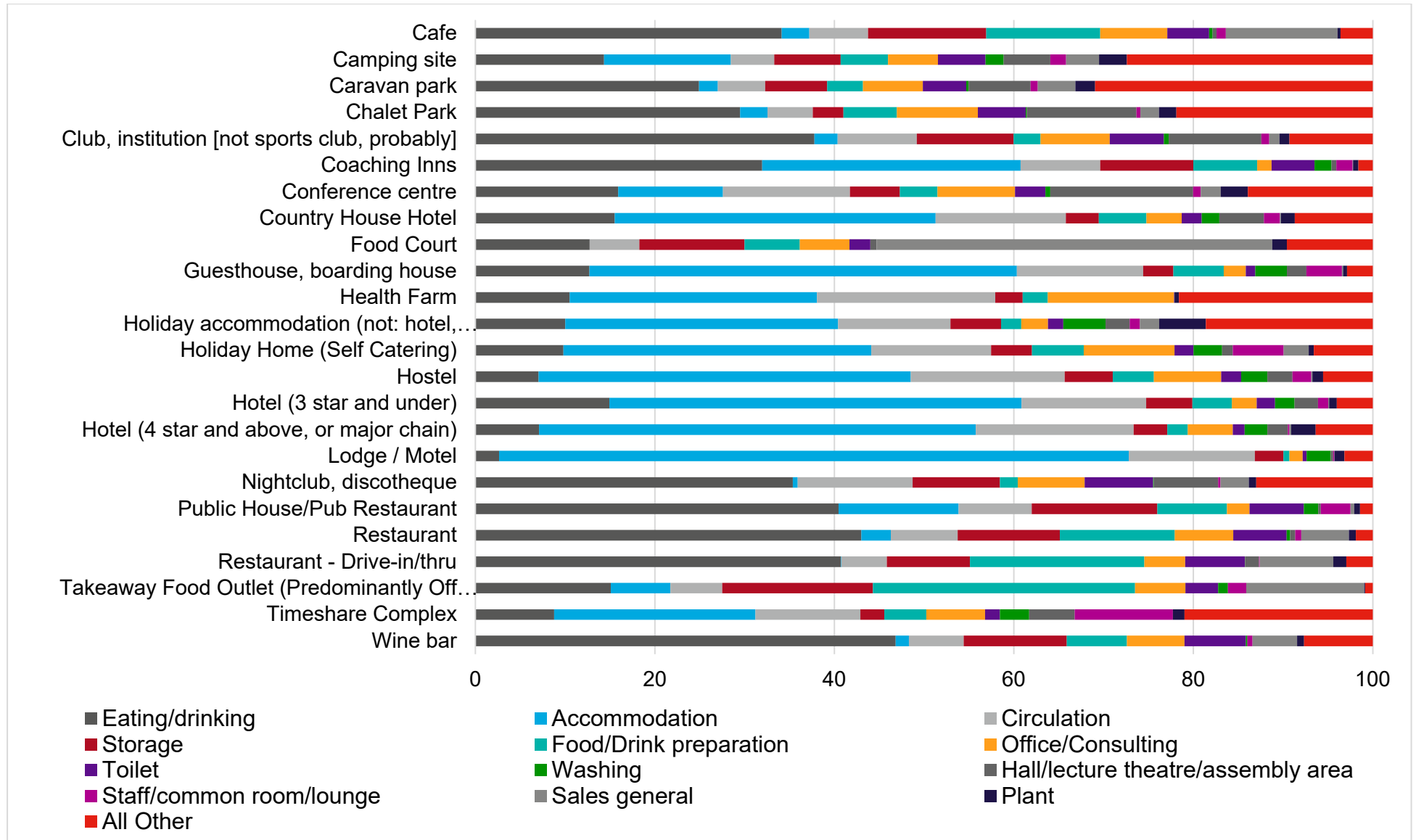
Figure 45 Percentages of EPC total area, per activity group, per survey sub-sector. Hospitality
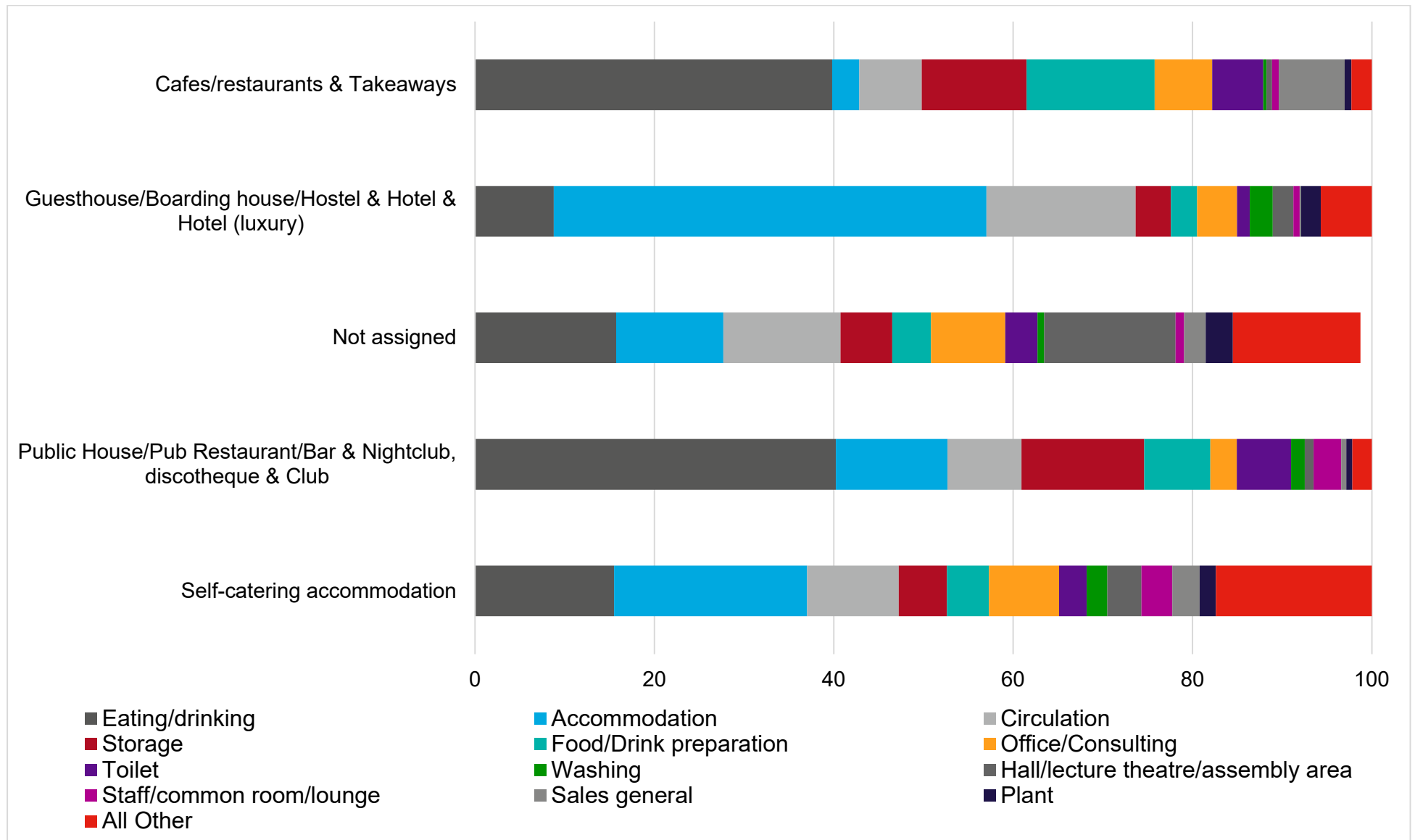
Table 10 Percentages of EPC total area, per activity group, per CaRB3 activity. Hospitality class.

CaRB3 Activity	Eating/drinking	Accommodation	Circulation	Storage	Food/Drink preparation	Office/Consulting	Toilet	Washing	Hall/lecture theatre/assembly area	Staff/common room/lounge	Sales general	Plant	All Other
Cafe	34	3	7	13	13	7	5	<1%	<1%	1	12	<1%	4
Camping site	14	14	5	7	5	6	5	2	5	2	4	3	27
Caravan park	25	2	5	7	4	7	5	<1%	7	<1%	4	2	31
Chalet Park	29	3	5	3	6	9	5	<1%	12	<1%	2	2	22
Club, institution [not sports club, probably]	38	3	9	11	3	8	6	<1%	10	<1%	1	1	9
Coaching Inns	32	29	9	10	7	2	5	2	<1%	2	<1%	<1%	2
Conference centre	16	12	14	6	4	9	3	<1%	16	<1%	2	3	14
Country House Hotel	16	36	15	4	5	4	2	2	5	2	<1%	2	9
Food Court	13	<1%	6	12	6	6	2	<1%	<1%	<1%	44	2	10
Guesthouse, boarding house	13	48	14	3	6	2	1	3	2	4	<1%	<1%	3
Health Farm	11	28	20	3	3	14	<1%	<1%	<1%	<1%	<1%	<1%	22

Non-Domestic Building Stock in England and Wales – Part 3: Hospitality

CaRB3 Activity	Eating/drinking	Accommodation	Circulation	Storage	Food/Drink preparation	Office/Consulting	Toilet	Washing	Hall/lecture theatre/assembly area	Staff/common room/lounge	Sales general	Plant	All Other
Holiday accommodation (not: hotel, guesthouse, caravan)	10	30	13	6	2	3	2	5	3	1	2	5	19
Holiday Home (Self Catering)	10	34	13	5	6	10	2	3	1	6	3	<1%	7
Hostel	7	41	17	5	5	8	2	3	3	2	<1%	1	6
Hotel (3 star and under)	15	46	14	5	4	3	2	2	3	1	<1%	<1%	4
Hotel (4 star and above, or major chain)	7	49	18	4	2	5	1	3	2	<1%	<1%	3	6
Lodge / Motel	3	70	14	3	<1%	1	<1%	3	<1%	<1%	<1%	1	3
Nightclub, discotheque	35	<1%	13	10	2	7	8	<1%	7	<1%	3	<1%	13
Public House/Pub Restaurant	40	13	8	14	8	3	6	2	<1%	3	<1%	<1%	1
Restaurant	43	3	7	11	13	7	6	<1%	<1%	<1%	5	<1%	2
Restaurant - Drive-in/thru	41	<1%	5	9	19	5	7	<1%	2	<1%	8	1	3
Takeaway Food Outlet (Predominantly Off Premises)	15	7	6	17	29	6	4	1	<1%	2	13	<1%	<1%

Non-Domestic Building Stock in England and Wales – Part 3: Hospitality

CaRB3 Activity	Eating/drinking	Accommodation	Circulation	Storage	Food/Drink preparation	Office/Consulting	Toilet	Washing	Hall/lecture theatre/assembly area	Staff/common room/lounge	Sales general	Plant	All Other
Timeshare Complex	9	22	12	3	5	7	2	3	5	11	<1%	1	21
Wine bar	47	1	6	11	7	6	7	e	<1%	<1%	5	<1%	8

Surveys

A programme of survey work was undertaken in order to gain a deeper understanding of the Hospitality activity class. The surveys were intended to supplement the data analysis by exploring questions for which no comprehensive secondary data set exists. The surveys consisted of remote (telephone) surveys supplemented by a smaller number of on-site verification surveys. Due to the timing of data access, it was necessary to design and undertake these surveys ahead of the final data analysis of the whole Hospitality class.

The scope of the remote survey was the total non-domestic building stock in England and Wales, falling into the Hospitality classification.

The sample frame for the final sample comprises all such non-domestic properties across England and Wales, i.e. the sample frame constituted the population. The sample frame was developed on the basis of Valuation Office Agency (VOA) and Ordnance Survey Address Base (OSAB) data, which provided the underlying database. Data from the Inter-Departmental Business Register (IDBR) was also matched to these. As the model does not comprise any contact details for occupiers of premises, these were sourced from a commercial database supplier and a consultancy providing insight specifically to the Hospitality activity class (Oxford partnerships).

The sampling unit for the remote survey was an addressable location in England and Wales with its own Unique Property Reference Number (UPRN), in the OSAB data.

The database for the remote survey indicated instances where a building has multiple occupiers, i.e. multiple companies with different Company Registration Numbers (CRN) sharing the same UPRN. Interviews with these organisations captured the percentage of the building occupied by the organisation. The remote survey aimed to capture any ad hoc arrangements on utility consumption between tenants.

Where the database for this survey indicated that multiple buildings were part of the same UPRN, e.g. university campuses, respondents were asked for information about one of those buildings only. In order to ensure representation of different building sizes and avoid bias from a completely self-selected approach, interviewers randomly asked for a small, large, or typical-sized building on the site.

Sector and sub-sectors

Activities were classified using the CaRB3 scheme which is described in [reference appendix containing literature review]. Activity classifications were consolidated into a manageable number of sub-sectors for survey purposes. For this study in the Hospitality class, 25 combinations of activity codes were identified, reviewed and aggregated, resulting in 10 sub-sectors, as below:

- Self-catering accommodation
- Cafes/Restaurants
- Public House/Pub Restaurant/Bar

- Guesthouse/Boarding house/Hostel

- Club

- Takeaway

- Hotel

- Hotel (luxury)

- Nightclub, discotheque

- Hospitality/Accommodation, other

For fieldwork purposes, activity classifications were further consolidated. The consolidation process was based on the following principles:

Sub-sectors accounting for less than 1% of the total number of premises in the Hospitality sector, were either merged with a similar sub-sector, or, where that was not possible, they were discarded from sampling. Sub-sectors accounting for 1-10% of the total number of premises in the Hospitality class, were merged with a similar sub-sector, or, where that was not possible, they were retained as a separate category. This process resulted in the following fieldwork sub-sectors:

- Self-catering accommodation (32% of all premises)

- Cafes/restaurants & Takeaways (32% of all premises)

- Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club (27% of all premises)

- Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury) (9% of all premises)

Stratification

Where possible the sample was coded in an attempt to ensure that representation of all premise sizes, especially of larger premises which tend to consume more energy, and sub sectors could be monitored.

Within the 'Cafes/restaurants & Takeaways' sub-sector, floor area was used to denote size of premises. However, floor area is typically not a good proxy for energy consumption of take-aways compared to other activities, as they tend to be energy intensive despite, or due to, their smaller size. Thus, four strata were applied, small, medium, large, and a separate stratum for take-aways. Allocation to these strata was done on the following basis:

- Small: all premises with a floor area less than the sub-sector's median floor area

- Medium: all premises with a floor area higher than the median but less than the ninth decile of the distribution

- Large: all premises with a floor area higher than the ninth decile of the distribution (the top 10%)

- All take-aways irrespective of floor area.

Within licenced premises and accommodation premises, the sample could not be stratified based on floor space, as data on floor space was not available for these sub-sectors. Instead, these sub-sectors were stratified with respect to rateable value[11]. The following strata were applied:

- Small: all premises with a rateable value less than the sub-sector's median
- Medium: all premises with a rateable value higher than the median but less than the ninth decile of the distribution
- Large: all premises with a rateable value higher than the ninth decile of the distribution (the top 10%)

The distribution of rateable value within each sub-sector was examined separately for Central London and for the rest of England & Wales. Whilst rateable value is a proxy for annual rent, which in turn is usually a proxy for size but also the earning capability of the premises, it also reflects geographical variation in rents, which are much higher in Central London, where small premises are likely to still have high earning potential.

Special care was taken for instances where multiple businesses shared the same address. Within each sub-sector the selection of premises to be offered an interview was done randomly.

Data matching

Table 11 outlines the total pool of records from the sample frame provided to a commercial database provider for the purposes of matching. The table also shows how many of these records were mapped to the IDBR.

Table 11 Contacts provided for matching

Sub-sector	Population provided for matching	Number matched to IDBR
Self-catering accommodation	5,127	1,106
Cafes/restaurants & Takeaways	10,091	1,973
Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club	8,004	2,328
Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)	7,010	2,012
Total	30,232	7,419

When supplied to the commercial data provider for appending contact details, the following guidelines on matching were supplied:
- If available, match using the IDBR name and address.

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[11] Data on rateable value is sourced from the VOA and represents a theoretical annual rental value.

- If IDBR is not available, match using the NDR address and OSAB organisation name.

- Where OSAB organisation name is not present, match using the NDR address only (incl. postcode), without an organisation name.

- Finally, if none of the above are possible match on the UPRN address for the remaining records.

The challenges of attaching contact details are likely to have resulted in a bias in the sample towards less complex ownership cases, which has implications for the survey results.

In total, 5,640 contacts were matched and imported for use in fieldwork. Table 12 shows the final sample used, broken down by data source and sub-sector.

Table 12 Final sample for fieldwork

Sub-sector	Commercial database provider	Specialist consultancy data (Oxford partnerships)	Total
Self-catering accommodation	102	96	198
Cafes/restaurants & Takeaways	2,329	242	2,571
Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club	1,095	356	1,451
Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)	1,166	167	1,333
Unknown (where Oxford partnerships data and 3DStock model did not match on sub-sector)	-	87	87
Total	4,692	948	5,640

The following sample design approaches were trialled as part of this study:
- Random sampling - this is the pre-requisite for all statistical significance testing to be valid. This approach was followed for the survey work with a subset of 540 contacts. In this subset, all sample units were given an equal chance of being selected and five attempts were made to contact each one.

- Stratification with quotas – to ensure that there was adequate representation of all sub-sectors and premises sizes.

The sample was managed using a CATI system and observed the following principles:
- Attempts to contact respondents were made across different days and times over at least two weeks before no further calls were attempted.

- When a completed interview was not secured, a final call outcome was recorded in order to better understand response rates. These call outcomes included:

  o Refusal – when a suitable respondent was not willing or able to complete an interview

  o Gatekeeper refusal – where the gatekeeper would not put the call through to the respondent

- - No suitable respondent identified – when a suitable respondent could not be identified

  - Unfulfilled appointment – when a general appointment was booked that wasn't kept by a potential respondent

  - Invalid record – when the telephone number was not in use

  - Not in target sector – when the business turned out not to be in the hospitality sector when we spoke to them or they were not in the premises in 2019 (when we were seeking to collect data for – see later)

  - No longer in business

  - 5 or more attempts made without an interview secured

  - No final outcome reached (record is available for call back).

- Once an interview with a suitable respondent had been conducted (whether or not they could provide all the data required), the interview was considered complete.

- Interviews were conducted within the hours of 8am-8pm, to maximise convenience for respondents.

Sample achieved: response rates and call outcomes

In total, 246 interviews were conducted during April - July 2022. Table 13 shows the number of interviews per sub-sector compared to the original expectation:

Table 13 Target number of interviews per sub-sector

Sub-sector	Anticipated number of responses per sub-sector	Actual number of responses
Self-catering accommodation	50	6
Cafes/restaurants & Takeaways	100	63
Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club	80	94
Guesthouse/Boarding house/Hostel & Hotel & Hotel (luxury)	70	83

The primary reason for the low number of responses in the self-catering accommodation sub-sector was the low count of premises for this sub-sector in the sample frame. This is most likely a result of many of these premises being considered as 'domestic' despite being classified as non-domestic for business rates purposes.

538 cases remained unused at the end of fieldwork. All of these were businesses that had 3 or more sites in the database. These were considered to be part of a chain and recruitment was attempted via head offices – see multi-site recruitment for further detail. Where responses had not been received from head offices, some of these were then released into the telephone survey sample. Therefore, a total of 5,102 cases were released for telephone contact. Call outcomes for these are shown by sub-sector.

Early fieldwork indicated a high proportion of contacts (23%) were not in the particular hospitality sub-sector. This arose as a discrepancy between IDBR and OSAB data. Further information was appended to the database of contacts to minimise the impact of this during fieldwork, hence the low incidence of premises not in the target sub-sector at final call outcome. A summary of call outcomes can be found in Annex 2 Call Outcomes. The majority of completed interviews (over 70%) took place within five or fewer contact attempts.

Where people seemed initially reluctant to participate, as well as being offered flexibility in the timing of the interview, they were encouraged to contribute through the highlighting of the following information:

- This is a national survey on behalf of the Department for Business, Energy and Industrial Strategy

- The survey is supported by X sector organisation (with X representing the relevant activity sector for that organisation supporting the survey – discussed further later).

- The survey is to help understand building energy use so that policy to support the hospitality sector can be developed .

Nonetheless, 295 potential respondents refused to complete the survey, with the vast majority indicating that they did not have the time (30 minutes) to spare[12].

Remote telephone survey

This section outlines the approach to the remote survey. A remote survey using Computer Assisted Telephone Interviewing (CATI) was used because:
- The response rate was expected to be much higher compared to online data collection.

- Quality was expected to be better as highly skilled interviewers were used to ensure that the data collected was as complete as possible.

- A more representative sample was expected to be accessed through careful sample management.

- This provided an opportunity to have conversations with organisations about which members of staff were best placed to answer the questions in the survey.

The technical annex for the Building Energy Efficiency Survey[13] also noted that when the survey was split into two parts, telephone followed by online, there were difficulties securing a response to the online.

The process of the remote interview was as follows:
- Identification of appropriate respondent and recruitment

- Appointment setting including guidance on interview content and preparation needed

- Interview lasting 30-50 minutes (including closing with an invite to participate in an on-site verification survey)

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[12] It is uncertain whether the response would have been different if the survey was shorter i.e. this reason was sometimes felt to be provided where respondents were simply not interested in supporting the work.
[13] The Building Energy Efficiency Survey (BEES) 1014-2015 was commissioned by the UK Government Department for Business, Energy and Industrial Strategy. BEES set out to improve and update the evidence of how energy is used, and to provide an assessment of the abatement opportunities for all non-domestic premises across England and Wales.

- Data checking and clarification call where needed.

Recruitment approach

An overview of the recruitment approach piloted with the Hospitality activity class is shown in Figure 46 below:

Figure 46 Recruitment process
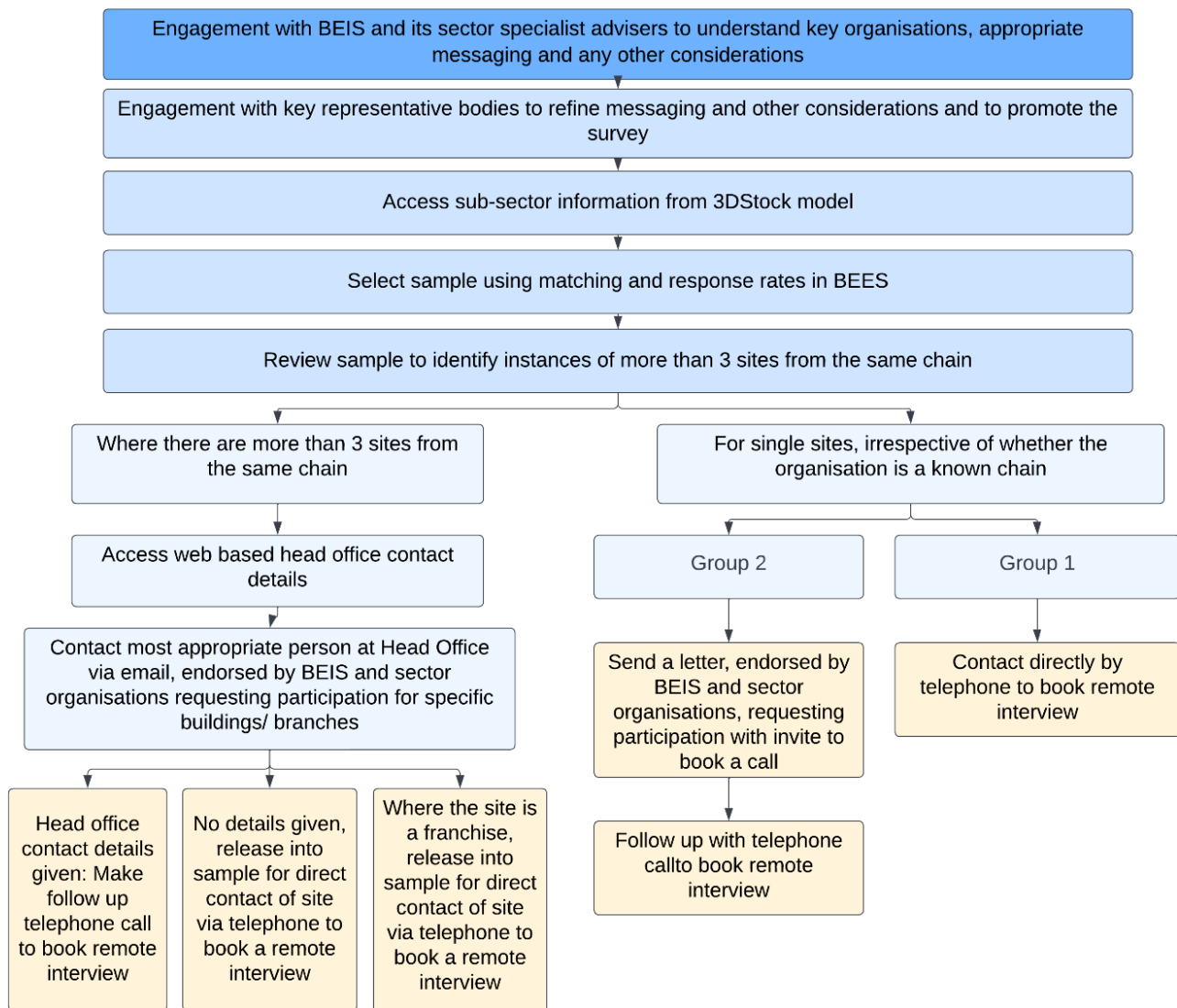
Prior to commencing fieldwork and agreeing a recruitment approach, we engaged with BEIS, sector specialists and the following key representative bodies in the hospitality sector:

- UK Hospitality

- Beer and Pub Association

- British Institute of Innkeeping

- Short Term Accommodation Association

- Robinsons Brewery

- Headland Consultancy

Representative bodies and stakeholders provided feedback on what might influence the success of data collection in this sector. This feedback included:

- Timing of contact. Early in the week may be best when businesses tend to be less busy; it was best to avoid lunchtimes. We managed the sample so that sub-sectors likely to be serving at lunchtimes (cafes, restaurants, take aways, public houses and pub restaurants) were not to be called between noon and 2.30pm. We monitored fieldwork responses and adapted the timing of calls, as required, for any specific sub-sectors – for example, evening calls for businesses that opened later in the day.

- Most suitable respondent. There is a split in terms of who is likely to be the most suitable respondent according to whether the business is an independent single site or part of a chain. The owner is likely to be the best starting point for independent businesses. For sites that are part of a chain, permission/encouragement from head office may be needed. Where more than 3 sites from the same chain were identified in the sample, we approached head office to ask them to nominate contacts at individual sites to participate.

- The sector was under pressure due to Covid. At the time the method was developed it was hypothesized this could lead to greater interest in the cost saving potential of energy efficiency and limited interest in net zero. Larger companies/chains were likely to have a greater focus on sustainability and the pathway to net zero. Recruitment materials were tailored to highlight both the net zero and cost saving opportunities of energy efficiency and be sensitive to the recent difficult experiences of the sector.

- With an increased focus on net zero and heat strategies, there has been a lot of sales activity. This could cause businesses to be more guarded than usual about calls related to energy.

One particular challenge in recruitment in the Hospitality activity class was hypothesized to be accessing appropriate contact details for a person able to answer the questionnaire in respect of self-catering accommodation. Initial consultation with the Short Term Accommodation Association suggests that in many cases, owners would be best placed to respond but in others, owners will have property management agencies working for them who are more likely to have the relevant information.

All of these bodies indicated they were willing to support the survey. We included their names (the first four listed above) on the recruitment materials. In addition, BEIS added information about the survey to their website to which respondents could be directed.

Single site recruitment

We trialed two approaches to recruiting hospitality businesses, with a single site in the database, to participate in the survey:

- Sending an official letter to businesses, prior to a telephone call, from BEIS to 674 contacts

- Telephoning businesses directly (a supporting email was sent following the call where needed).

Multi-site recruitment

Any case that had 3 or more sites associated with the organisation name was treated as a chain, for example, KFC, Costa Coffee and so forth. Based on feedback from sector representatives, multiple sites were approached via their head office in the first instance, and a different approach depending on contact details available.

Survey name

We gave the survey a name and trialed two for use in telephone contact procedures:

- Non Domestic Building Survey

- National Survey of energy use in business premises

In the early stages this was refined to:

- National Building Energy Use Survey (for the hospitality sector)

Recruitment tools for remote survey

The following tools were developed for use in the recruitment of respondents:

- A letter sent to hospitality businesses with a single site in the contacts database, prior to contact by telephone

- A script for use in telephone recruitment

- A follow-up email to verify the work that was being undertaken

- An email for head offices

These tools can be found in Annex 3 Recruitment Materials.

Remote survey instruments

An overview of the survey for the Hospitality sector is shown in Table 14 and included in full in Annex 5 Remote survey questions.

Table 14 Overview of hospitality remote survey

Section	Overview
Premises details	A set of questions to understand whether the organisation we spoke to occupies a whole building, a collection of buildings or a premises within a building. This section went on to capture details on ownership and sector specific details for the building (for example the % of space used for different purposes).
Occupancy and running hours	A set of questions to understand the number of individuals that occupy the premises on a regular basis and the hours that the business operates.
Energy supply and metering arrangements	Included questions on metering, including any submetering, energy supplies to the building and energy consumption (using cost as a proxy where necessary)
Energy using equipment	Three sets of questions to understand energy using equipment and fuel type Heating, cooling and ventilation Lighting Other energy using processes and equipment
Actors with responsibility for energy an energy efficiency measures installed and policy Questions.	A section to understand who has ultimate responsibility for energy within the premises and to understand what energy efficiency measures have been taken forward and when. We also included a couple of bespoke policy questions. This gave participants an opportunity to express their views to government, for example, on challenges or support needs they have related to energy management.

Questions specific to the hospitality sector were included in the following sections:
- Premises details - Questions were included here that capture details specific to the sector, such as number of bedrooms for hotels, or the proportion of space devoted to eating/dining in pubs and restaurants.

- Occupancy and running hours - The number of visitors for the hospitality sector was described as customers and additional occupancy questions were drafted for the Guest house, boarding house, hotel and hostel sub-sector to cover capacity in terms of bedrooms and typical occupancy

- Lighting - Questions on lighting were expanded to include specialist lighting that may be used by the "Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club"

- Types of energy using equipment - Questions on catering equipment, refrigeration, bar equipment and sound systems.

Cognitive testing of questions

Some cognitive testing of the script was carried out to ensure that questions were understood as intended and that the correct language was used. We spoke to 2 businesses: a pub serving light, mainly pre-cooked meals; a hotel with restaurant.

Areas we tested were:

- Respondent ability to reflect on 2019 given some time has elapsed.

- Ensuring that unit/scales are in line with the way respondents can respond to the questions.

- Respondents' understanding of bespoke equipment types.

- Respondent ability to answer questions where a 'typical day' is referenced to understand if language would better be tailored to busy days/quieter days or citing specific days of the week.

Both respondents were able to reflect on 2019. Neither had made significant changes outside of adaptations to service throughout COVID. One respondent thought about quantities in terms of covers (restaurant) and the other (a bar serving some hot sandwich type meals) in terms of turnover, although they could approximate meals from turnover and approximate numbers of customers.

In terms of equipment, both respondents were clear about what was being referred. However, they did have additional equipment including games/fruit machines and the facility to serve hot food, such as sandwiches or panini, from a standalone grill/oven type piece of equipment. These elements were added to the survey prior to the main fieldwork.

Both could easily identify busy and quiet periods and approximate numeric information for both of these. They instinctively went through the days and times of the week (although not necessarily in order). For example: "Our busiest times would be Thursday, Friday, Saturday. On those days both lunch and evening and we would expect x customers/ y turnover/ z hot food orders or covers" (where covers refers to a meal, typically 2 courses). On the basis of this, the questionnaire was tweaked slightly to accommodate these types of responses.

Questionnaire testing and refinement

As part of the fieldwork the following were also tested and assessed.

Table 15 Survey testing

Survey element	How success was assessed
Answerability of different questions	% 'don't know' response by question
Units used	% of respondents using different energy units in their responses

The main area for 'don't know' responses was energy consumption with about 15% missing information for 2019. This rose to over 20% with the inclusion of organisations that were part of a chain where the person responsible for day-to-day operation of the business could answer

questions on the building, responsibilities, occupancy and equipment yet the energy was dealt with directly by head office.

Where respondents could give data, they were able to do so using the energy units provided by the questionnaire.

Assessing the quality of responses

We included the following question in the questionnaire - asked to both respondents and interviewers respectively to gain their insight into the quality of the data collected.

In terms of your responses given to questions where factual information is provided, how accurate do you think your responses have been?
- Mainly accurate

- Mix of some accurate and some guesswork

- Mainly guesswork but should be about right

- Don't know

Of the 247 interviews included in the final dataset, 209 included a response to the question on accuracy of factual information.

Table 16 Assessment of response accuracy

Accuracy	Respondents' self-assessment	Interviewer assessment
Mainly accurate	109	95
Mainly guesswork but should be about right	18	88
Mix of some accurate and some guesswork	78	24
Unsure	4	2

Interviewers were asked for their comments as well as a coded response. Their comments were broadly similar for the options "Mainly guesswork but should be about right" and "Mix of some accurate and some guesswork". It is likely that these two options were not adequately discreet and that they have been used interchangeably by both respondents and interviewers. The main areas for potential inaccuracy were:
- Energy bill figures

- Differentiation of customers/footfall in peak and off season and on quiet and busy days.

The main reasons for inaccuracy or guesswork included:
- Not having bill data to hand at the time of the interview

- The respondent, based at the site, had all the information on occupancy, the building and equipment however energy and finance was dealt with by head office.

Before analysis, the data was reviewed for any gaps, potential data entry errors and any poor-quality records. No changes to the raw data had to be made.

Verification surveys

The verification survey work stream provided an independent verification of the data provided by telephone survey participants by sending an auditor to the site. Auditors repeated selected questions from the telephone surveys and undertook visual inspections to assess the accuracy of the data provided in answers to the telephone interviewers.

Remote survey participants were asked at the conclusion of their remote survey if they would be willing to receive a verification visit. The contact details of those who agreed were transferred securely to the verification audit team who then re-established contact with the phone survey participant to organise the verification visit.

The results of the remote survey were provided via Secure File Transfer (SFT) to the verification auditor who then travelled to site and carried out the verification audit. The results of the verification audit were transferred back via SFT so that the telephone and verification audit results could be compared and any variances in answers given identified.

The verification audit team consisted of 5 UCL post graduate students in technical building engineering disciplines and two members of the Verco energy engineering team. In preparation for the verification audits the students attended a one-day training course at UCL where Verco provided training on, for instance, plant room familiarity and safety, asbestos awareness, confined spaces, lone working (not permitted during the project), technical plant familiarisation and the data security protocols to be followed by the audit team at all stages. UCL attended and provided key insights to the audit team of the background and objectives of the verification work stream. The verification audit team were issued with Personal Protective Equipment (PPE) identified as necessary by the workstream risk assessment.
In total 25 verification audits were completed as part of the Hospitality Verification workstream. Whilst lower than the target of 30, it is slightly higher than the 10% of remote surveys originally proposed. Hence the absolute total is mainly explained by the lower than expected success rate for remote surveys (246 vs 300 target). Other reasons for the low number of verification surveys are discussed in the sections below.

Survey Results

This section sets out the results of remote surveys, where findings from verification surveys differed, these are also reported. In this discussion the following terms are used to describe each sub-sector group for brevity:

- Catering premises - Cafes, restaurants and takeaways
- Accommodation premises - Guesthouse, boarding house, hostel, hotel and hotel (luxury)
- Licenced premises - Public house, Pub, Bar, Nightclub, Discotheque
- Self-catering accommodation premises

Key characteristics of surveyed premises

Sub-sector assignment

Respondents were asked which sub-sector group they considered their business to be in. The sub-sector groupings derived from the VOA classification were confirmed for a large majority of all classes except self-catering accommodation in which only half of the 10 surveyed premises identified as self-catering accommodation as shown in Table 17.

Table 17 Comparison of assigned and self-identified sub-sectors

Self-identified sub-sector	Cafes, restaurants and takeaways (n=65)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=85)	Public house, Pub, Bar, Nightclub, Discotheque (n=81)	Self-catering accommodation (n=10)
Cafes, restaurants and takeaways	92.3%			10.0%
Guesthouse, boarding house, hostel, hotel and hotel (luxury)	1.5%	100.0%	3.7%	40.0%
Public house, Pub, Bar, Nightclub, Discotheque	6.2%		96.3%	
Self-catering accommodation				50.0%

Grid connection

Connection to the gas grid varied by sub-sector with 75% of catering premises, 89% of accommodation premises, 65% of licenced premises and 6% of self-catering premises reporting a connection to the gas grid.

Numbers of employees

The percentiles for numbers of employees are shown in Table 18, these are reported as total numbers and may not reflect Full Time Equivalents (FTE).

Table 18 Numbers of employees

Number of employees	25th percentile	50th percentile	75th percentile
Cafes, restaurants and takeaways (n=53)	5	8	16
Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=70)	2	2	7
Public house, Pub, Bar, Nightclub, Discotheque (n=59)	3	5	13
Self-catering accommodation (n=9)	2	3	30

Format of premises

The format of premises occupied varied by sub sector with at least 85% of accommodation premises, licenced premises and self-catering accommodation premises being sole occupier of a building or buildings. For catering premises the picture was very different with 48% of premises occupying only part of a larger building.

Table 19 Format of premises occupied

Format	Cafes, restaurants and takeaways (n=65)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=85)	Public house, Pub, Bar, Nightclub, Discotheque (n=81)	Self-catering accommodation (n=10)
A collection of buildings	2%[14]	8 %	5%	20%
A whole building	51%	87%	80%	80%
Part of a building	48%	5%	15%	

Across all sub-sectors, respondents were more likely to report occupying a whole building in the survey than the data suggests (catering premises 51% vs 30%, accommodation premises 87% vs 44%, licenced premises 80% vs 35% and self-catering accommodation premises 80% vs 55%). It is likely that this results from the difficulty in obtaining contact details for premises in multiple occupation and survey results should be interpreted with caution accordingly.

Tenure Status

Tenure status varies by sub-sector, a majority of accommodation and self-catering accommodation premises are owned (either outright or with a mortgage) while licenced premises are evenly split between owned and rented/leased. Only 15% of catering premises are owned.

Table 20 Tenure status

Tenure status	Cafes, restaurants and takeaways (n=65)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=85)	Public house, Pub, Bar, Nightclub, Discotheque (n=81)	Self-catering accommodation (n=10)
Don't want to say			1%	
Lease purchase	2%	4%	1%	
Leased	37%	13%	26%	
Mixture - capture details	3%	2%	1%	

---

[14] Percentages sum to greater than 100% due to rounding.

Other - capture details	2%	5%		
Owned - Mortgage	9%	28%	11%	30%
Owned outright (include if mortgage has been paid off in full)	6%	39%	38%	60%
Rented	34%	4%	19%	10%

Length of occupation (n=218)

The median period of occupation ranged from 11 years (catering premises) to 22 years (self-catering accommodation premises). Catering premises were the most likely to be rented (34%) and accommodation premises were rarely rented (4%). 19% of licenced premises and 10% of self-catering accommodation premises were rented. A large majority of premises in each sub-sector were built before 1990 (catering premises 72%; accommodation premises 95%; licenced premises 89%; self-catering accommodation premises 100%).

Timing of investment (n=241)

Levels of investment in the premises were relatively high in all sub-sectors with only 19% of catering premises, 4% of accommodation premises, 14% of licenced premises reporting no significant investment by either the responding organisation or their landlord. The majority of those investments had been made since 2015 in all sub-sectors (catering premises 93%; accommodation premises 83%; licenced premises 79%; self-catering accommodation premises 80%).

Floorspace uses

Auditors estimated the breakdown of floorspace by categories during verification site visits. Figure 47 shows the breakdown for each site.

Figure 47 Verification Surveyor estimates of proportion of floor area by site and grouped by sub sector (n=25)
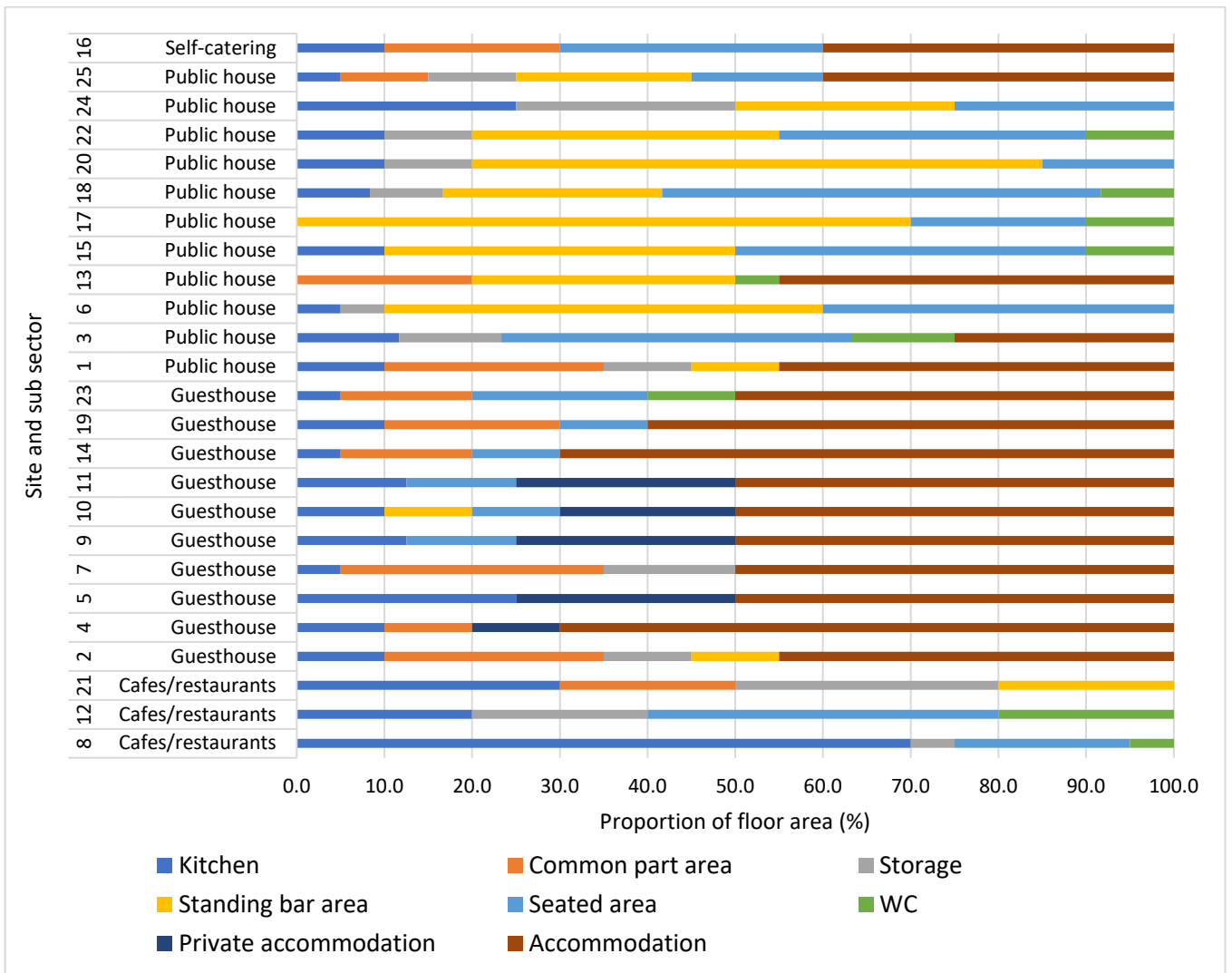
Energy Supplies

Across all sub-sectors, energy costs were generally paid directly to the supplier. The proportion for self-catering accommodation was slightly lower than for other sectors but the small sample for this sub-sector means that only 1 respondent did not pay for energy costs directly to the supplier.

Table 21 Responsibility for energy costs

	Cafes, restaurants and takeaways (n=61)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=82)	Public house, Pub, Bar, Nightclub, Discotheque (n=75)	Self-catering accommodation (n=8)
Energy costs included within rent paid to a landlord	1.6%		1.3%	12.5%
Payment made directly to your energy supplier	75.4%	95.1%	89.3%	87.5%
A combination of the above	4.9%			
Unsure	18.0%	4.9%	9.3%	

Two catering premises reported paying for energy for communal areas directly to the supplier and 3 reported paying a charge to their landlord for energy for communal areas, no other respondents indicated that they paid a charge for communal areas.

Authority to make changes to heating system

Respondents were asked if they had authority to make fundamental changes to the heating system, responses varied by sector with 89% of accommodation premises able to make changes compared with 52.5% of catering premises (licenced premises 60%, self-catering accommodation premises 75%).

Table 22 Authority to make fundamental changes to heating system

	Cafes, restaurants and takeaways (n=61)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=82)	Public house, Pub, Bar, Nightclub, Discotheque (n=75)	Self-catering accommodation (n=8)
No	29.5%	8.5%	30.7%	25.0%
Yes	52.5%	89.0%	60.0%	75.0%
Unsure	18.0%	2.4%	9.3%	0%

Fuels and energy sources

All respondents except 1 accommodation premises had an electricity supply as shown in Table 23. Eighteen licenced premises reported a supply not listed, 16 of these used wood for a log-burning stove, 1 used an air source heat pump and one was an incorrect response. One self-catering accommodation premises also reported using a log burning stove.

Table 23 Types of fuel supplied

Fuel	Cafes, restaurants and takeaways (n=61)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=82)	Public house, Pub, Bar, Nightclub, Discotheque (n=75)	Self-catering accommodation (n=8)
Electricity	100.0%	98.8%	100.0%	100.0%
Gas	85.2%	86.6%	73.3%	62.5%
Oil	6.6%	12.2%	13.3%	50.0%
Coal	3.3%	2.4%	13.3%	12.5%
LPG	6.6%	11.0%	17.3%	50.0%
Smokeless fuel including coke	1.6%	0.0%	8.0%	0.0%
Anthracite	0.0%	0.0%	2.7%	0.0%
Dual fuel - mineral and wood	1.6%	2.4%	14.7%	12.5%
District Heat	0.0%	0.0%	0.0%	12.5%
Other	8.5%	24.0%	25.0%	3.3%

In addition to gas and electricity metering, 2 accommodation premises and 1 licenced premises reported metering for their oil supply. 3 accommodation premises, 3 licenced premises and 2 self-catering accommodation premises reported metering for an LPG supply. One self-catering accommodation premises had a metered connection to a district heating system.

Main fuels for space and water heating

Heat recovery systems were reported in 3 catering premises, 3 accommodation premises, 2 licenced premises and 1 self-catering accommodation premises. The heat recovery system was reported to be the main energy source for either space heating or domestic hot water in 1 case in each subsector. The main fuels for space heating and water heating are shown in Table 24 and Table 25 respectively.

Table 24 Main space heating fuel

Fuel	Cafes, restaurants and takeaways (n=60)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=81)	Public house, Pub, Bar, Nightclub, Discotheque (n=74)	Self-catering accommodation (n=7)
Electricity	43.3%	12.2%	27.0%	14.3%
Gas	41.7%	75.6%	48.6%	42.9%
Coal			1.4%	
Dual fuel - mineral and wood			2.7%	14.3%
LPG	3.3%	1.2%	5.4%	
Oil	1.7%	7.3%	6.8%	28.6%
Other		1.2%	2.7%	
Smokeless fuel including coke			1.4%	

Table 25 Main fuel for water heating

Fuel	Cafes, restaurants and takeaways (n=56)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=79)	Public house, Pub, Bar, Nightclub, Discotheque (n=70)	Self-catering accommodation (n=8)
Electricity	31.7%	8.6%	28.4%	
Gas	55.0%	80.2%	51.4%	37.5%
District heating				12.5%
Dual fuel - mineral and wood			1.4%	12.5%
LPG	5.0%		5.4%	
Oil	1.7%	4.9%	8.1%	37.5%
Other		3.7%		
Smokeless fuel including coke	6.7%	2.5%	5.4%	

Energy expenditure

45% of catering premises, 52% of accommodation premises, 47% of licenced premises and 60% of self-catering accommodation premises were able to provide an estimate of their annual expenditure on electricity in 2019. Values are shown in Table 26. Only 15 premises across all sub-sectors were able to predict expenditure for 2022 when the survey took place. The proportions of premises able to provide an estimate of gas expenditure in 2019 were similar to those for electricity (catering premises 48%, accommodation premises 54%, licenced premises 42% and self-catering accommodation 60%)

Table 26 Annual electricity expenditure in 2019

Annual electricity spend in 2019	25th percentile	50th percentile	75th percentile
Cafes, restaurants and takeaways (n=29)	£4,500	£6,000	£11,000
Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=44)	£2,080	£3,550	£8,750
Public house, Pub, Bar, Nightclub, Discotheque (n=38)	£6,500	£12,000	£15,000
Self-catering accommodation (n=6)	£3,000	£9,650	£25,000

39% of catering premises, 45% of accommodation premises, 28% of licenced premises and 30% of self-catering accommodation premises were able to provide an estimate of expenditure on gas in 2019. Only 11% of catering premises, 16% of accommodation premises and 8% of licenced premises and 0% of self-catering accommodation premises were able to estimate expenditure on gas for the current year (n=73).

Table 27 Annual gas expenditure in 2019

Annual gas spend in 2019	25th percentile	50th percentile	75th percentile
Cafes, restaurants and takeaways (n=25)	£1,800	£3,000	£4,560
Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=38)	£1,800	£2,850	£5,000
Public house, Pub, Bar, Nightclub, Discotheque (n=23)	£3,000	£4,200	£8,000
Self-catering accommodation (n=3)	£3,850	£7,500	£38,750

Expenditure on oil in 2019 was available from 1 catering premises, 10 accommodation premises, 8 licenced premises and 3 self-catering accommodation premises. Results for the 1 catering premises are excluded from Table 28.

Table 28 Annual oil expenditure in 2019

Annual oil spend in 2019	25th percentile	50th percentile	75th percentile
Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=10)	£2,722	£4,000	£8,400
Public house, Pub, Bar, Nightclub, Discotheque (n=8)	£1,745	£3,750	£5,600
Self-catering accommodation (n=3)	£22,500	£25,000	£30,650

Expenditure on coal in 2019 was available from 1 catering premises, 2 accommodation premises, 7 licenced premises and 1 self-catering accommodation premises. Results for the 1 catering premises and 1 self-catering accommodation premises are excluded from Table 29. Annual expenditure on coal was lower than for other fuel types, suggesting this is only used as a supplementary energy source, this reflects the results in Table 24 in which only one premises reported coal as the main fuel for space heating. This case was a public house which reported oil as the main fuel for water heating.

Table 29 Annual coal expenditure in 2019

Annual oil spend in 2019	25th percentile	50th percentile	75th percentile
Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=2)	£20	£210	£400
Public house, Pub, Bar, Nightclub, Discotheque (n=7)	£500	£500	£2,250

Expenditure on LPG in 2019 was available from 2 catering premises, 8 accommodation premises, 10 licenced premises and 3 self-catering accommodation premises.

Table 30 Annual LPG expenditure in 2019

Annual LPG spend in 2019	25th percentile	50th percentile	75th percentile
Cafes, restaurants and takeaways (n=2)	£5,400	£5,700	£6,000
Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=8)	£480	£2,000	£3,000
Public house, Pub, Bar, Nightclub, Discotheque (n=10)	£2,500	£3,550	£5,183
Self-catering accommodation (n=3)	£2,900	£5,000	£12,500

Expenditure on dual fuels in 2019 was available from 2 catering premises, 2 accommodation premises, 8 licenced premises and 1 self-catering accommodation premises. Results for the 1 self-catering accommodation premises are excluded from Table 31.

Table 31 Annual dual fuel expenditure in 2019

Annual dual fuel spend in 2019	25th percentile	50th percentile	75th percentile
Cafes, restaurants and takeaways (n=2)	£0	£250	£500
Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=2)	£300	£12,650	£25,000
Public house, Pub, Bar, Nightclub, Discotheque (n=8)	£500	£800	£4,160

Three licenced premises were able to provide expenditure on smokeless fuels in 2019.

Table 32 Annual smokeless fuel expenditure in 2019

Annual smokeless fuel spend in 2019	25th percentile	50th percentile	75th percentile
Public house, Pub, Bar, Nightclub, Discotheque (n=3)	£500	£600	£3,120

Expenditure on other fuels in 2019 was available from 1 catering premises, 5 accommodation premises, 14 licenced premises and 1 self-catering premises. Results for the 1 catering premises and the 1 self-catering accommodation premises are excluded from Table 33.

Table 33 Annual other fuels expenditure in 2019

Annual other fuels spend in 2019	25th percentile	50th percentile	75th percentile
Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=5)	£50	£100	£180
Public house, Pub, Bar, Nightclub, Discotheque (n=19)	£300	£650	£1,400

One licenced premises reported expenditure on anthracite in 2019.

Metering arrangements and end uses

Sub-metering for gas was reported in 4 (6.1%) catering premises, 3 (3.5%) accommodation premises and 3 (3.7%) licenced premises). Smart or automated metering arrangements were reported for 18 (28%) catering premises, 23 (27%) accommodation premises, 5 (6.2%) licenced premises and 1 (10%) self-catering accommodation premises. Four (4.7%) accommodation premises and 1 (1.2%) licenced premises reported receiving gas bills broken down by end use.

Sub-metering for electricity was reported in 4 (6.2%) catering premises and 3 (3.7%) licenced premises and 3 (30%) self-catering accommodation premises). Smart or automated metering arrangements were more common for electricity than gas with smart or automated electricity metering arrangements reported for 19 (29%) catering premises, 30 35%) accommodation premises, 24 licenced premises and 3 self-catering accommodation premises. 5 accommodation premises, (1.2%) licenced premises and 1 (10%) self-catering accommodation premises reported receiving electricity bills broken down by end use.

No sub metering of energy end uses was observed at the verification sites. The verification auditors asked occupiers if they would be able to provide Automatic Meter Reading (AMR), half hourly or manual meter reading derived energy consumption data for their sites, whether for electricity or gas. However, there was not a single instance where this proved possible, despite mains incoming metering being fitted. Some sites simply didn't have an AMR fitted whilst others were either unwilling or more often unable to extract this data from their utility provider – at least according to the person met on site. It is possible this pattern reflected a participation fatigue effect.

Respondents were asked what their most significant drivers of gas consumption were, a total of 176 responses were received. Following analysis these were coded as "Heating", "Catering", "Catering & Heating". The patterns shown in Table 34 reflect what might be expected in the different sub-sectors with catering premises indicating that catering activities are more likely to be the dominant consumer of gas and accommodation premises more likely to indicate heating. The level of detail of free text responses varied considerably for the "Catering" code with some respondents specifying particular pieces of catering equipment (e.g. tandoor oven, grills etc) and others just listing "Kitchen".

Table 34 Most significant gas end-uses

	Cafes, restaurants and takeaways (n=50)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=71)	Public house, Pub, Bar, Nightclub, Discotheque (n=50)	Self-catering accommodation (n=5)
Heating	9	51	23	1
Catering	32	3	17	2
Catering & heating	9	17	10	2

Respondents were asked what their most significant drivers of electricity consumption were, a total of 223 responses were received. The range of equipment mentioned was considerably broader than for gas consumption. Figure 49 to Figure 51 record the equipment types by number of mention, for each sub-sector.

In some verification cases, occupiers could indicate anecdotally which was their most energy intense equipment or areas, for instance, in the case of one of the licenced premises the landlady described to the auditor how their largest consumers on a mains metered energy supply were the kitchen facilities and the beer cellar, however there was no sub-metering installed to verify this or understand the apportionment between the two. Interestingly, in this instance the landlady also made clear their other significant end use was kiln dried logs procured for the wood burning stoves which provided additional heating to the restaurant space.

Figure 48 Catering premises - largest electrical consumers by mention (n=58)
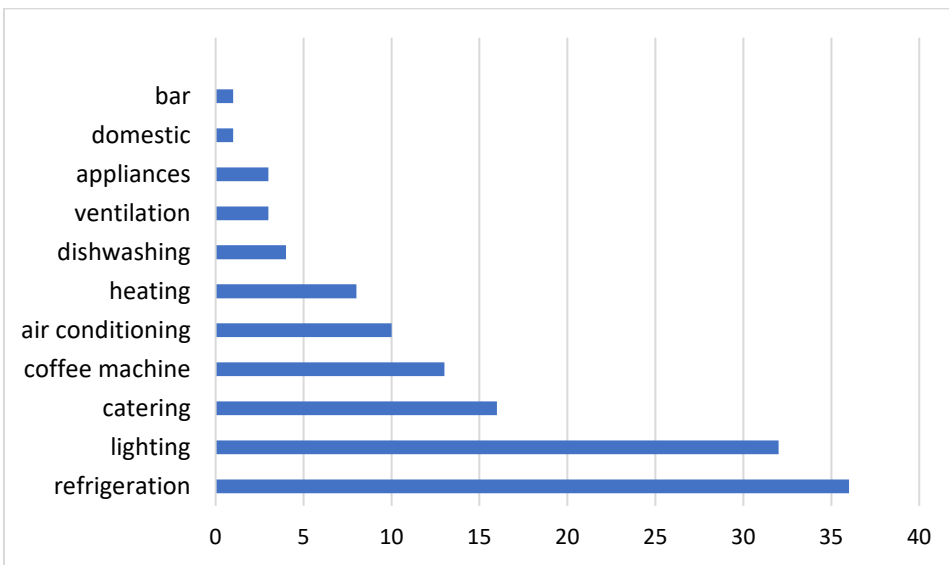
Figure 49 Accommodation premises - largest electrical consumers by mention (n=77)
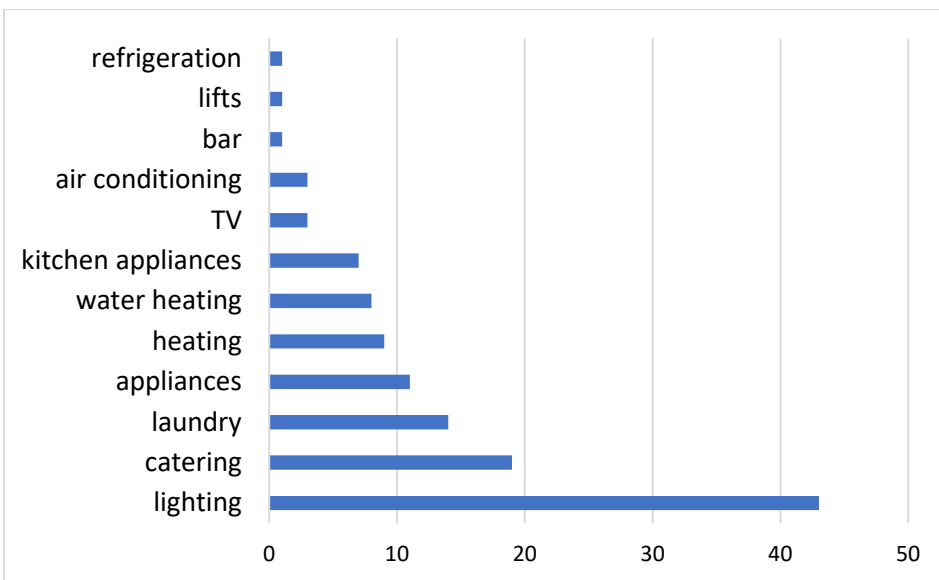
Figure 50 Licenced premises - largest electrical consumers by mention (n=70)
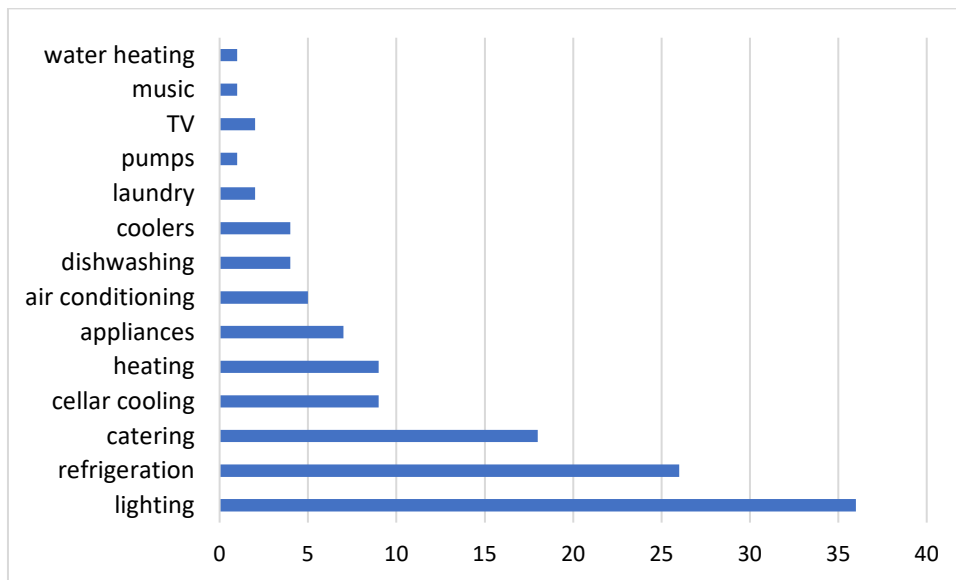
Figure 51 Self-catering accommodation premises - largest electrical consumers by mention (n=8)
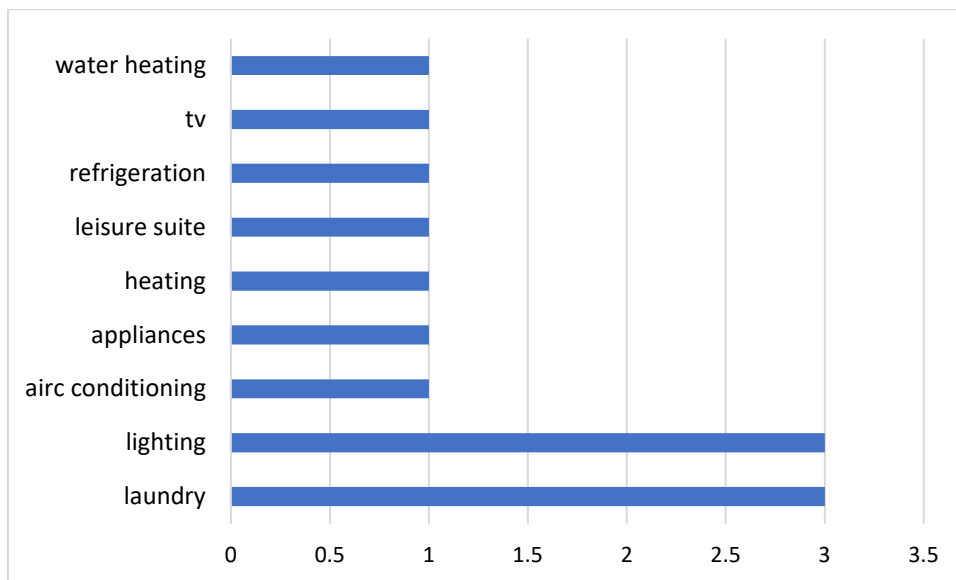
Heating, ventilation and air-conditioning systems

181 premises (73%) were able to confirm whether or not their premises were served by a dedicated heating and ventilation system. Catering premises were more likely to be served by central plant provided by their landlord (6.5%) or to have a mix of dedicated and central services (10%). However, across all sectors, a dedicated system under the direct control of the respondent was the most likely arrangement (Catering premises 77%, accommodation premises 96%, licenced premises 91% and self-catering accommodation premises 88%).

22% of respondents (n= 54) provided details of electrical heating equipment. The most common form of electrical heating system in all sub-sectors except accommodation premises was an electric boiler. In accommodation premises it was individual room heaters. In total, 5

respondents reported using air source heat pumps. The breakdown of responses is shown in Figure 52.

Questions relating to specific heating technologies used on sites demonstrated several instances of remote survey answers being different to verification answers, this is a technical area and may reflect the difference in knowledge between the remote survey respondent and the auditor about the names of different system types.

Figure 52 Presence of electric heating equipment
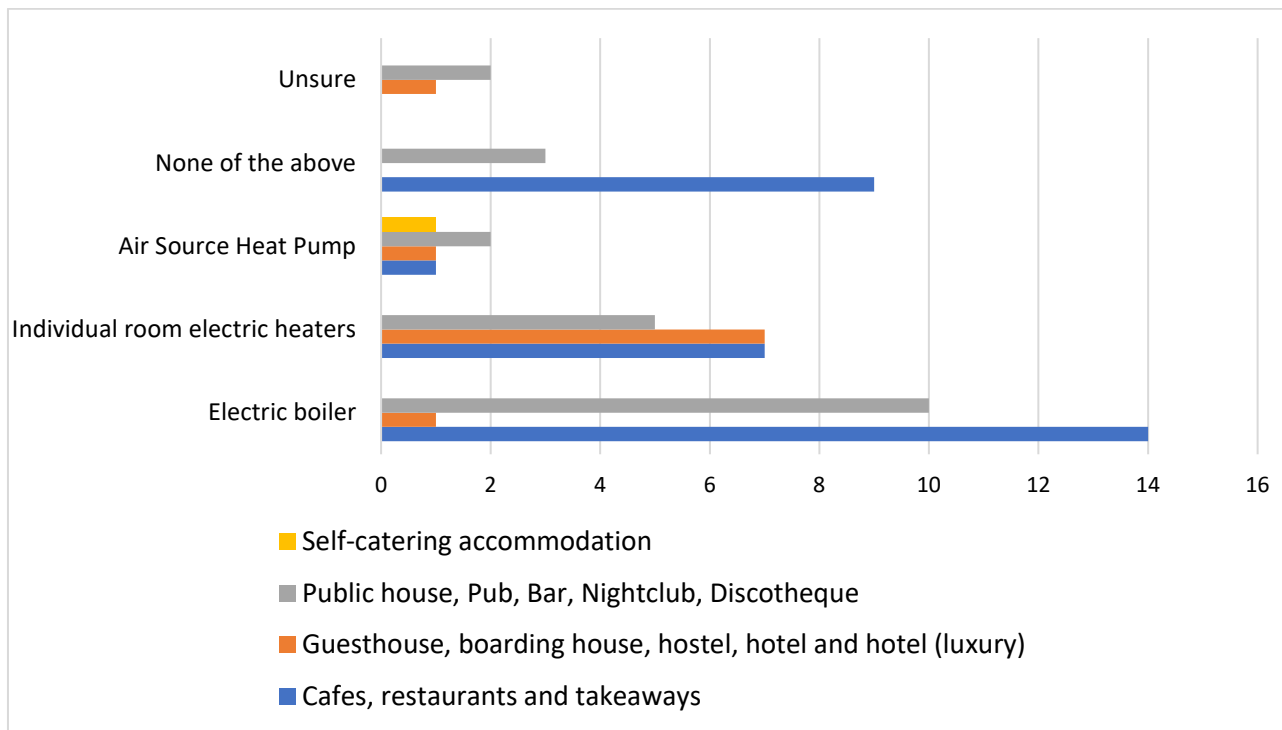
50% of respondents (n= 123) provided details of fossil-fuel heating equipment. The most common forms of equipment for catering premises were condensing combi boilers with hot water storage and combi boilers. For accommodation premises the most common form of equipment was a condensing combi boiler with hot water storage while for licenced premises combi boilers were most common. One accommodation premises and 2 licenced premises reported using CHP. The breakdown of responses is shown in Figure 53.

Figure 53 Presence of fossil fuel heating equipment
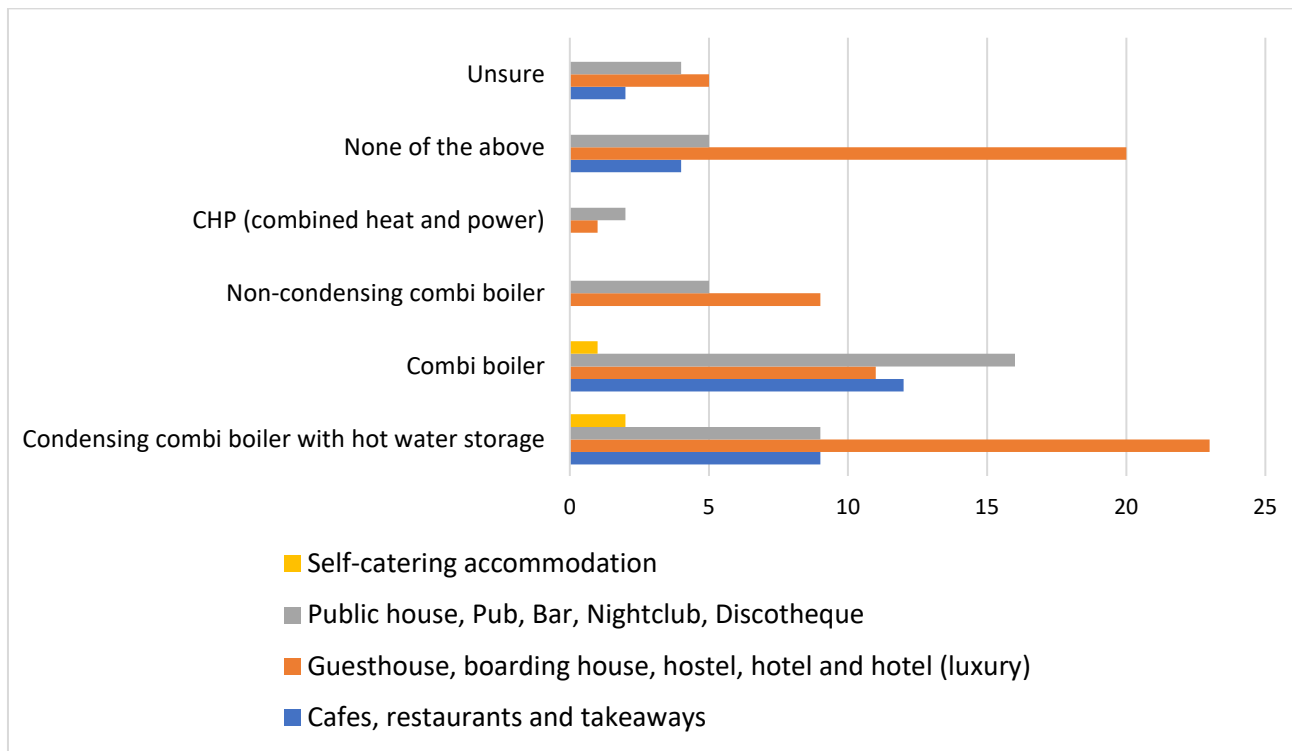
Two accommodation premises and 1 licenced premises reported the presence of solar thermal heating and 1 catering premises and 2 accommodation premises reported the presence of biomass boilers.

89% of respondents (n=217) provided details of their heat distribution system as shown in Figure 54. Radiators dominated in all sub-sectors with hot-air systems proportionately more common in catering premises than in other sub-sectors.

Figure 54 Heating distribution systems

64% of respondents (n= 158) were able to provide details of when the last substantial investment in the heating system took place. Catering premises were most likely to have

replaced systems since 2019 with licenced premises the most likely to report over 18 years since investment.

Table 35 Timing of last substantial investment in heating system

	Cafes, restaurants and takeaways (n=25)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=51)	Public house, Pub, Bar, Nightclub, Discotheque (n=37)	Self-catering accommodation (n=5)
After 2019	16	20	16	1
Between 2010 and 2019	8	27	14	4
Between 2005 and 2009	1	0	1	0
Pre 2005	0	4	6	0

The majority of respondents reported recent repairs in all sub-sectors, in some cases respondents noted that regular repairs were needed due to the age of the system.

Table 36 Timing of last repair of heating system

	Cafes, restaurants and takeaways (n=21)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=40)	Public house, Pub, Bar, Nightclub, Discotheque (n=34)	Self-catering accommodation (n=6)
After 2019	17	35	24	6
Between 2010 and 2019	4	4	9	0
Between 2005 and 2009	0	1	1	0
Pre-2005	0	0	0	0

The majority of respondents in all subsectors reported that heating was controlled by a thermostat (catering premises 64%, accommodation premises 73%, licenced premises 86% and self-catering accommodation premises 88%) n=217.

88% of respondents (n=217) provided information on the percentage of space heated on a typical day when the heating was running. In all subsectors except self-catering accommodation, some respondents noted that no areas were heated as shown in Figure 55. The higher level of uncertainty in the self-catering accommodation sector may reflect the degree of control that occupants have. Accommodation premises are the only sub-sector in which more than half of respondents reported that all of the premises were heated.

Figure 55 Percentage of space heated on a typical day in 2019 when heating is on
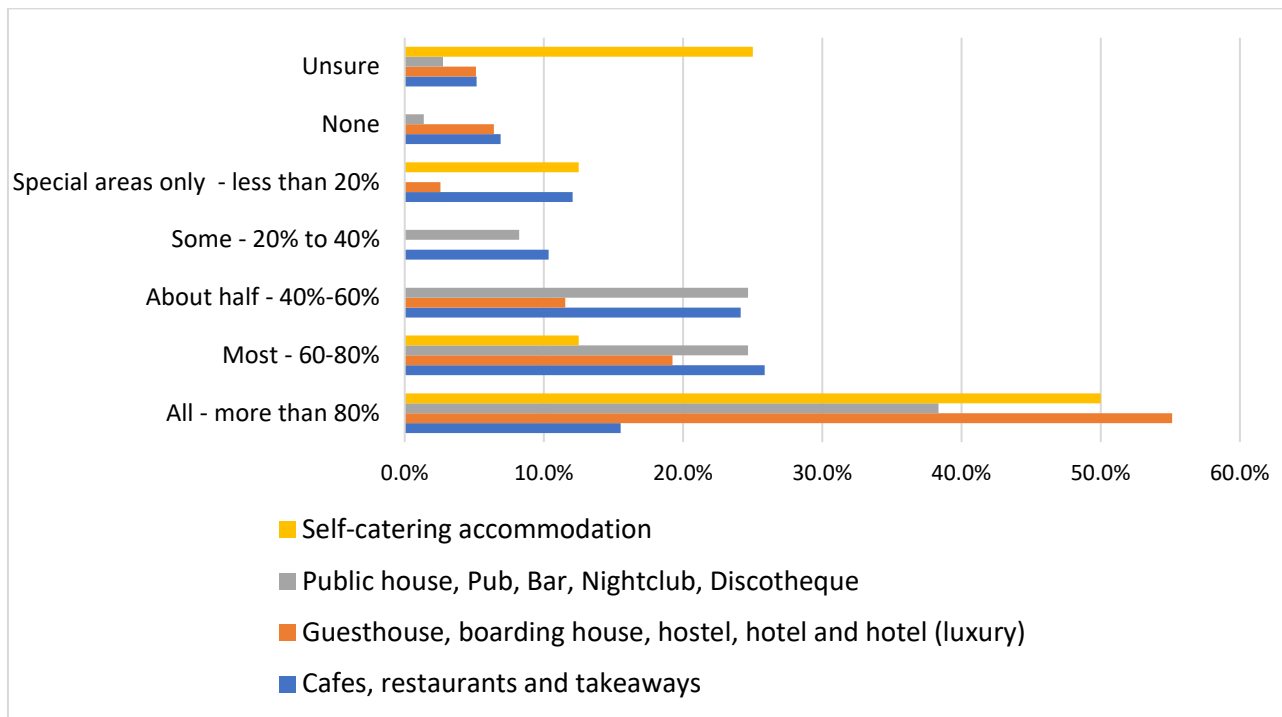
Over 80% of respondents in catering, accommodation and licenced premises (n=197) were able to provide the number of hours that heating was running on a typical day in 2019. For self-catering accommodation the percentage was lower, 60% (n=6) perhaps reflecting the degree of control occupants have. The hours of heating are longer for accommodation and self-catering accommodation than for catering and licenced premises which seems to reflect opening hours in the different sub-sectors.

Figure 56 Hours of heating per day in 2019
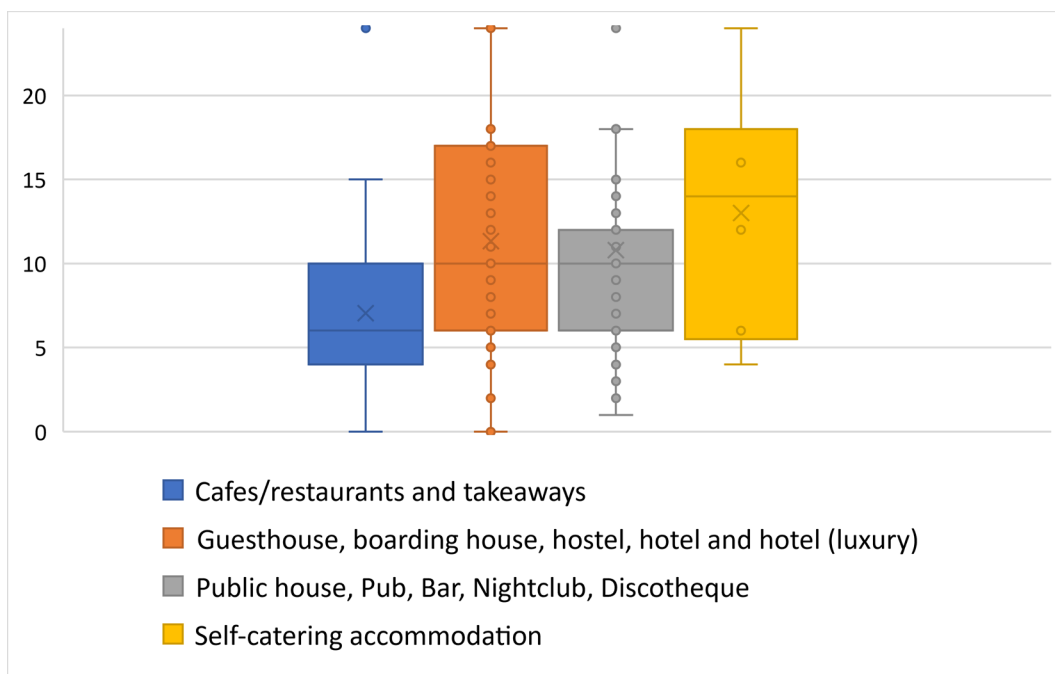
During verification audits there were no instances observed where a hospitality retail unit i.e. a café or take away, had a fully integrated Building Management System (BMS) installed, even where a unit formed part of a larger building which might have had a BMS for communal plant.

Commonly independent controllers were being used to control separate plant items, for instance manual kitchen extract controllers and wall mounted controllers or remote controls used for the controls of Split air-conditioning used for retail unit heating and cooling. Overall, there was a lack of integrated controls throughout the portfolio of sites audited; controls controlled single plant items in isolation from each other, rather than balancing the needs of two separate requirements, for instance the provision of heat with the provision of fresh air. Though there were no BMS systems to interrogate regarding run hours it was possible to establish through conversation with audit hosts the average hours per day that heating systems were run on site.

88% of respondents (n=217) were able to provide details of ventilation modes in their premises. The dominant ventilation type in catering, accommodation and licenced premises was openable windows supplemented by extract fans in special areas. For self-catering accommodation premises the dominant type was openable windows. Only 8.3% of all premises reported a central system for ventilation for most or all parts of their premises.

Table 37 Ventilation modes

	Cafes, restaurants and takeaways (n=58)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=78)	Public house, Pub, Bar, Nightclub, Discotheque (n=65)	Self-catering accommodation (n-8)
Openable windows EVERYWHERE	13.8%	20.5%	16.4%	62.5%
Openable windows in MOST areas, PLUS extract fans in special areas (e.g. kitchens or toilets)	67.2%	76.9%	69.9%	37.5%
Ventilation from a CENTRAL SYSTEM in MOST or ALL of your areas	15.5%	1.3%	11.0%	
Unsure	3.4%	1.3%	2.7%	

70% of respondents (n= 172) were able to provide an estimate for the proportion of their premises which used mechanical ventilation. In all sub-sectors, the majority of respondents indicated that mechanical ventilation was used only in special areas. Across all sectors only 8% of respondents reported mechanical ventilation in most or all of their premises (none of these were self-catering premises).

Figure 57 Area covered by ventilation
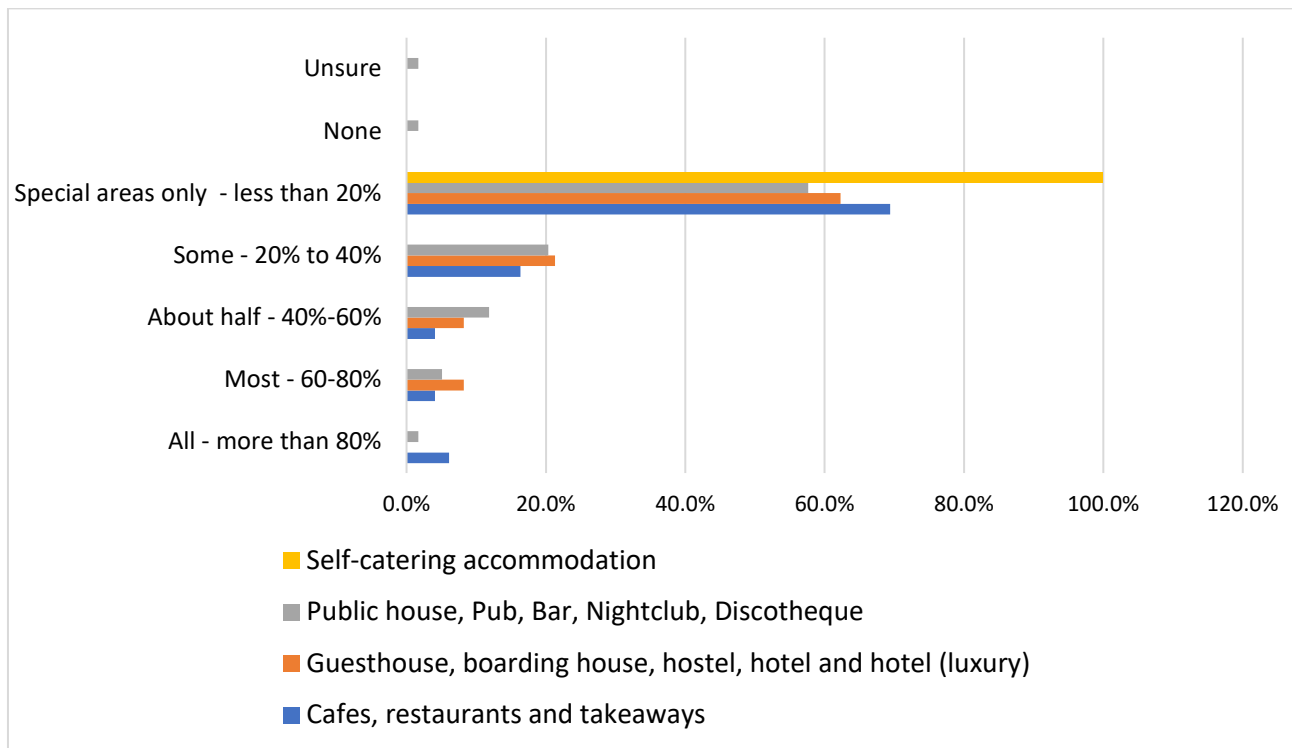
Across all sub-sectors only 19 respondents were able to provide details of ventilation controls. The majority of premises reporting some form of controlled ventilation were catering premises.

Figure 58 Ventilation controls
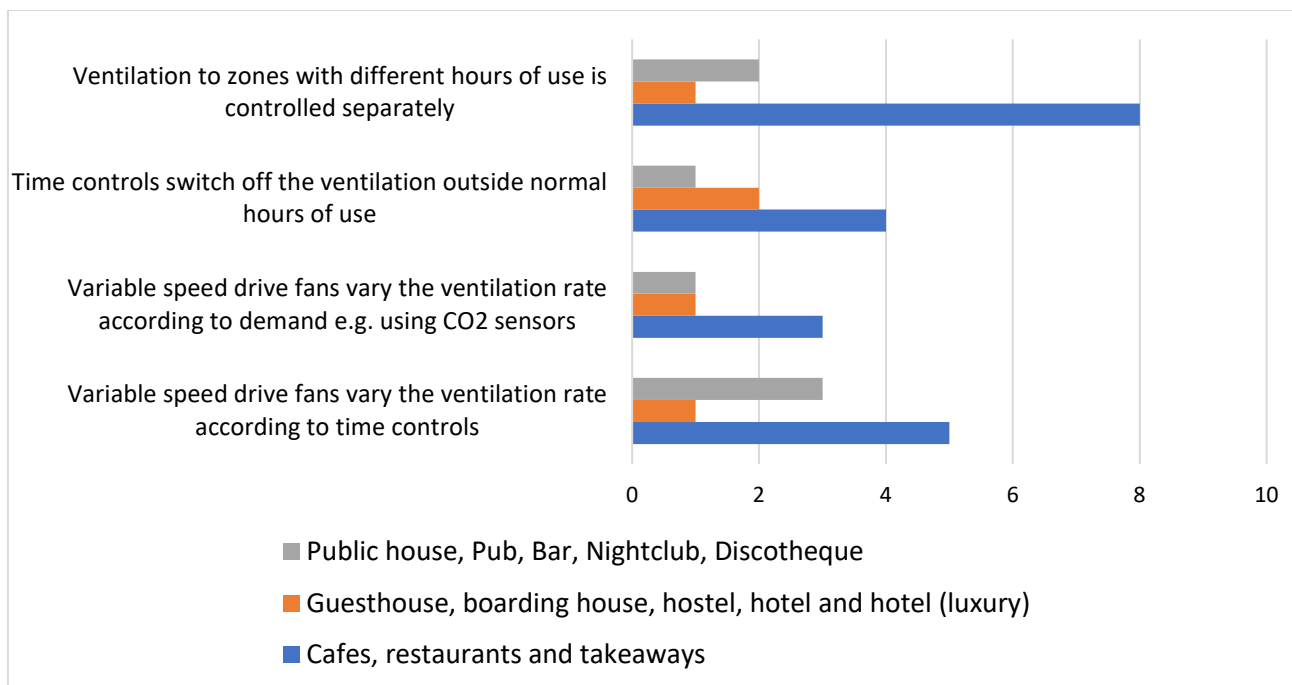
116 respondents across all sub-sectors were able to provide details of the last time the ventilation system had seen substantial investment. Accommodation premises were the mostly likely to have seen very recent significant investment. Across all sub-sectors, 56 premises reported that ventilation systems had never been replaced.

Table 38 Timing of last substantial investment in ventilation system

	Cafes, restaurants and takeaways (n=18)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=33)	Public house, Pub, Bar, Nightclub, Discotheque (n=25)	Self-catering accommodation (n=3)
After 2019	8	25	12	2
Between 2010 and 2019	7	6	10	1
Between 2005 and 2009	2	0	1	0
Pre-2005	1	2	2	0

Across all sub-sectors, 103 respondents reported that ventilation systems had never been repaired. 51 respondents were able to indicate when the ventilation system had last been repaired. In all sub-sectors, repairs were most likely to have been carried out in the previous 3 years.

Table 39 Timing of last repair of ventilation system

	Cafes, restaurants and takeaways (n=11)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=17)	Public house, Pub, Bar, Nightclub, Discotheque (n=21)	Self-catering accommodation (n=2)
After 2019	10	16	18	2
Between 2010 and 2019	1	1	3	0
Between 2005 and 2009	0	0	0	0
Pre-2005	0	0	0	0

214 respondents were able to indicate the proportion of floor area covered by mechanical cooling or air-conditioning. Accommodation and self-catering accommodation premises were dominated by premises with no air-conditioned floor space. Catering and licenced premises were evenly distributed between those with some proportion of air-conditioned space and those with none as shown in Figure 59.

Figure 59 Area covered by mechanical cooling or ventilation
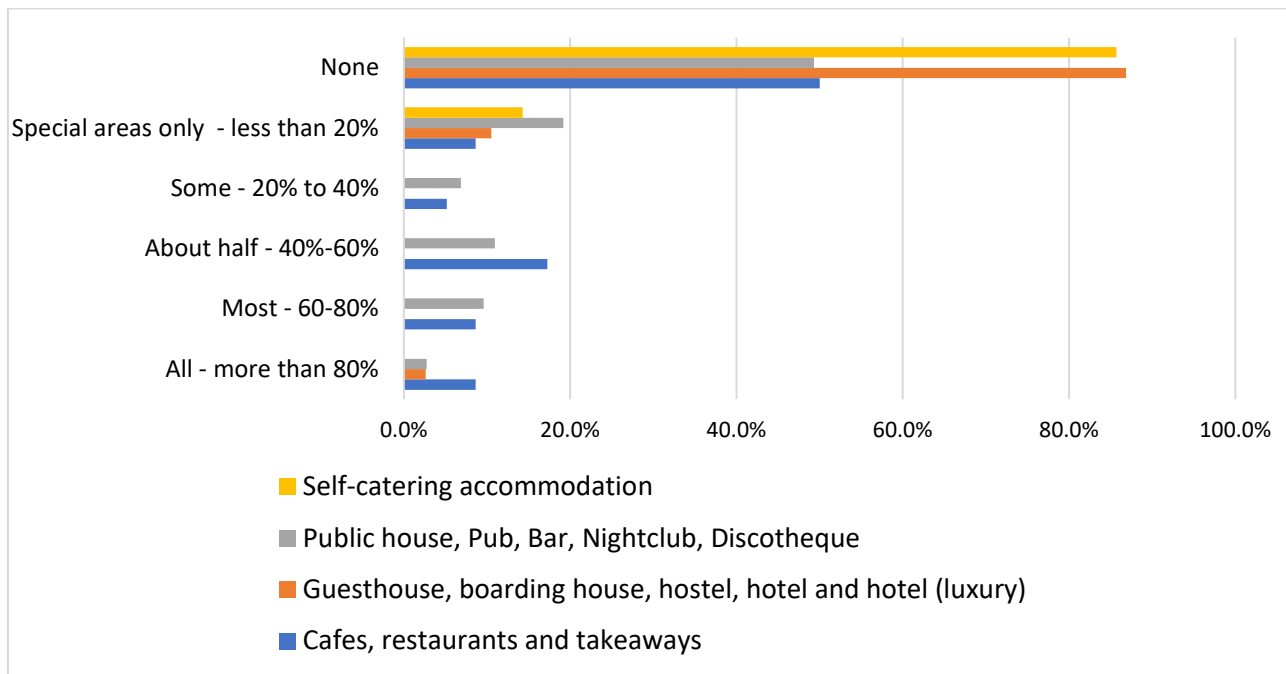
Across all sub-sectors, 30 respondents provided details of cooling systems. Local units were the most commonly reported system for licenced and catering premises while central systems were more common for accommodation premises.

Figure 60 Types of cooling system
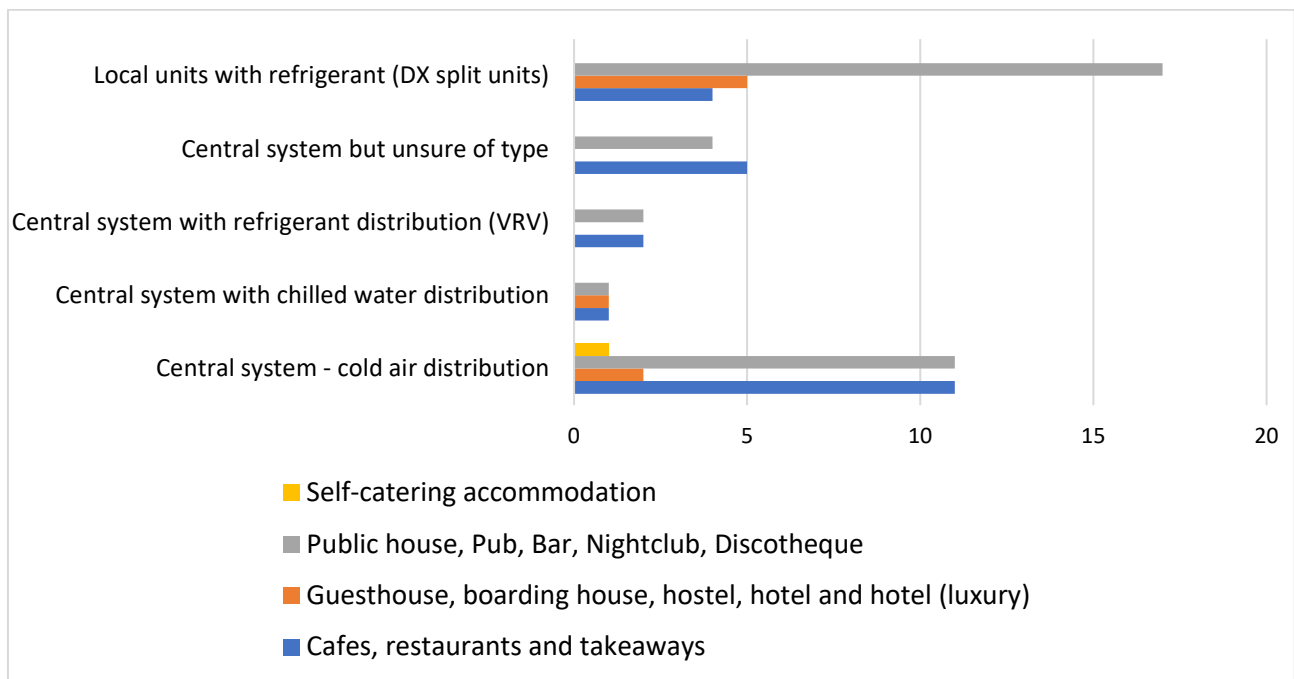
Across all sub-sectors, 30 respondents indicated that the cooling system had never been replaced.

Table 40 Timing of last substantial investment in cooling system

	Cafes, restaurants and takeaways (n=7)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=6)	Public house, Pub, Bar, Nightclub, Discotheque (n=18)	Self-catering accommodation (n=0)
After 2019	3	3	7	0
Between 2010 and 2019	3	3	8	0
Between 2005 and 2009	0	0	2	0
Pre-2005	1	0	1	0

Across all sub-sectors, 38 respondents indicated that repairs had never been made to the cooling system. Across catering, accommodation and licenced premises, where repairs had been made, this was predominantly in the last 3 years.

Table 41 Timing of last repair in cooling system

	Cafes, restaurants and takeaways (n=6)	Guesthouse, boarding house, hostel, hotel and hotel (luxury) (n=3)	Public house, Pub, Bar, Nightclub, Discotheque (n=17)	Self-catering accommodation (n=1)
After 2019	5	3	12	0
Between 2010 and 2019	1	0	5	1
Between 2005 and 2009	0	0	0	0
Pre-2005	0	0	0	0

Across all sub-sectors, 77 respondents provided details of cooling controls, in all sub-sectors, temperature controls were most common followed by time controls as shown in Figure 61.

Figure 61 Cooling controls

Figure 62 Cooling strategies
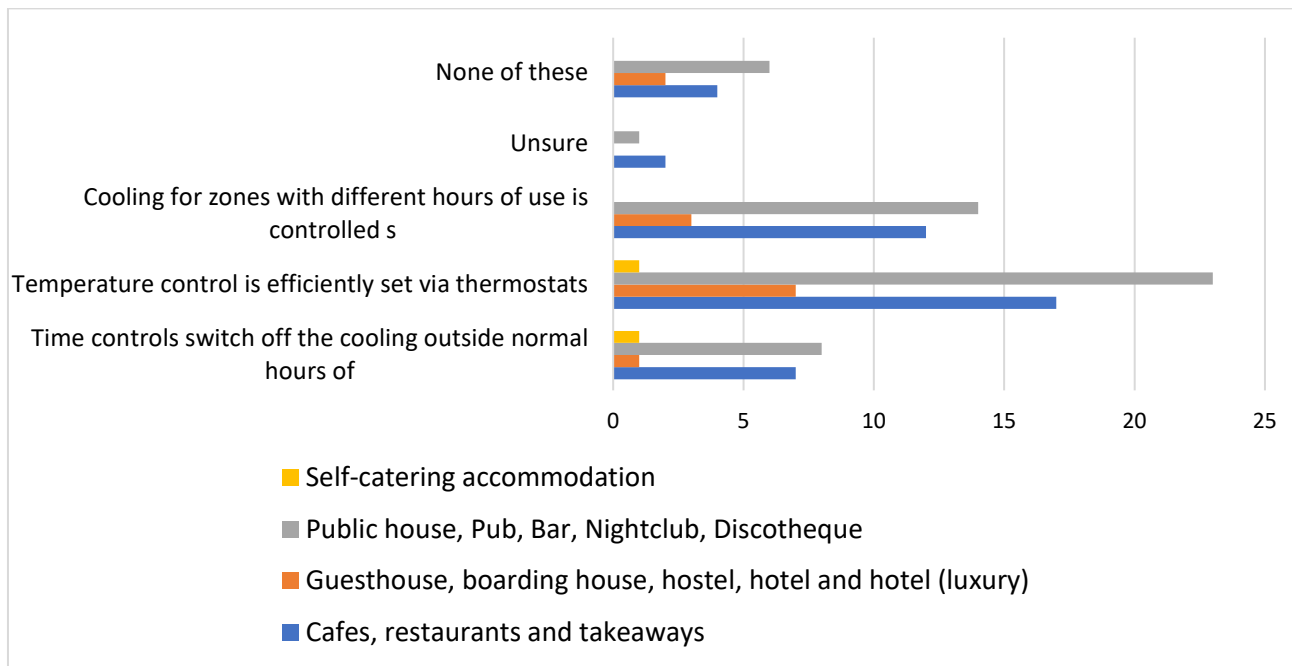
Across all sub-sectors, 77 respondents provided details cooling strategies and needs.
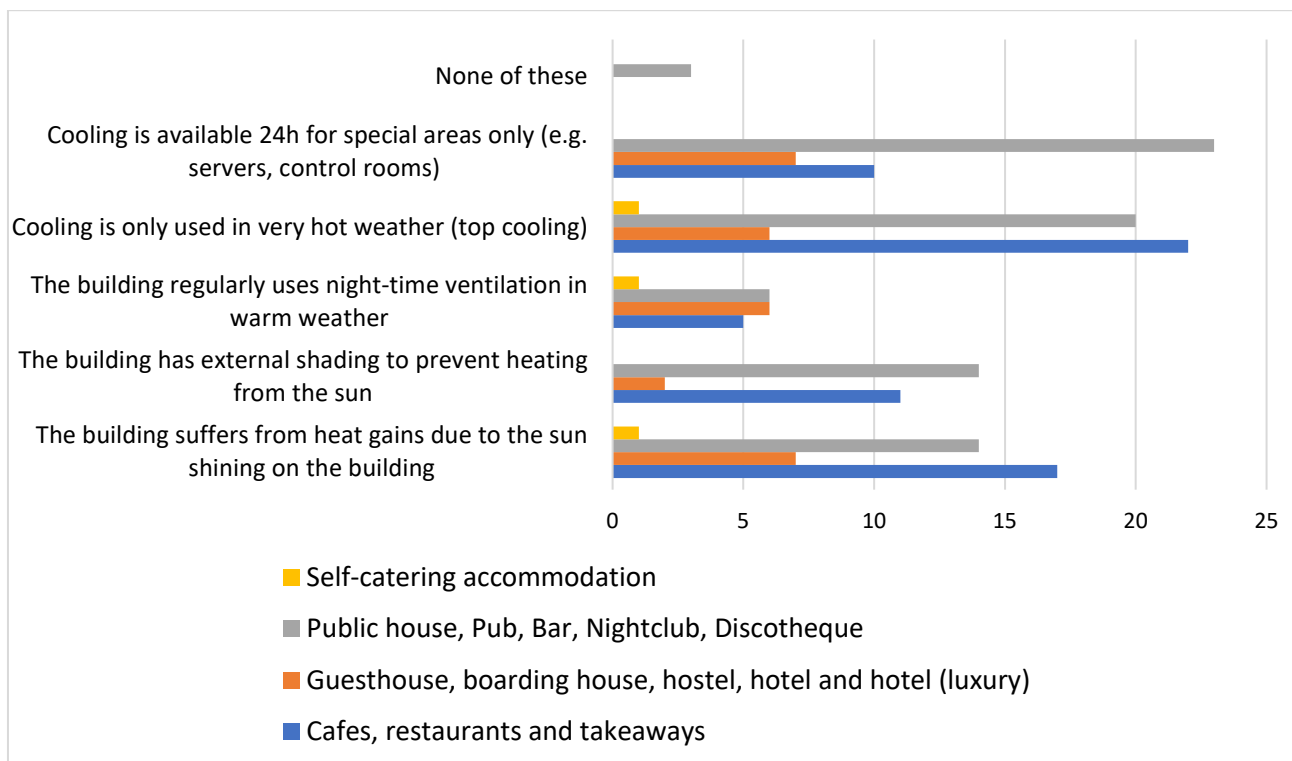
Across all sub-sectors, 73 respondents provided details of the number of months cooling was operational each year (catering premises 40%, accommodation premises 12%, licenced premises 44% and 1 self-catering accommodation premises). Accommodation premises had the largest variation in responses and the highest median response (7 months).

Figure 63 Number of months cooling system in use
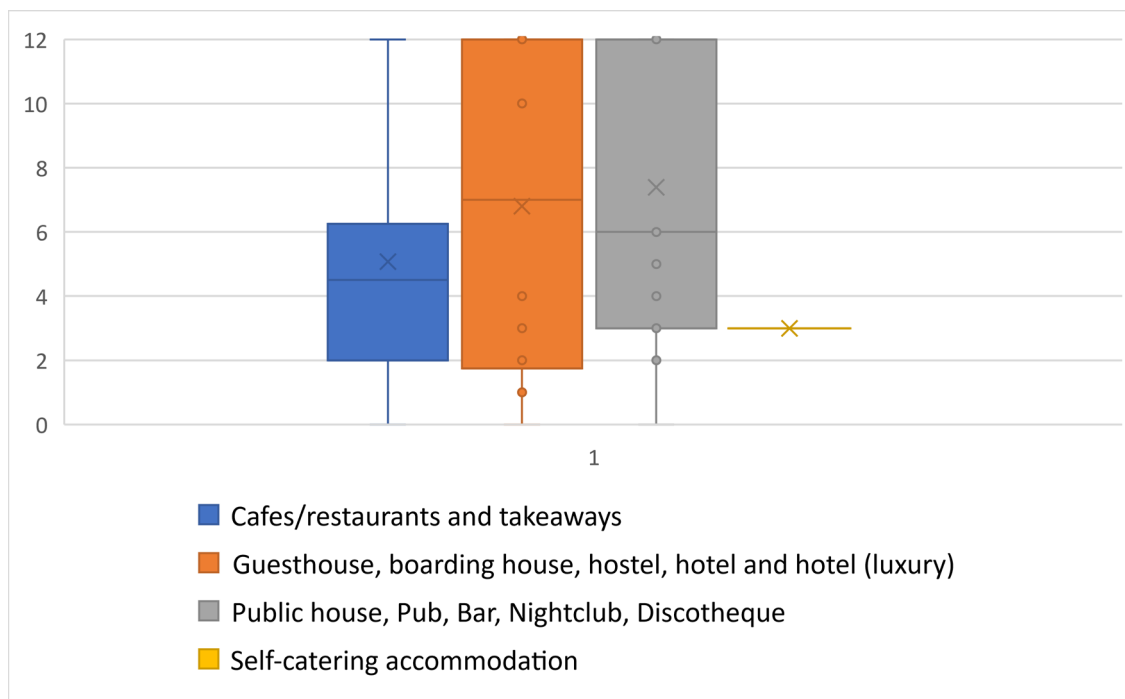
Low carbon and renewable technologies

A total of 10 respondents reported some form of renewable or low carbon energy supply. Photovoltaic panels were reported in one catering premises, 5 accommodation premises, one licenced premises and 2 self-catering accommodation premises. One accommodation premises reported a gas boiler with a heat recovery system.

Hot water

Supplementary electric heating for hot water was reported by 16% of respondents (catering premises 21%, accommodation premises 13%, licenced premises 14% and self-catering accommodation premises 14%) n=212.

Equipment

Respondents were asked a series of questions about the main energy consuming equipment in their premises and its operation. Verification surveys indicated a number of discrepancies with the remote survey results. A question concerning the provision of laundry facilities on site produced the highest incidence of incorrect answers across the entire sample, either where facilities were confirmed to be on site when not expected or not on site when they were.

A cluster of deviations can be observed in the answers relating to the types of meal served by commercial kitchens, this is surprising given food is core business in the hospitality sector so it is possible these discrepancies come from different naming conventions rather than answers being materially wrong at any stage.

Questions relating to the presence of laundry equipment, fridges and their ages again demonstrated relatively frequent variances between responses, there was a prevalence of answers being similar but not quite matching and also of additional information being provided through verification audit compared to that secured by remote survey.

There were some marked variances in responses relating the specific use patterns of certain equipment, in particular some large variances occurred in the number of times a site reported using a glasswasher, in one case the variance documented is nearly 100 washes per day, the implications of this variance for the understanding of demise EUI and its constituent parts are significant in these cases as the verification audit confirmed a higher number of uses per day than the remote survey. It is possible that the usage rate reported in the remote survey was accurate at the time of survey and had changed by the time of the verification audit, in which case this also demonstrates the variable nature over time of unregulated loads in the hospitality sector.

Figure 64 Equipment types
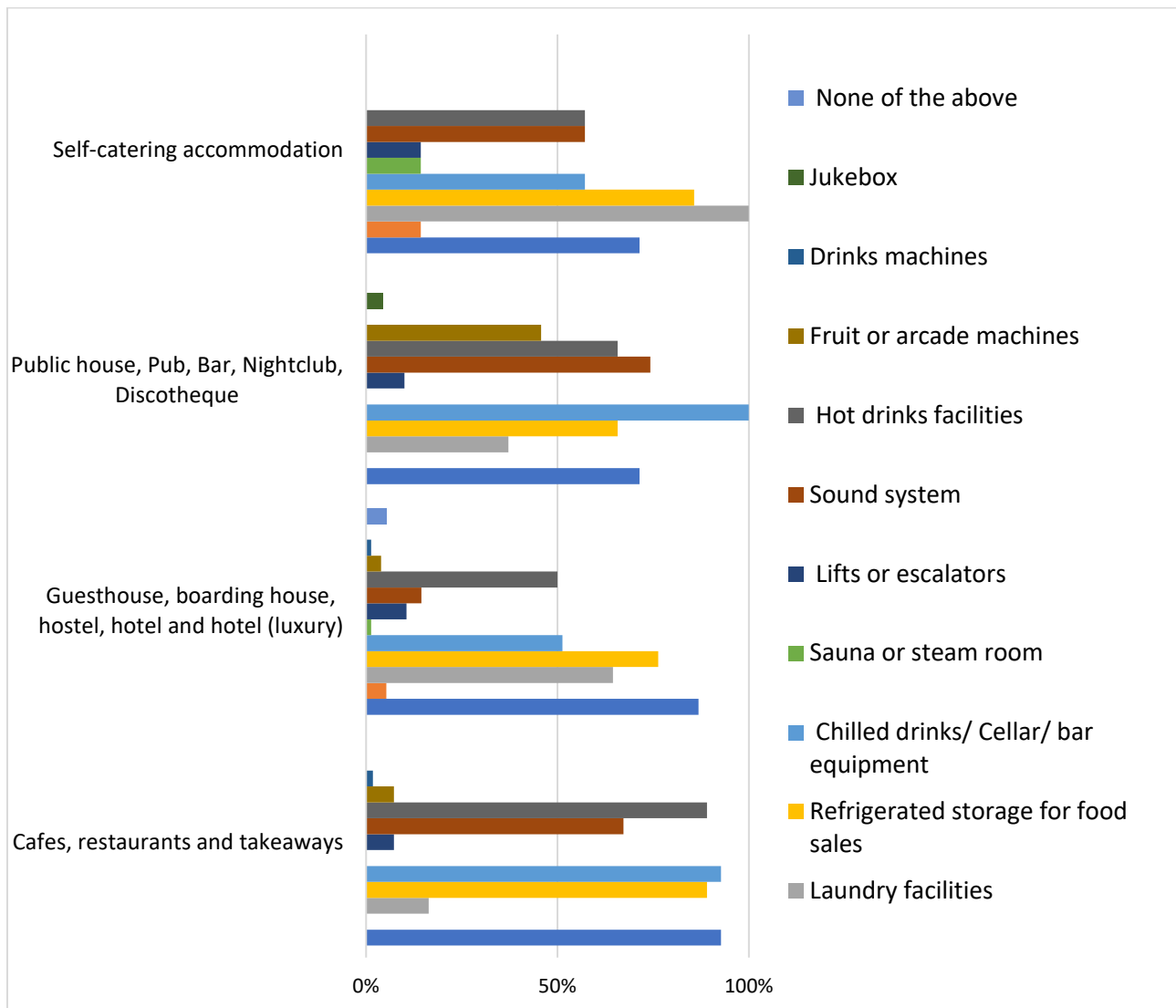
Energy Management

83% of respondents (n=204) identified who was responsible for energy management in their premises. Specialist support for energy management was infrequent in all sectors but particularly in accommodation premises (4%) and not present in self-catering accommodation premises.

Figure 65 Energy management responsibility
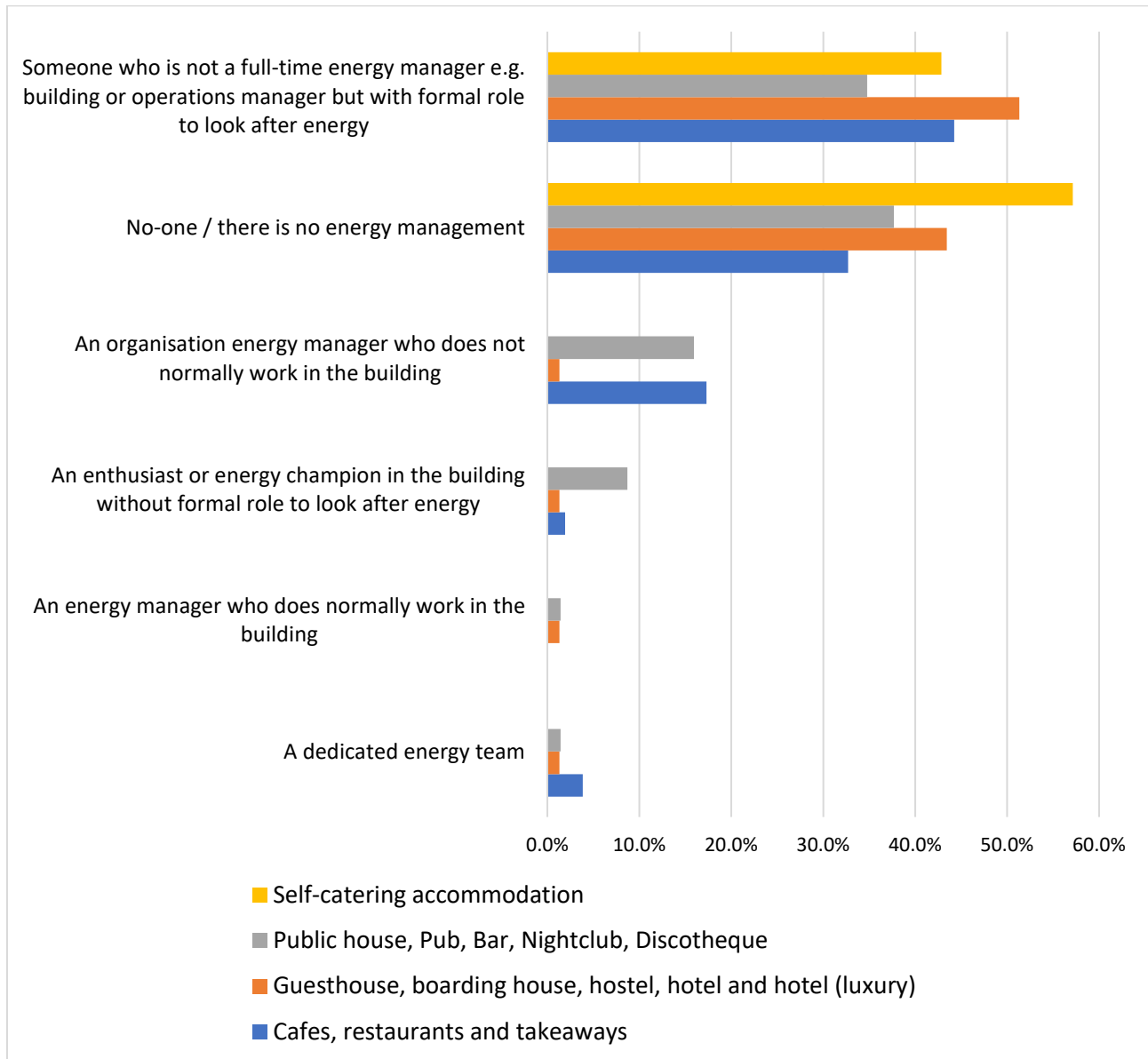
83% (n=204) of respondents reported having taken steps to improve energy efficiency in the last 5 years (catering premises 60%, accommodation premises 75%, licenced premises 62% and self-catering accommodation premises 86%. Figure 66 shows the actions which were taken, the patterns are similar across all sub-sectors with improvements to fabric, systems and behaviour change the most common. In all sub-sectors, only a small proportion had undertaken an energy audit or increased energy management expertise within the organisation.

Figure 66 Energy management actions
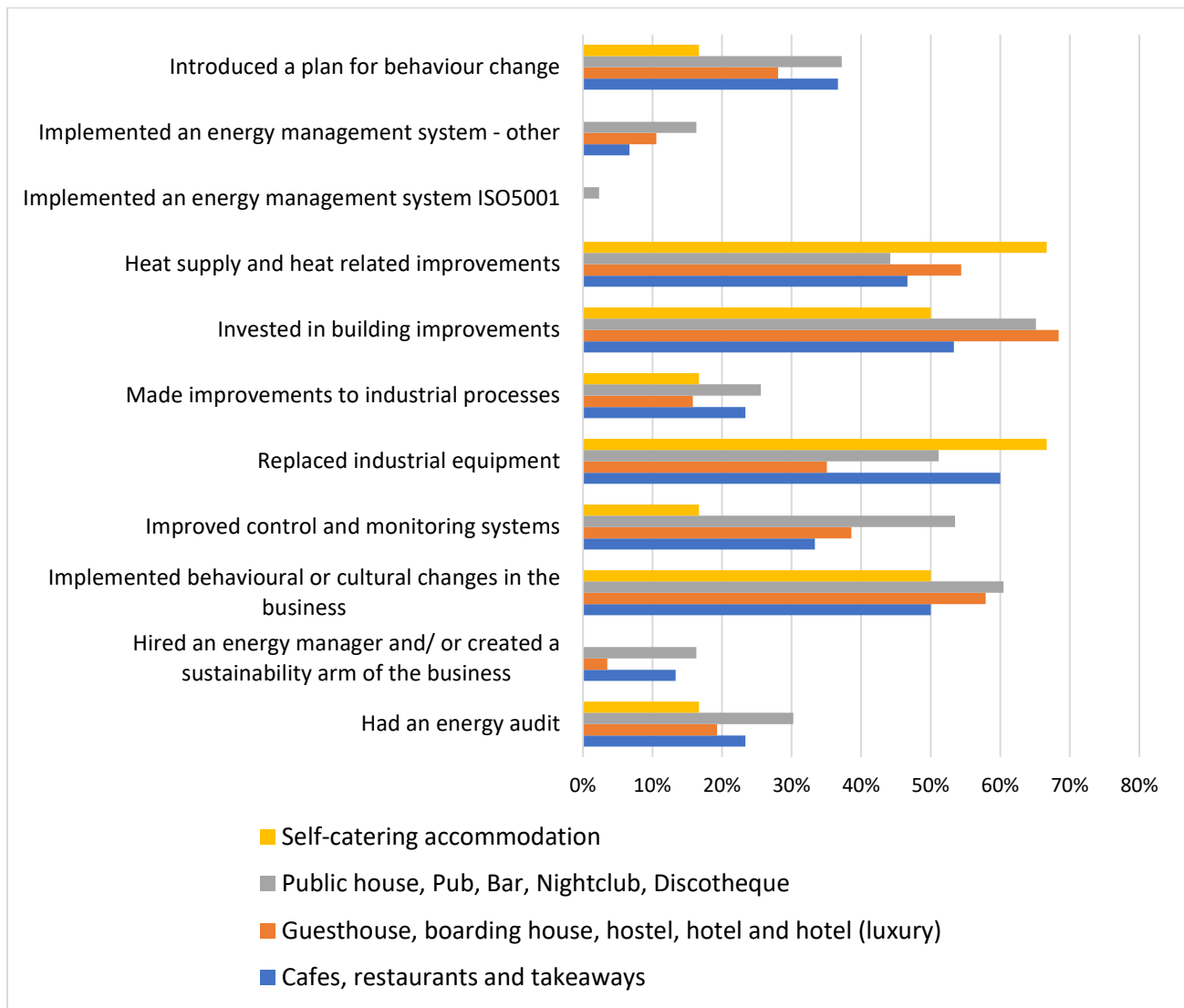
Government support

Respondents were asked what they would use funding support for if it were available. 114 respondents indicated a use for funding; these responses were coded and are shown in Figure 67. The total number of responses shown is greater than 114 as some respondents indicated multiple needs. The range of measures for which respondents would use funding varied by sub-sector with catering premises being more likely to focus on equipment upgrade and accommodation premises more likely to focus on upgrades of building systems and fabric. Seven respondents indicated that they required specialist advice around energy efficiency. It is notable that age and listed status of the premises were mentioned by 21 respondents as an important factor constraining their ability to invest, either because the measure was prohibitively expensive (replacing glazing) or non-permitted (installation of PV panels). This reflects the very high levels of listing or conservation status across the sector with catering, accommodation and licenced premises all having more than 50% of premises by count and by floor area in premises which are either listed or in a conservation area as shown in Figure 18 and Figure 19.

Figure 67 Government funding support needs
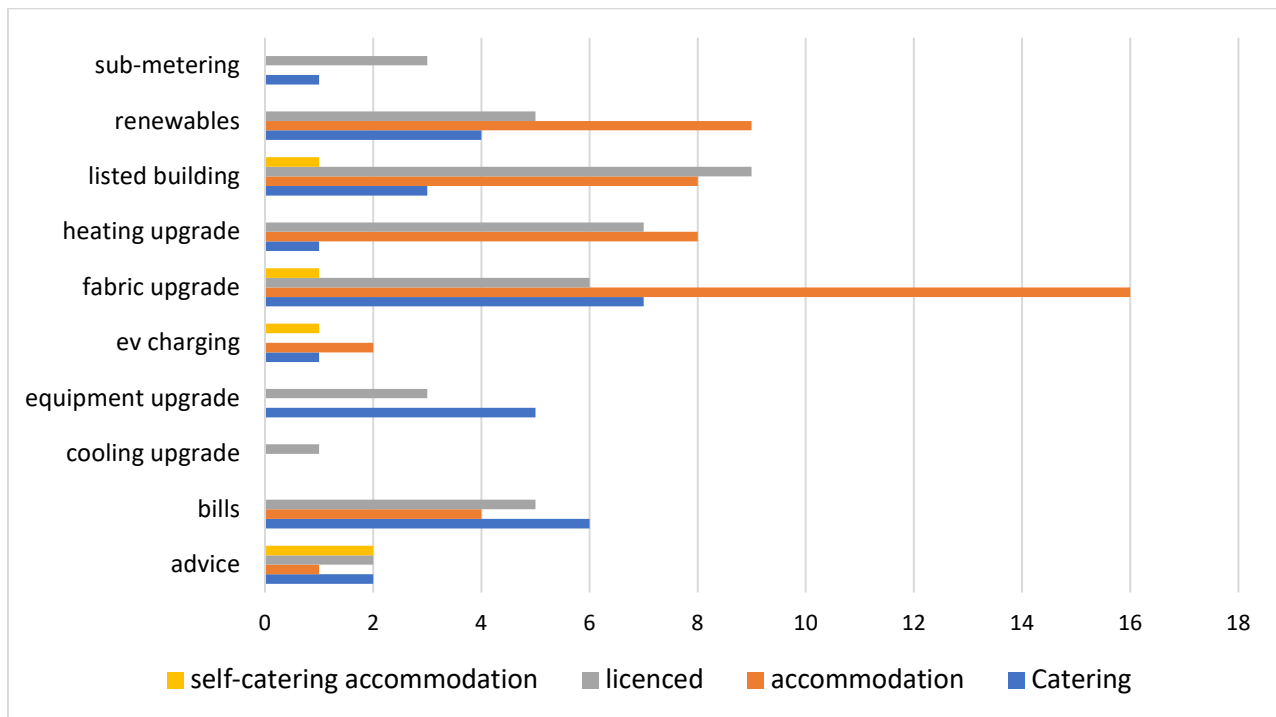
71 respondents identified other government support which would help reduce energy consumption for their premises. The range of responses was broader than for the identified funding support and the need for education and specialist advice was more prominent. The most reported need was for support to reduce energy consumption in listed and historic buildings (n=13) followed by reduction in energy costs (n=12).

Figure 68 Other government support needed
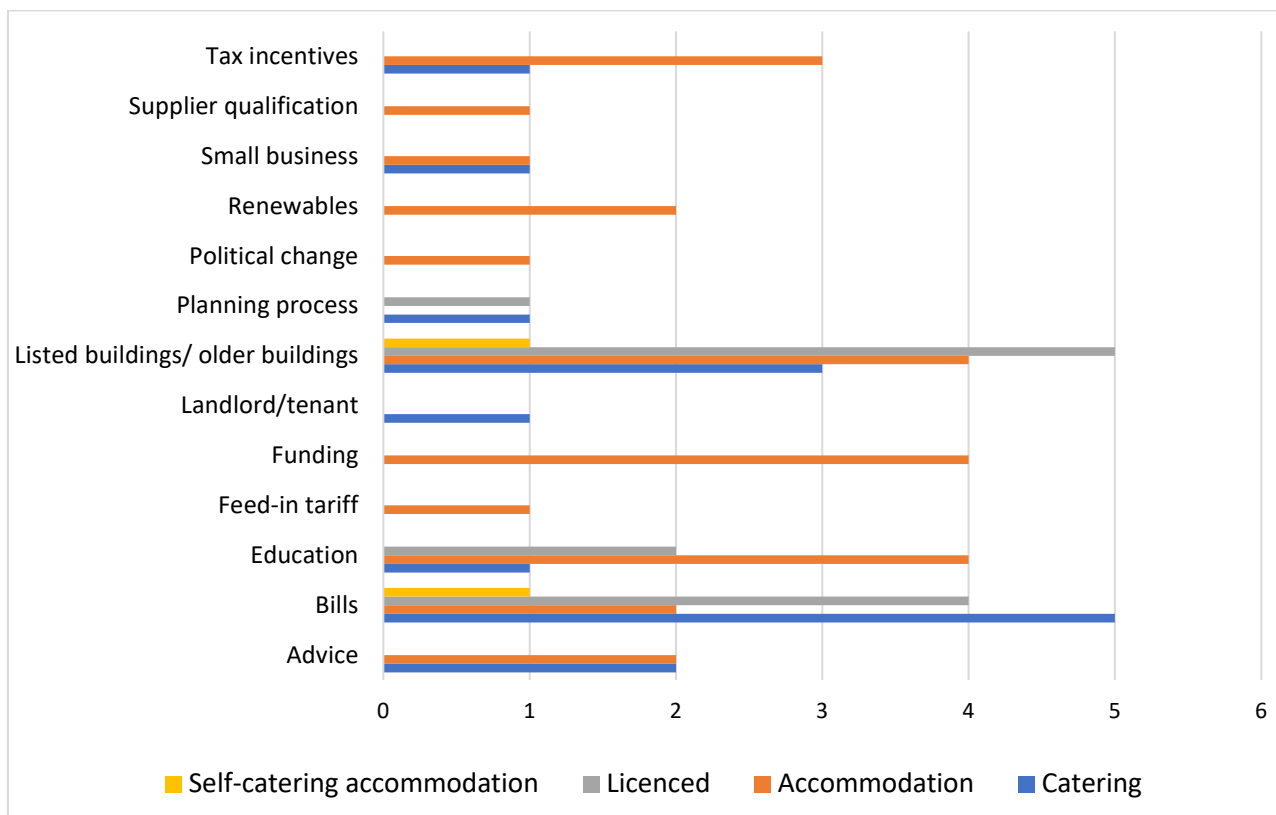
Lessons learned from surveys

A key difference between this study and previous approaches has been the availability of building-by-building secondary data for the bulk of the stock. As a result, surveys have been used to gain additional insights rather than as the core data source. The remote and verification surveys were originally programmed to take place after analysis of secondary data. However, the original programme did not reflect the complexities of data sharing arrangements between government departments and it became necessary to design and undertake the surveys prior to the completion of data analysis. As a result, surveys were less finely calibrated to data gaps than they might have been. It should also be noted that the need to attach contact details to premises is likely to have biased surveys towards more established businesses in less complex premises – it is notable that the proportion of survey respondents in mixed use premises is lower than in the population as a whole (catering premises 30% vs 51%, accommodation premises 44% vs 87%, licenced premises 35% vs 80% and self-catering accommodation premises 55% vs 80%). Nonetheless, the surveys were able to provide a range of additional insights which would not have been possible from the secondary data alone:

- At best only partial insights into patterns of operation and occupation are possible from the secondary data, web-scraping data obtained from Oxford Partnerships could indicate peak periods of occupancy by customers but not periods when only staff are present. Energy Performance Certificates (EPC) and VOA data show the overall building environment but cannot show hours of operation. EPC data can be used to show the proportions of space served by different building systems but not whether those systems are in regular use. This is particularly important for air-conditioned spaces where only a small proportion of surveyed premises had full air conditioning coverage in practice. In future it may be possible to gain further insights from textual analysis of narrative fields in the air conditioning inspection reports although this was not possible during this study.

- Surveys allowed respondents to highlight what they considered to be the most significant challenges facing them. A key example of this was the focus on the limitations imposed by listed and conservation area status in the Hospitality activity class when respondents were asked to identify areas where government support was needed.

- It was anticipated that details of equipment types, age and patterns of use could be identified through the surveys. However, verification surveys indicated that details provided by remote survey respondents were often incomplete and, in some cases, incorrect, highlighting the importance of the verification surveys.

- It is clear from the literature that energy consumption in commercial kitchens is primarily driven by manner of operation of equipment rather than by the type of equipment and the volume of meals served[15], for example whether equipment is switched off when not in use. This level of detail would only be possible from on site surveys which were beyond scope of this study

- Remote surveys were originally designed to enable dynamic thermal simulation models to be developed of the stock. However, for this sector, the importance of catering energy and the challenges of modelling it accurately meant this was ultimately not considered to be a robust strategy although it would appropriate for other activity classes. The

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[15] Mudie, S., & Vadhati, M. (2017). Low energy catering strategy: Insights from a novel carbon-energy calculator. *Energy Procedia*, *123*, 212–219. https://doi.org/10.1016/j.egypro.2017.07.244

primary aim of the simulation modelling was to identify the split of energy end uses on each site. The breakdown of energy end-uses identified in the EPC surveyor data was preferred as a source for this information given the more detailed surveys undertaken and the extensive coverage of the stock.

A number of lessons can be drawn from the experience of undertaking the surveys, these are summarised in Annex 6 Lessons learned from survey processes.

Annex 1 Calculating energy use intensities without using modelled floor areas

In the section "Understanding 'floor area'" in Report 1, the role and importance of floor area is described and how this affects various aspects of understanding the non-domestic stock and its energy use. Also, in this report, the sections 'Floorspace selection' and 'Distribution of total energy intensity by sub-activity' describe how the 'best' floorspace' is chosen for the calculation of annual energy use intensities (kWh/m²) and what these intensities look like for each CaRB3 activity in the Hospitality class. In this annex the importance of VOA 'floor area' records will be demonstrated with regard to the energy use intensities of premises in the Hospitality CaRB3 class.

Figure 69 Total energy use intensity (kWh/m²), using just 'floor space area' records from VOA data. CaRB3 Hospitality class.
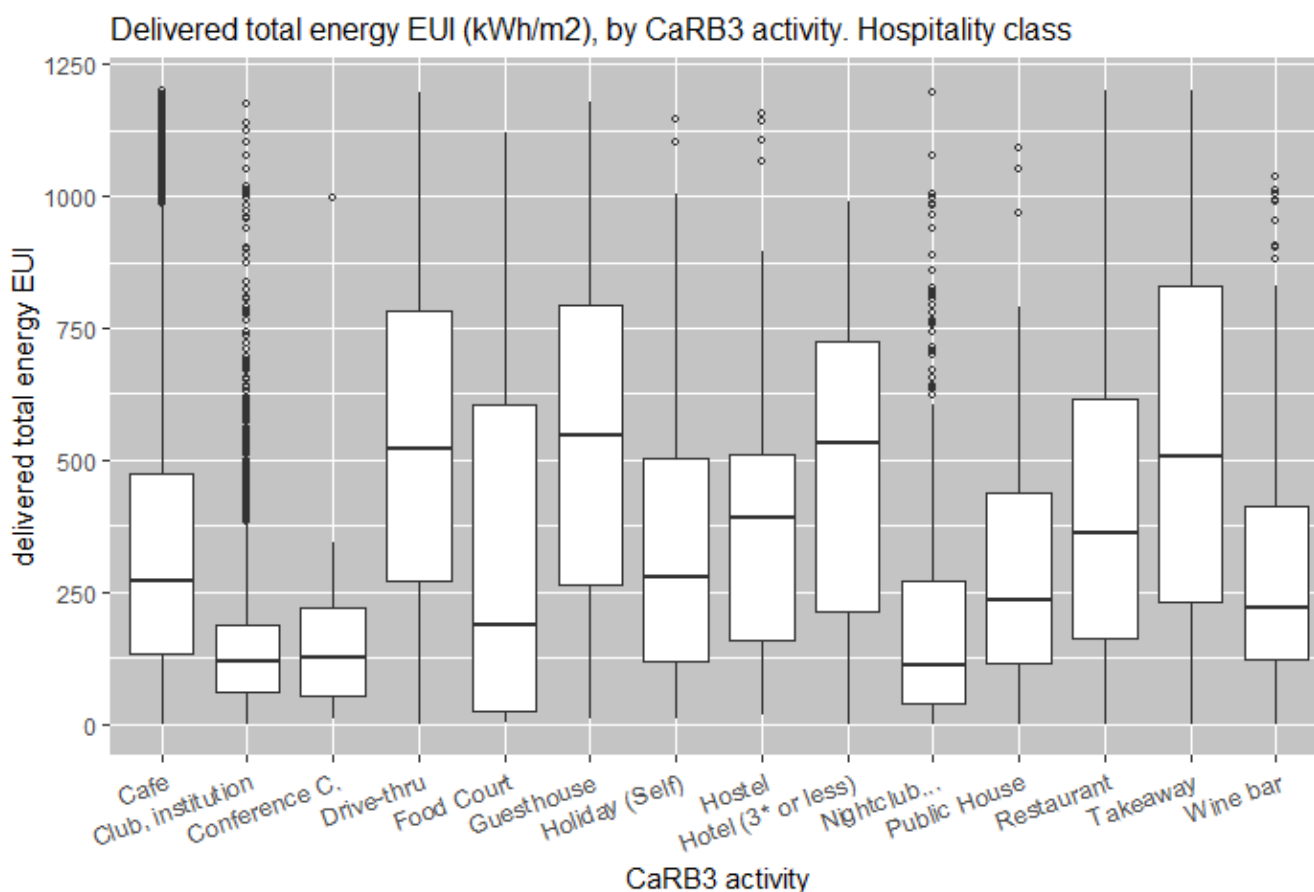
Figure 69, above, shows the box and whisker plot of total energy use intensity (EUI) of each CaRB3 activity (shortened titles) in the CaRB3 class 'Hospitality'. This figure uses only premises that have 'floor area' records in the VOA data and it may be seen that there is no analysis for 'Hotel (4* or more)', when compared against Figure 22, above, due to there being no floor area data for premises in this category. The comparison also shows how the median EUI for Guesthouses is considerably greater when only VOA 'floor areas' are used as the area metric. This is principally because the metric is generally the number of rooms, not an actual area, in this activity class. However, the EUI can also be lower, such as with Wine bar, as

indicated by Table 41, which shows a tabulated comparison of the VOA-derived 'floor area' and the 3DStock model-derived floor area, for the Hospitality class activities. Note that some results have been withheld (Camping site; Caravan park; Lodge / Hotel) for the VOA-derived method, to preserve an adequate degree of anonymity for the energy data.

The analysis shows the number of premises that can be given a calculated floor area using the method described in the section 'Floorspace selection', in the main text, compared to what can be achieved using only the raw VOA floor space area data. However, in spite of the additional finesse of the modelling of floor areas, there are still EUIs that are suspect, such as that for 'Caravan park', or 'Chalet park'. The median total energy EUIs of 458 and 484, respectively, are extremely high compared to what might be expected, especially given the seasonality of these activities. The probable explanation is that, even with the modelled floor area, the total energy use is being allocated to very small floor areas associated with the few buildings at each site, whilst there will be, in the case of some caravan parks, multiple caravans connected to the site supply, which is fed by a single metered supply. In this way, the number of 'consumers' and their 'floor area' – actually the size and occupancy of each caravan – is much higher than the data suggest.

Figure 70, below, shows the overall effect on the total energy use intensity (EUI) of the Hospitality class, when using the best floorspace method, employing floor areas calculated within the 3DStock model, versus the older VOA-floorspace derived. In the figure, each box contains the middle 50% of data (1st quartile to 3rd quartile), whilst the bottom end of the lower line and top end of the upper line indicate the 10th and 90th percentile, respectively. The thicker line across the box indicates the median EUI. As may be seen, by comparing all data points, there is a clear reduction in EUI when using the best floorspace method. This more than 40% reduction in the median EUI has significant implications for policy development.

Figure 70 Comparison of total Energy use intensity of the Hospitality class, using best floorspace method and the VOA-only floor area method
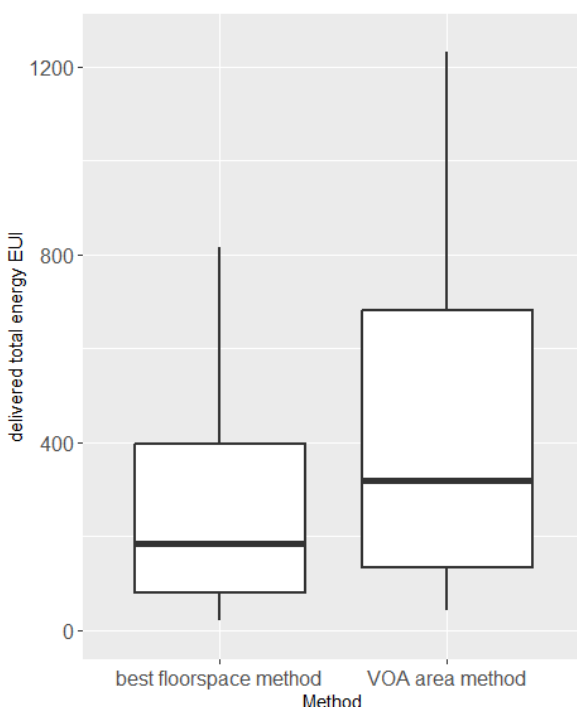
In summary, this annex demonstrates the differences in the floor areas calculated by the 3DStock model and the 'floor areas' derived from the VOA 'floor space area' field alone, when

applied to the Hospitality CaRB3 class. In some cases the energy use intensities are quite similar, but it is not known precisely how representative the apparent floor areas of the VOA-only-based method are, compared to the actual premises, because the bulk of premises in some CaRB3 activities have never had their floor areas measured, with the consequent data being made available. Bearing in mind that approximately 177,000 of all the premises (not just those in the Hospitality class) that are in buildings in England and Wales do not have floor areas recorded by the VOA, the model method provides a valuable insight into the floor areas and distributions of energy use within these 177,000 premises, which have not previously been quantified with this level of robustness. As the model is also geospatial and geometrical, it then becomes possible to place these premises in their geographical context and evaluate building volumes and surface areas.

Table 42 Comparison of floor area and annual total energy use intensity (kWh/m2) for VOA-based 'floor areas' and the floor areas calculated by the 3DStock model. CaRB3 activities in Hospitality class.

	count of premises		average area (m²)		average EUI		1st quartile		median		3rd quartile	
carb3_activity	VOA	Model	VOA	Model	VOA	Model	VOA	Model	VOA	Model	VOA	Model
Cafe	8,741	9,022	112	112	521	514	144	139	297	291	555	549
Camping site		132		233		677		43		161		429
Caravan park		1,209		343		2,740		101		458		1,575
Chalet Park		77		275		1,491		142		484		1,286
Club, institution [not sports club, probably]	6,110	6,404	506	503	152	149	61	58	121	117	190	187
Coaching Inns		115		595		325		110		214		385
Conference centre	26	94	956	2,392	426	505	56	53	130	127	259	295
Country House Hotel		131		1,943		546		94		229		487
Food Court	14	18	177	480	1,457	1,253	121	267	880	617	2,499	2,193
Guesthouse, boarding house	236	6,037	56	268	1,605	211	492	61	920	143	1,952	245
Health Farm		9		5,624		406		93		204		398
Holiday Home (Self Catering)	76	35,940	78	101	1,402	134	136	32	370	96	830	173
Holiday accommodation (not: hotel, guesthouse, caravan)		38		2,116		5,685		90		404		2,839
Hostel	53	771	404	441	1,872	655	257	62	668	185	1,805	366
Hotel (3 star and under)	50	3,294	112	818	2,844	375	569	97	1,548	201	4,600	356
Hotel (4 star and above, or major chain)		2,484		4,515		1,301		119		230		439
Lodge / Motel		98		1,297		287		71		146		219
Nightclub, discotheque	526	600	469	476	386	364	42	33	118	110	290	284
Public House/Pub Restaurant	102	34,430	276	389	313	386	114	129	239	242	448	434
Restaurant	18,362	19,083	221	223	540	532	177	171	403	394	721	712
Restaurant - Drive-in/thru	1,372	1,405	325	324	1,055	1,044	446	441	875	863	1,543	1,527

Non-Domestic Building Stock in England and Wales – Part 3: Hospitality

Takeaway Food Outlet (Predominantly Off Premises)	3,797	3,867	82	82	974	961	340	326	777	764	1,323	1,314
Timeshare Complex		30		1,010		986		85		447		1,067
Wine bar	297	650	181	223	416	635	122	112	229	234	436	513

Annex 2 Call Outcomes

Call outcomes	Self-catering accommodation	Cafes, restaurants & Takeaways	Public House/Pub Restaurant/Bar & Nightclub, discotheque & Club	Guesthouse, Boarding house/Hostel & Hotel & Hotel (luxury)	Unknown	Total
Completes	6	63	94	83	-	246
Refusal	21	91	57	119	7	295
Gatekeeper – not allowed to speak to respondent	2	11	8	7	1	29
No suitable respondent identified	7	45	23	16	9	100
Unfulfilled appointment – when a general appointment was booked that wasn't kept	9	59	33	39	2	142
Invalid record – when the telephone number is not in use	4	25	21	14	1	65
Not in target sector (not hospitality, not in the premises in 2019 and not appropriate to continue)	9	13	13	9	5	49
No longer in business	1	2	-	4	-	7
5 or more attempts made	46	236	193	138	46	659
No final outcome and available for call back	88	1,664	997	761	10	3,510

Annex 3 Recruitment Materials

Official letter sent to individual building occupiers

<Title> <First name> <Last name>
<Busname>
<Address>
<Town>
<Post code>

Unique reference number: <URN>

Date

Dear Sir/Madam
Re: Building Energy Use Survey – Hospitality

The Department for Business, Energy and Industrial Strategy (BEIS), UKHospitality, the British Beer and Pub Association (BBPA), the British Institute of Innkeeping (BII) and the Short Term Accommodation Association (STAA) would like to request your participation in an important national survey of buildings in the hospitality sector.

We appreciate that many businesses in the hospitality sector have faced extremely challenging circumstances during the pandemic and continue to do so. We are asking for your help as a step towards supporting the hospitality sector in another challenge - its journey to net zero. Importantly, in the current context of high energy prices, action to reduce carbon emissions can also often help to reduce business energy costs.

As a thank you for your time, every participant will receive an information pack on energy and emissions reductions opportunities in your sector. There is also an opportunity for you to share your views on challenges and support needs relating to the pathway to net zero.

The survey will help the Government to understand building energy use accurately and how this is affected by the fabric and use of buildings and, in turn, help inform policy to support the hospitality sector. The data will be used in national statistics.

To help us, **please could you nominate an appropriate member of your staff to participate and email their name, telephone number and email address to** buildingenergysurvey@winningmoves.com citing your unique reference number in all correspondence: <URN>

They should be able to talk about your premises in terms of:
- Building type and its ownership

- Sources of energy and metering arrangements

- The occupancy and running hours of your premises

- The equipment using energy in the premises

- Allocation of responsibilities for paying energy bills and making energy efficiency improvements

The survey will be undertaken by telephone at a time to suit your business and is expected to last up to 30 minutes. All data will be held confidentially and securely in accordance with GDPR. Further details on data protection will be provided prior to the survey.

If you have any queries about the research, please contact Winning Moves who are delivering the project at buildingenergysurvey@winningmoves.com citing your unique reference number <URN>. If you would like to verify the research, please contact BEIS at builtenvironmentresearch@beis.gov.uk

Many thanks in anticipation

Winning Moves Ltd

For head offices of national chains/ networks of sites

National Building Energy Use Survey for Hospitality

Dear xxxxx,

We would like to request your participation in the national Building Energy Use Survey for Hospitality undertaken by the Government Department for Business, Energy and Industrial Strategy and supported by UKHospitality, the British Beer and Pub Association (BBPA), the British Institute of Innkeeping (BII) and the Short Term Accommodation Association (STAA).

The survey will help the Government to understand building energy use accurately and how this is affected by the fabric and use of buildings. This will then inform policy to support the hospitality sector. There is also an opportunity for sites to share their views on challenges and support needs relating to the pathway to net zero.

For xxxxxxx, we would like to collect data for the following sites:

Site 1:
Site 2:
Site 3:
etc

To help us, **please could you nominate the person to contact at individual sites and email us at buildingenergysurvey@winningmoves.com to let us know their name, email address and telephone number and also send us an email stating that you have approved their participation in the research.**

The respondents should be able to talk about your premises at the address listed in terms of:
- Building type and its ownership
- Sources of energy and metering arrangements

- The occupancy and running hours of your premises

- The equipment using energy in the premises

- Allocation of responsibilities for paying energy bills and making energy efficiency improvements

The survey will be undertaken by telephone at a time to suit the business and is expected to last up to 30 minutes. All data will be held confidentially and securely in accordance with GDPR. Further details on data protection will be provided prior to the survey.

If you have any queries about the research, please let me know. If you would like to verify the research, please contact BEIS at builtenvironmentresearch@beis.gov.uk

Many thanks in anticipation

Telephone script

Good morning, I'm calling from Winning Moves on behalf of the government Department for Business, Energy and Industrial Strategy. Please could I speak to <named individual> / the manager of the premises at <address>?

For those sent a letter – We recently sent a letter to <Name> which you may have seen.

If needed: Or the person responsible for energy use at the premises?

Background information to be used as needed.
- We are conducting a National Building Energy Use Survey for Hospitality.

- To inform policy to support the hospitality sector to reduce their energy use

- The work is supported by key trade bodies including (select most relevant to business): UK Hospitality British Beer and Pub Association British Institute of Innkeeping Short Term Accommodation Association

- The survey will help the Government to understand building energy use accurately and how this is affected by the fabric and use of buildings and, in turn, help inform policy to support the hospitality sector.

- I'd like to talk to you about

    o Building type and its ownership

    o Sources of energy and metering arrangements

    o The occupancy and running hours of your premises

    o The equipment using energy in the premises ·

    o Allocation of responsibilities for paying energy bills and making energy efficiency improvements

Is this something we can talk about now?/ I can make an appointment for a time that's more convenient for you? It is expected to last around 30 minutes.

For all who are unwilling to participate – capture reason for this.

Other possible useful information:
- We are not selling anything.

- We are asking for your help as a step towards supporting the hospitality sector in its journey to net zero.

- There is also an opportunity for you to share your views on challenges and support needs relating to the pathway to net zero.

- The data will be used in national statistics.

- We are building a model to understand energy demand better and this modelling will inform policy changes.

- The research is being undertaken by a consortium led by UCL, with Winning Moves and Verco.

- The data will be used in national statistics.

- As a thank you for your time, every participant will receive an information pack on energy and emissions reductions opportunities. This may help you to reduce business energy costs.

- There is also an opportunity for you to share your views on challenges and support needs relating to the pathway to net zero.

Where making an appointment:
Can I just ask a couple of questions to check your eligibility for the interview to avoid making an unnecessary appointment with you please?
- The organisation occupying the premises is called <recall organisation name from database>?   - if the answer is no, check that this business is in the hospitality sector and occupied the building in 2019. Where this is the case, proceed with interview.

- That <recall organisation name from database> occupied <recall address> in 2019? – if the answer is no probe to establish nature of the previous business and extent of any changes in operation or fabric of the building. Where this information is known and where business is broadly similar, proceed using current figures as a proxy in the same way as for those who do not have energy figures for 2019.

- *(if self-catering accommodation)* That you pay business rates? (Interviewer note: Some self-catering accommodation buildings may be domestic rather than non-domestic. If a domestic building, they will pay council tax instead of business rates and are out of scope)

If no – is there someone better who could discuss this?
If no- please can you tell me why you would not like to participate

Once appropriate respondent has agreed in principle, go to full questionnaire.

Email text to be sent as needed:

Dear xxxx,

We would like to request your participation in
the national Building Energy Use Survey for Hospitality undertaken by the Government
Department for Business, Energy and Industrial Strategy and supported by UKHospitality, the
British Beer and Pub Association (BBPA), the British Institute of Innkeeping (BII) and the Short
Term Accommodation Association (STAA).

The survey will help the Government to understand building energy use accurately and how this
is affected by the fabric and use of buildings. This will then inform policy to support the
hospitality sector. There is also an opportunity for you to share your views on your challenges
and support needs relating to the pathway to net zero.

I would like to talk to you about <organization name and address> in terms of:
- Building types and its ownership

- Sources of energy and metering arrangements

- The occupancy and running hours of your premises

- Allocation of responsibilities for paying energy bills and making energy efficiency
  improvements.

The survey will be undertaken by telephone at a time to suit your business and is expected to
last up to 30 minutes. All data will be held confidentially and securely in accordance with
GDPR. Further details on data protection will be provided prior to the survey.

If you have any queries about the research, please let me know. If you would like to verify the
research, please contact BEIS at builtenvironmentresearch@beis.gov.uk

Many thanks in anticipation,

Annex 4 Remote survey quality protocol

Winning Moves undertook the work in compliance with ISO20252, the International Standard for Social and Market Research. Winning Moves is registered to the Standard. The following quality procedures were for the remote survey.

- Training and supervision of interviewers

- A comprehensive training plan was developed and conducted at the beginning of fieldwork. This covered the following elements:

- Background to the project, including: its aims, the client and supporting organisations, methodological background

- Number of target interviews and sample management rules

- Supervision procedures including how quality was to be checked and process for queries

- Identification of appropriate respondents

- Run through of all survey questions

- Explanation of technical terms – glossary provided for interviewers

- Interviewer questions

- Role play/practice interviews. Before researchers interviewed 'real' respondents they role-played interviews with each other to familiarise themselves with the questionnaire and learn to anticipate how respondents might react to particular areas of questioning. This helped to ensure that interviewers were well prepared prior to the first interview.

A dedicated field manager was available throughout the fieldwork period to answer any queries arising from interviews. The field manager monitored:

- Individual interviewer productivity

- Overall response rates and refusal rates weekly to ensure that sample was being worked effectively.

Quality monitoring of interviewer work

The quality of interviewers' work was monitored in two ways:

- By listening to interview recordings.

- By manual review of the data collected through interviews.

Each of these is explained in more detail below.

The first interview conducted by an interviewer was listened to by the field manager alongside checking the data that was entered into the system for that interview. Across fieldwork 5.2% of interviews were monitored. In addition, introductions to potential respondents were monitored to ensure the effectiveness of the recruitment approach and consistency in recording of call outcomes.

Feedback from interviews was given to interviewers within one day and any further training was given where required.

Each interview listened to was given a quality score based on consideration of:
- Identification of the right respondent

- Accuracy of data entry and categorization including verbatim responses

- Appropriate probing of responses

- Accurate delivery of questions

- General interviewing manner.

The project team had targets to ensure that the average quality score was at a high level.

Before fieldwork commenced the consultant responsible for drafting the survey produced a dataset checking guide. This covered a range of areas including ensuring that the respondent is correct, that all essential questions are covered and the interviewer has probed to provide a detailed response. This also included checking the quality of numeric data collected (if and where applicable), as well as ensuring that data across an interview was consistent.

The field manager checked the write-ups from first interviews and provided feedback to the team. The overall data was checked on a weekly basis. The project team met once a week to discuss the work.

In some cases the energy figures given seemed to be outliers. For each of these, the interview recordings were checked and the documented figures were found to be an accurate representation of the respondents' answers. These responses were retained in the survey responses dataset.

No interviews were excluded from the final dataset as a result of not meeting the minimum quality standard.

Annex 5 Remote survey questions

Can I confirm that you pay business rates? [Interviewer note: Some self-catering accommodation buildings may be domestic rather than non-domestic. If a domestic building, they will pay council tax instead of business rates and are out of scope]

Yes	1
No - Thank and close interview	2
Unsure	3

A_4

If confirmed as part of introduction then do not ask. Select yes and continue.

As part of your role, can I confirm whether you are involved in dealing with energy use at <ADDR> (e.g. you have knowledge of the energy costs and uses on your premises) and would be able to answer questions about <busname> energy usage at this address?

Yes	1
No	2

A_5

Who would be the most appropriate person to speak to regarding energy use in your premises or building at this address? Can you put me through to them?

Yes can provide contact and put us through – CONTINUE AND RECORD NEW RESPONDENT NAME	1
Can provide contact but can't put us through -(record contact details in the f8 contact screen) CLOSE CALL AND TRY AND ARRANGE A DATE AND TIME TO RESUME THE INTERVIEW WITH THE NEW CONTACT	2
Don't know alternative contact – THANK AND CLOSE INTERVIEW	3
Don't wish to provide an alternative contact – THANK AND CLOSE INTERVIEW	4

ONOFFGRID

Can I confirm, is your building/ the building you occupy connected to the main gas grid?

Yes	1

No	2
Unsure	3

A_8EMPS

How many people does your organisation employ? If required: If your organisation is part of a wider group please provide employees for just <busname>?

Can give a figure - enter FTE	1
Don't know	2
Prefer not to say	3

A_9EMPS2

How many of these employees operate out of <addr>? Note: we want full time equivalent.

Can give figure - enter a number only	1
Don't know	2
Prefer not to say	3

A_10CHANGE

Have you made any changes to how you run your business in response to Covid-19, for example made changes to the number of people employed, the number of staff that occupy your premises, your operating hours and/or the services offered?

Yes - capture details	1
No	2
Unsure	3

Section B – Premises type and ownership

B_1BUILD

prompted; single response

I´d now like to capture some information on the premises your business occupies at <addr>. For some of these questions, we will ask you to give us an answer thinking about how things stood for your business pre-Covid-19 and so the questions are asking you to think about 2019. Which of the following best describes the premises at <addr> in 2019 - Did your organisation have full use of…? (promoted; single response) Researcher note: If there are people living in part of the building eg where a pub owner lives on one floor then select option 3 "part of a building" as we are only interested in the business part and not the residential part of the building.

A collection of buildings	1
A whole building	2
Part of a building	3

B_1SITE

And is your premises located on a site with other buildings that your organisation doesn't occupy/ have full use of?

Yes	1
No	2
Unsure	3

B_2BUILDSWAP

And, has this changed since 2019?

Yes	1
No	2
Unsure	3

B_3OVER100

Capture number - Enter 999 for don't know

How many buildings over 100m2 were there on this site in 2019? [Interviewer note: Approximate answer is fine. 100 m2 is the size of a typical 3-bedroom house; portakabins should not be included?]

B_4SELECTA

Please select the smallest sized building on the site for which your organisation occupies the whole building. Please base all your following responses on this building.

B_4SELECTB

Please select a typical sized building on the site for which your organisation occupies the whole building. Please base all your following responses on this building.

B_4SELECTC

Please select the largest sized building on the site for which your organisation occupies the whole building. Please base all your following responses on this building.

B_5NAME

What is the name of this building or how should we refer to this building for the rest of our conversation?

Choices	
Capture verbatim	1

B_6PERCENT

Interviewer to probe to help respondents approximate. Enter 999 for don't know

What percentage of the building did <busname> occupy in 2019? [Capture percentage of floor area]

B_7ASIZE

Prompted, single response

Please answer the following questions for <B_5name:o> Which of the following comes closest to describing the size of <B_5name:o> in 2019?

Small – up to the size of a 4- or 5-bedroom house	1
Medium – about the size of a local convenience store or supermarket (e.g. Sainsbury's Local)	2
Large – about the size of a larger in-town supermarket (e.g. Tesco Superstore) or larger	3
Unsure - DO NOT READ OUT	4

B_7BSIZE

Prompted, single response

Please answer the following questions for the whole building Which of the following comes closest to describing the size of the building / the building your premises occupied in 2019?

Small – up to the size of a 4- or 5-bedroom house	1
Medium – about the size of a local convenience store or supermarket (e.g. Sainsbury's Local)	2
Large – about the size of a larger in-town supermarket (e.g. Tesco Superstore) or larger	3
Unsure - DO NOT READ OUT	4

B_7CSIZE

Prompted, single response

Please answer the following questions for the premises you occupy within the building. Which of the following comes closest to describing the size of the premises you occupied in 2019?

Small – up to the size of a 4- or 5-bedroom house	1
Medium – about the size of a local convenience store or supermarket (e.g. Sainsbury's Local)	2
Large – about the size of a larger in-town supermarket (e.g. Tesco Superstore) or larger	3
Unsure - DO NOT READ OUT	4

B_8LONG

Enter 999 for don't know
How long has your business occupied this building / part of the building? Capture years

B_9PAY

Prompted, single response
Which of the following best describes how your organisation typically pay for this building / part of the building?

Rented	1
Leased	2
Lease purchase	3
Owned outright (include if mortgage has been paid off in full)	4
Owned - Mortgage	5
Other - capture details	6
Mixture - capture details	7
Unsure - DO NOT READ OUT	8
Don't want to say - DO NOT READ OUT	9

B_10RENT

Enter 999 for don't know
When does your rental or tenancy agreement for this building / part of the building end? Capture year

B_11BUILT

Prompted, single response
When was the building / the building your premises occupies originally built?

Pre 1990	1
1991-1995	2
1996-2000	3
2001-2005	4
2006-2010	5
After 2010	6
Unsure - DO NOT READ OUT	7

B_12WALLS

Prompted, single response
Which of the following best describes the construction of the walls for the building/ the building your premises occupies?

Solid masonry construction e.g. brick or stone	1
Cavity wall construction	2
Concrete walls	3
Panel construction e.g. wood or steel frames with wood, metal or other cladding	4
Unsure - DO NOT READ OUT	5

B_13INVEST

When was the last time significant investment was made, by you or your landlord, on refurbishing or repairing the building/the building your premises occupies? [By significant investment we mean -replacement of major items such as boilers, chillers, air handling units, -or lighting or new control systems such as a Building Management Systems -or fabric improvements such as replacing windows which go beyond standard maintenance and upkeep]

Capture year - Enter year	1
Significant investment has never been made	2
Unsure	3

B_13INVESTB

Prompted, single response

Are you able to estimate if it was.....

After 2019	1
Between 2010 and 2019	2
Between 2005 and 2009	3
Pre 2005	4
Still unsure - DO NOT READ OUT	5

B_14REFURB

Thinking back to 2019, did you consider the building/the building your premises occupied to be in need of refurbishment?

Yes	1
No	2
Unsure	3

B_15ENTRY

Prompted, multiple response

In 2019, did the main entrances and exits to the building/the building your premises occupies have any of the following?

Revolving doors	1
Motorised doors	2
Draught lobbies	3
Over door heaters or air curtains	4
Open door policy (door is always open during opening hours)	5
None of the above	6

BH1CUSTA

Interviewer to probe to help respondents approximate percentage. Enter 999 for don't know

Thinking about the whole building in 2019, what proportion of the premises was used by customers?

BH1CUSTB

Interviewer to probe to help respondents approximate percentage. Enter 999 for don't know

Thinking about <B_5name:o> in 2019, what proportion of the premises was used by customers?

BH1CUSTC

Interviewer to probe to help respondents approximate percentage. Enter 999 for don't know

Thinking about the premises you occupy within the building in 2019, what proportion of the premises was used by customers?

BH2TYPE

Prompted, multiple response

And can I clarify which of the following types of customer area you have?

Standing or bar area	1
Seated eating area	2
Dance floor	3
Stage	4
Other facilities (restrooms, lounge etc)	5

BH2PROPA

Interviewer to probe to help respondents approximate. Enter 999 for don't know

What proportion of the customer area was devoted to each of these?

Standing or bar area

BH2PROPB

Interviewer to probe to help respondents approximate. Enter 999 for don't know

What proportion of the customer area was devoted to each of these?

Seated eating area

BH2PROPC

Interviewer to probe to help respondents approximate. Enter 999 for don't know

What proportion of the customer area was devoted to each of these?

Dance floor

BH2PROPD

Interviewer to probe to help respondents approximate. Enter 999 for don't know

What proportion of the customer area was devoted to each of these?

Stage

BH2PROPE

Interviewer to probe to help respondents approximate. Enter 999 for don't know
What proportion of the customer area was devoted to each of these?
Other facilities

BH3ROOMSA

Enter 999 for don't know
In 2019, how many of the following guest rooms did you have?
Suites comprising a day room, large double bedroom and ensuite bathroom

BH3ROOMSB

Enter 999 for don't know
In 2019, how many of the following guest rooms did you have?
Double ensuite bedroom

BH3ROOMSC

Enter 999 for don't know
In 2019, how many of the following guest rooms did you have?
Single ensuite bedroom

BH3ROOMSD

Enter 999 for don't know
In 2019, how many of the following guest rooms did you have?
Bedroom with no ensuite

BH4SELFA

Prompted, single response
In 2019, would you describe your self-catering accommodation as:

Multiple self catering units / rooms rented out separately	1
The entire building / premises is rented out as one	2
A mixture of both	3

BH5SELFB

Enter 999 for don't know
In 2019, how many self-catering accommodation rooms did you have?

BH6SELFA

Is the building/premises used for domestic purposes too i.e. does anyone live at the premises part of the year?

Yes	1
No	2

BH6SELFB

Number less than 52. Enter 999 for don't know

Approximately how many weeks a year are they occupied?

SECTIONCA

We would now like to ask a series of questions relating to the whole building. For the following questions please answer considering how your business operated in 2019 (i.e. prior to the Covid-19 pandemic). If you are unsure we can ask about how the business operates now, but would prefer to take an approximate answer for 2019…..

SECTIONCB

We would now like to ask a series of questions relating to <B_5name:o>. For the following questions please answer considering how your business operated in 2019 (i.e. prior to the Covid-19 pandemic). If you are unsure we can ask about how the business operates now, but would prefer to take an approximate answer for 2019…..

Section C – Occupancy and running hours

SECTIONCC

We would now like to ask a series of questions relating to the premises you occupy within the building. For the following questions please answer considering how your business operated in 2019 (i.e. prior to the Covid-19 pandemic). If you are unsure we can ask about how the business operates now, but would prefer to take an approximate answer for 2019…..

C_1EMPSA

Approximately, how many employees of <busname> were based in the building/ the part of the building you use on a typical working day in 2019?

Can give figure for 2019	1
Unsure - ask about now	2
Don't know	3

C_1EMPSB

Number of employees

C_2BUSYA

Number 7 or less. Enter 999 for don't know

Closed

Thinking about a whole week (ie 7 days), in 2019 approximately how many days was your business

C_2BUSYB

Number 7 or less. Enter 999 for don't know
Open and busy

C_2BUSYC

Number 7 or less. Enter 999 for don't know
Open but quiet

C_2BUSYD

Number 7 or less. Enter 999 for don't know
Unsure

BUSYUNSURE

DO NOT ASK

If they are unsure due to fluctuations in peak/off peak seasons record any relevant information here.

C_4TYPBUSYA

Number 24 or less. Enter 999 for don't know
reasonably occupied (i.e. at least 50% of staff present)?
Thinking about typical BUSY days, how many hours was the building/the part of building you use

C_4TYPBUSYB

Number 24 or less. Enter 999 for don't know
partly occupied (i.e. 20%- 50% of staff present)?
Thinking about typical BUSY days, how many hours was the building/the part of building you use

C_5TYPQUIETA

Number 24 or less. Enter 999 for don't know
reasonably occupied (i.e. at least 50% of staff present)?
Thinking about typical QUIET days, how many hours was the building/the part of building you use

C_5TYPQUIETB

Number 24 or less. Enter 999 for don't know
partly occupied (i.e. 20%- 50% of staff present)?
Thinking about typical QUIET days, how many hours was the building/the part of building you use

C_6WEEKSA

Number 52 or less. Enter 999 for don't know
In 2019, how many weeks per year was the building/the part of building you use closed e.g. business holiday periods?
Number of weeks in 2019

C_6WEEKSB
Number 52 or less. Enter 999 for don't know
If unsure - capture number of weeks as of now

C_7CUSTBUSY
Enter 999 for don't know
In 2019, approximately how many customers were in the building/ the part of the building you use on each of your BUSY days?

C_7CUSTQUIET
Enter 999 for don't know
In 2019, approximately how many customers were in the building/ the part of the building you use on each of your QUIET days?

XH1A
Number 12 or less. Enter 999 for don't know
In 2019, how many months of the year would you say was your:
Peak season

XH1B
Number 12 or less. Enter 999 for don't know
In 2019, how many months of the year would you say was your:
Low season

XH2A
Enter 999 for don't know
In 2019, on average how many bedrooms were occupied in...?
The peak season

XH2B
Enter 999 for don't know
In 2019, on average how many bedrooms were occupied in...?
The low season

XH3
Enter 999 for don't know
How many staff bedrooms did you have in 2019?

XH4
Enter 999 for don't know
How many of these were occupied in 2019?

YH1A
Number 12 or less. Enter 999 for don't know
In 2019, how many months of the year would you say was your:
Peak season

YH1B

Number 12 or less. Enter 999 for don't know
In 2019, how many months of the year would you say was your:
Low season

YH2A

Enter 999 for don't know
In 2019, on average how many bedrooms were occupied in...?
The peak season

YH2B

Enter 999 for don't know
In 2019, on average how many bedrooms were occupied in...?
The low season

YH3

Number 52 or less. Enter 999 for don't know
In 2019, how many weeks of the year was the building/premises rented out?

Section D – Energy supply and state of metering

DINTROA

WHOLE BUILDING
Please answer the following questions for the whole building you occupy...

DINTROB

A COLLECTION - refer to specified name
Please answer the following questions for <b_5name:o>

DINTROC

PART OF A BUILDING
Please answer the following questions for the part of the building your business uses... Thinking about the premises you occupy, EXCLUDING any communal areas shared with other premises or businesses....

D_1PAYA

Prompted list; single response
How do you pay for your energy supply

Payment made directly to your energy supplier	1
Energy costs included within rent paid to a landlord	2
A combination of the above	3
Unsure	4

D_1PAYB

For payments made directly to the energy supplier, is this done directly by this site or paid for by another part of your organisation (e.g. a head office, university central services etc)

Paid by this site	1
Paid by another part of the organisation	2

D_1PAYC

For energy costs included within rent paid to a landlord, is this

A fixed cost	1
A variable cost	2

D_1PAYA2

Prompted list; single response

Thinking now about COMMUNAL areas, how do you pay for energy supply in these spaces?

Payment made directly to your energy supplier	1
Energy costs included within rent paid to a landlord	2
A combination of the above	3
Do not pay for communal areas	4
Not applicable/ no communal areas	5

D_1PAYB2

For payments made directly to the energy supplier, is this done directly by this site or paid for by another part of your organisation (e.g. a head office, university central services etc)

Paid by this site	1
Paid by another part of the organisation	2

D_1PAYC2

For energy costs included within rent paid to a landlord, is this

A fixed cost	1
A variable cost	2

D_2CHANGE

Do you / your organisation have the authority to make fundamental changes to the building heating system(s) at <addr>? For example, to change from an oil boiler to a new technology

Yes	1
No	2
Unsure	3

D_3SUPPLY

Prompted, multiple response

Which of the following supplies did the building receive in 2019? (N.B LPG, Oil and Coal must be delivered specifically for the selected address and not to a central point e.g. site boiler)

Electricity	01
Gas	02
Oil	03
Coal	04
LPG	05
Smokeless fuel including coke	06
Anthracite	07
Duel fuel - mineral and wood	08
District Heat	09
Other	10

D_3METER

And which of these supplies were directly metered?

Electricity	01
Gas	02
Oil	03
Coal	04
LPG	05
Smokeless fuel including coke	06
Anthracite	07
Duel fuel - mineral and wood	08
District Heat	09
Other -	10
Unsure	11
None of these	12

D_4RECOVERY

Did the building have a heat recovery system in 2019?

Yes	1
No	2
Unsure	3

D_4ARECOVERY

Was the heat recovery system the main energy source for either heating the building or heating the hot water?

Yes - heating the building	1
Yes - heating the hot water	2
No	3

D_5MAINBUILD

Prompted single response

Which one of the supplies you received was the main energy source for heating the building?

Electricity	01
Gas	02
Oil	03
Coal	04
LPG	05
Smokeless fuel including coke	06
Anthracite	07
Duel fuel - mineral and wood	08
District Heat	09
Other -	10
Unsure	11

D_6MAINWATER

Prompted single response

Which one of the supplies you received was the main energy source for heating water in the building?

Electricity	01
Gas	02
Oil	03
Coal	04
LPG	05
Smokeless fuel including coke	06
Anthracite	07
Duel fuel - mineral and wood	08
District Heat	09
Other -	10
Unsure	11

D_7DHFUEL

Prompted, single response

What was the fuel used to generate the heat for the district heat system?

Gas	1
Oil	2
LPG	3

Other - what?	4
Unsure	5

D_7BDH
Is your district heat bill calculated from a meter?

Yes	1
No	2
Unsure	3

D_7CDH
Do you have a set payment for your allocation?

Yes	1
No	2
Unsure	3

D_8SPENDJ1
In 2019, do you know approximately how much you spent in total on DISTRICT HEAT?

Yes	1
No	2
Unsure	3

D_8SPENDJ2
Enter 999 for don't know
Capture annual 2019 DISTRICT HEAT spend in £'s

D_8SPENDJ3
Are you able to give an approximate average per month or per quarter?

Yes - per month	1
Yes - per quarter	2
No	3

D_8SPENDJ4
Enter 999 for don't know
Capture 2019 DISTRICT HEAT spend per month/quarter in £'s

D_8SPENDJ5
Do you know how much you CURRENTLY spend per year on DISTRICT HEAT?

Yes	1
No	2

Unsure	3

D_8SPENDJ6

Enter 999 for don't know

Capture current annual DISTRICT HEAT spend in £'s

D_8SPENDA1

In 2019, do you know approximately how much you spent in total on ELECTRICITY?

Yes	1
No	2
Unsure	3

D_8SPENDA2

Enter 999 for don't know

Capture annual 2019 ELECTRICITY spend in £'s

D_8SPENDA3

Are you able to give an approximate average per month or per quarter?

Yes - per month	1
Yes - per quarter	2
No	3

D_8SPENDA4

Enter 999 for don't know

Capture 2019 ELECTRICTY spend per month/quarter in £'s

D_8SPENDA5

Do you know how much you CURRENTLY spend per year on ELECTRICITY?

Yes	1
No	2
Unsure	3

D_8SPENDA6

Enter 999 for don't know

Capture current annual ELECTRICITY spend in £'s

D_8SPENDB1

In 2019, do you know approximately how much you spent in total on GAS?

Yes	1
No	2
Unsure	3

D_8SPENDB2

Enter 999 for don't know

Capture annual 2019 GAS spend in £'s

D_8SPENDB3

Are you able to give an approximate average per month or per quarter?

Yes - per month	1
Yes - per quarter	2
No	3

D_8SPENDB4

Enter 999 for don't know

Capture 2019 GAS spend per month/quarter in £'s

D_8SPENDB5

Do you know how much you CURRENTLY spend per year on GAS

Yes	1
No	2
Unsure	3

D_8SPENDB6

Enter 999 for don't know

Capture current annual GAS spend in £'s

D_8SPENDC1

In 2019, do you know approximately how much you spent in total on OIL?

Choices	
Yes	1
No	2
Unsure	3

D_8SPENDC2

Enter 999 for don't know

Capture annual 2019 OIL spend in £'s

D_8SPENDC3

Are you able to give an approximate average per month or per quarter?

Yes - per month	1
Yes - per quarter	2
No	3

D_8SPENDC4

Enter 999 for don't know

Capture 2019 OIL spend per month/quarter in £'s

D_8SPENDC5

Do you know how much you CURRENTLY spend per year on OIL?

Yes	1
No	2
Unsure	3

D_8SPENDC6

Enter 999 for don't know

Capture current annual OIL spend in £'s

D_8SPENDD1

In 2019, do you know approximately how much you spent in total on COAL?

Yes	1
No	2
Unsure	3

D_8SPENDD2

Enter 999 for don't know

Capture annual 2019 COAL spend in £'s

D_8SPENDD3

Are you able to give an approximate average per month or per quarter?

Yes - per month	1
Yes - per quarter	2
No	3

D_8SPENDD4

Enter 999 for don't know

Capture 2019 COAL spend per month/quarter in £'s

D_8SPENDD5

Do you know how much you CURRENTLY spend per year on COAL?

Yes	1
No	2
Unsure	3

D_8SPENDD6

Enter 999 for don't know
Capture current annual COAL spend in £'s

D_8SPENDE1

In 2019, do you know approximately how much you spent in total on LPG?

Yes	1
No	2
Unsure	3

D_8SPENDE2

Enter 999 for don't know
Capture annual 2019 LPG spend in £'s

D_8SPENDE3

Are you able to give an approximate average per month or per quarter?

Choices	
Yes - per month	1
Yes - per quarter	2
No	3

D_8SPENDE4

Enter 999 for don't know
Capture 2019 LPG spend per month/quarter in £'s

D_8SPENDE5

Do you know how much you CURRENTLY spend per year on LPG?

Yes	1
No	2
Unsure	3

D_8SPENDE6

Enter 999 for don't know
Capture current annual LPG spend in £'s

D_8SPENDF1

In 2019, do you know approximately how much you spent in total on SMOKELESS FUEL?

Yes	1
No	2
Unsure	3

D_8SPENDF2

Enter 999 for don't know

Capture annual 2019 SMOKELESS FUEL spend in £'s

D_8SPENDF3

Are you able to give an approximate average per month or per quarter?

Choices	
Yes - per month	1
Yes - per quarter	2
No	3

D_8SPENDF4

Enter 999 for don't know

Capture 2019 SMOKELESS FUEL spend per month/quarter in £'s

D_8SPENDF5

Do you know how much you CURRENTLY spend per year on SMOKELESS FUEL?

Yes	1
No	2
Unsure	3

D_8SPENDF6

Enter 999 for don't know

Capture current annual SMOKELESS FUEL spend in £'s

D_8SPENDG1

In 2019, do you know approximately how much you spent in total on ANTHRACITE?

Yes	1
No	2
Unsure	3

D_8SPENDG2

Enter 999 for don't know

Capture annual 2019 ANTHRACITE spend in £'s

D_8SPENDG3

Are you able to give an approximate average per month or per quarter?

Choices	
Yes - per month	1
Yes - per quarter	2
No	3

D_8SPENDG4

Enter 999 for don't know

Capture 2019 ANTHRACITE spend per month/quarter in £'s

D_8SPENDG5

Do you know how much you CURRENTLY spend per year on ANTHRACITE?

Yes	1
No	2
Unsure	3

D_8SPENDG6

Enter 999 for don't know

Capture current annual ANTHRACITE spend in £'s

D_8SPENDH1

In 2019, do you know approximately how much you spent in total on DUEL FUEL?

Yes	1
No	2
Unsure	3

D_8SPENDH2

Enter 999 for don't know

Capture annual 2019 DUEL FUEL spend in £'s

D_8SPENDH3

Are you able to give an approximate average per month or per quarter?

Yes - per month	1
Yes - per quarter	2
No	3

D_8SPENDH4

Enter 999 for don't know
Capture 2019 DUEL FUEL spend per month/quarter in £'s

D_8SPENDH5

Do you know how much you CURRENTLY spend per year on DUEL FUEL?

Yes	1
No	2
Unsure	3

D_8SPENDH6

Enter 999 for don't know
Capture current annual DUEL FUEL spend in £'s

D_8SPENDI1

In 2019, do you know approximately how much you spent in total on OTHER fuel?

Yes	1
No	2
Unsure	3

D_8SPENDI2

Enter 999 for don't know
Capture annual 2019 OTHER fuel spend in £'s

D_8SPENDI3

Are you able to give an approximate average per month or per quarter?

Yes - per month	1
Yes - per quarter	2
No	3

D_8SPENDI4

Enter 999 for don't know
Capture 2019 OTHER fuel spend per month/quarter in £'s

D_8SPENDI5

Do you know how much you CURRENTLY spend per year on OTHER fuel?

Choices	
Yes	1
No	2
Unsure	3

D_8SPENDI6

Enter 999 for don't know
Capture current annual OTHER fuel spend in £'s

D_12METERGAS

Single response
Was the total GAS supplied to the building sub-metered in 2019? (E.g. you have a meter or meters which are not the utility suppliers meter)?

Yes	1
No	2
Unsure	3

D_13TYPEGAS

Single response
What type of meter did you have for GAS in 2019? · Basic meter (These meters need to be read at the site of the meter, and are used by the utility company for billing purposes. These meters are very basic and are similar to those used in domestic buildings. They can have digital displays.) · Automatic meter reading or ``advanced´´ meter (AMR or advanced meters provide a company with the ability to read a meter remotely, automatically and at frequent intervals. For example, meter readings could be displayed real-time on a control panel/control room, providing much more accurate and `up to date´ energy usage data (than available through monthly or quarterly bills). This type of meter also reduces the need for manual readings and provides access to the information via internet `portals´, for example) · Smart meter (A 'smart' meter allows meter readings to be displayed off-site (for example, to a utility company or aggregator) on a frequent basis (e.g. half-hourly). A `smart´ meter may also allow the utility company to both remotely read and instruct the meter and therefore allows a number of additional operations such as updating the metering tariff.)

Basic meter	1
Automatic meter reading or "advanced" meter	2
Smart meter	3
Unsure	4

D_14GASEND

Single response
Do you have any metering in place that allows you to break down your GAS bill by the end use (e.g. space heating, hot water, cooking)?

Yes	1
No	2
Unsure	3

D_14ENMANG

Do you use this information in managing your energy use?

Yes	1
No	2
Unsure	3

D_15GASEQUIP

Do you know what equipment in your premises is responsible for most of your GAS use?

Choices	
Yes - what equipment uses most energy (capture verbatim)	1
No	2

D_16METEREL

Single response

Was the total ELECTRICITY supplied to the building sub-metered in 2019? (E.g. you have a meter or meters which are not the utility suppliers meter)?

Yes	1
No	2
Unsure	3

D_17TYPEEL

Single response

What type of meter did you have for ELECTRICITY in 2019? · Basic meter (These meters need to be read at the site of the meter, and are used by the utility company for billing purposes. These meters are very basic and are similar to those used in domestic buildings. They can have digital displays.) · Automatic meter reading or ``advanced´´ meter (AMR or advanced meters provide a company with the ability to read a meter remotely, automatically and at frequent intervals. For example, meter readings could be displayed real-time on a control panel/control room, providing much more accurate and `up to date´ energy usage data (than available through monthly or quarterly bills). This type of meter also reduces the need for manual readings and provides access to the information via internet `portals´, for example) · Smart meter (A 'smart' meter allows meter readings to be displayed off-site (for example, to a utility company or aggregator) on a frequent basis (e.g. half-hourly). A `smart´ meter may also allow the utility company to both remotely read and instruct the meter and therefore allows a number of additional operations such as updating the metering tariff.)

Basic meter	1
Automatic meter reading or "advanced" meter	2
Smart meter	3
Unsure	4

D_18ELEND

Single response

Do you have any metering in place that allows you to break down your ELECTRICITY bill by the end use (e.g. space heating, hot water, cooking)?

Yes	1
No	2
Unsure	3

D_18ENMANG

Do you use this information in managing your energy use?

Yes	1
No	2
Unsure	3

D_19ELEQUIP

Do you know what equipment in your premises is responsible for most of your ELECTRICITY use?

Yes - what equipment uses most energy (capture verbatim)	1
No	2

Section E: Energy using equipment – Heating, cooling and ventilation

E_1BSP

Single response

Please answer the following questions thinking about how you heated the building/part of the building you use in 2019….. Did the premise you occupy have its own dedicated building services plant (e.g. heating, and ventilation or cooling if present) or is this provided from central systems serving the whole building?

All heating, cooling etc. is dedicated to our premises & is our responsibility	1
All heating, cooling etc is provided centrally by the landlord & is their responsibility	2
Some services are dedicated and some are provided centrally by the landlord & is their responsibility	3
Not sure	4

E_2HEATSYS

Prompted, multiple response

In 2019, did you have any of the following electric heating systems in your building/premises?

Electric boiler	1
Individual room electric heaters	2
Ground Source Heat pump	3
Air Source Heat Pump	4
None of the above (DO NOT READ)	5
Unsure (DO NOT READ)	6

E_3HEATSYS

Prompted, multiple response

In 2019, did you have any of the following gas heating systems in your building/premises?

Condensing combi boiler with hot water storage	1
Combi boiler	2
Non-condensing combi boiler	3
CHP (combined heat and power)	4
None of the above (DO NOT READ)	5
Unsure (DO NOT READ)	6

E_4HEATSYS

Prompted, multiple response

Did you have either....... heating systems in 2019?

Solar Thermal	1
Biomass Boiler	2
Neither (DO NOT READ)	3
Unsure (DO NOT READ)	4

E_5HEATDIST

Prompted, multiple response

In 2019, did you use any of the following to distribute your heating?

Radiators	1
Underfloor heating	2
Hot air system	3
None of the above (DO NOT READ)	4
Unsure (DO NOT READ)	5

E_6REPLACEA

When was the last time you/your landlord replaced your heating system?

Capture year	1
Heating system has never been replaced	2
Unsure	3

E_6REPLACE

Prompted, single response
Are you able to estimate if it was.....

After 2019	1
Between 2010 and 2019	2
Between 2005 and 2009	3
Pre 2005	4
Still unsure - DO NOT READ OUT	5

E_7REPAIRA

And when was the last time you/your landlord made repairs to the current heating systems in the building/premises?

Capture year	1
Heating system has never been repaired	2
Unsure	3

E_7REPAIR

Are you able to estimate if it was.....

After 2019	1
Between 2010 and 2019	2
Between 2005 and 2009	3
Pre 2005	4
Still unsure - DO NOT READ OUT	5

E_8RUN

Number 12 or less. Enter 999 for don't know
How many months of the year did you typically have the heating running in 2019?
Capture months

E_9THERMO

Was the heating controlled by a thermostat in 2019?

Choices	
Yes	1
No	2
Unsure	3

E_10HEATA

On a typical day in 2019, where the heating is running, how much of the building/premises would be heated? For hotels, boarding houses and hostels

please answer this question for the areas that are controlled by central management.

Busy day

None	1
Special areas only - less than 20%	2
Some - 20% to 40%	3
About half - 40%-60%	4
Most - 60-80%	5
All - more than 80%	6
Unsure	7

E_10HEATB

On a typical day in 2019, where the heating is running, how much of the building/premises would be heated? For hotels, boarding houses and hostels please answer this question for the areas that are controlled by central management.

Quiet day

None	1
Special areas only - less than 20%	2
Some - 20% to 40%	3
About half - 40%-60%	4
Most - 60-80%	5
All - more than 80%	6
Unsure	7

E_11ONA

Number 24 or less. Enter 999 for don't know

And in 2019, typically how many hours would your organisation have the main heating system switched on?

Busy day

E_11ONB

Number 24 or less. Enter 999 for don't know

And in 2019, typically how many hours would your organisation have the main heating system switched on?

Quite day

E_12VENT

Prompted

I´d now like to understand a little more about the ventilation in your building in 2019… Which one of the following types of ventilation did you have 2019?

Openable windows EVERYWHERE	1
Openable windows in MOST areas, PLUS extract fans in special areas (e.g. kitchens or toilets)	2
Ventilation from a CENTRAL SYSTEM in MOST or ALL of your areas	3

Unsure	4

E_13VENTUSE

Prompted

Approximately how much of the building used mechanical ventilation in 2019? If they only have extractor fans then call it EXTRACTOR FANS [REMEMBER: mechanical ventilation is where fans supply or extract air to/from the internal spaces through pipes or ducts to grilles in the roof or floor, rather than opening windows to supply fresh air]

None	1
Special areas only - less than 20%	2
Some - 20% to 40%	3
About half - 40%-60%	4
Most - 60-80%	5
All - more than 80%	6
Unsure	7

E_14MECHVENT

Prompted, single response

What type of mechanical ventilation was most commonly in use in 2019? If they only have extractor fans then call it EXTRACTOR FANS

Supply and extract	1
Extract only	2
Displacement ventilation	3
Unsure	4

E_15VENTCONT

Prompted, multiple response

What types of ventilation controls did you have in the building in 2019

Variable speed drive fans vary the ventilation rate according to time controls	1
Variable speed drive fans vary the ventilation rate according to demand e.g. using CO2 sensors	2
Time controls switch off the ventilation outside normal hours of use	3
Ventilation to zones with different hours of use is controlled separately	4
Unsure	5
None of these	6

E_15REPLACE

When was the last time you/your landlord replaced your ventilation system? If they only have extractor fans then call it EXTRACTOR FANS

Capture year	1
Ventilation system has never been replaced	2
Unsure	3

E_15REPLACEA

Prompted, single response
Are you able to estimate if it was.....

Choices	
After 2019	1
Between 2010 and 2019	2
Between 2005 and 2009	3
Pre 2005	4
Still unsure - DO NOT READ OUT	5

E_15REPAIR

And when was the last time you/your landlord made repairs to the current ventilation systems in the building/premises? If they only have extractor fans then call it EXTRACTOR FANS

Capture year	1
Ventilation system has never been repaired	2
Unsure	3

E_15REPAIRA

Are you able to estimate if it was.....

After 2019	1
Between 2010 and 2019	2
Between 2005 and 2009	3
Pre 2005	4
Still unsure - DO NOT READ OUT	5

E_16MECHUSE

Prompted, single response
In 2019, how much of the building had a mechanical cooling or air conditioning system? (If required: this is areas where you can adjust the temperature to keep the space comfortably cool when it is hot outside or it is too hot inside a room)

None	1
Special areas only - less than 20%	2
Some - 20% to 40%	3
About half - 40%-60%	4

Most - 60-80%	5
All - more than 80%	6
Unsure	7

E_17COOL

Multiple response

What types of cooling systems did you have in the building in 2019?

Central system - cold air distribution	1
Central system with chilled water distribution	2
Central system with refrigerant distribution (VRV)	3
Central system but unsure of type	4
Local units with refrigerant (DX split units)	5
Unsure (DO NOT READ)	6
Non of the above (DO NOT READ)	7

E_18REPLACEA

When was the last time you/your landlord replaced your cooling system?

Capture year	1
Cooling system has never been replaced	2
Unsure	3

E_18REPLACE

prompted, single response

Are you able to estimate if it was.....

After 2019	1
Between 2010 and 2019	2
Between 2005 and 2009	3
Pre 2005	4
Still unsure - DO NOT READ OUT	5

E_19REPAIRA

And when was the last time you/your landlord made repairs to the cooling systems in the building/premises?

Capture year	1
Repairs to the cooling system have never been made	2
Unsure	3

E_19REPAIR

prompted, single response

Are you able to estimate if it was...	
After 2019	1
Between 2010 and 2019	2
Between 2005 and 2009	3
Pre 2005	4
Still unsure - DO NOT READ OUT	5

E_20CONTROL

Multiple response

What cooling controls did you have in the building in 2019? For hotels, boarding houses and hostels please answer this question for the areas that are controlled by central management.

Time controls switch off the cooling outside normal hours of use	1
Temperature control is efficiently set via thermostats	2
Cooling for zones with different hours of use is controlled separately	3
Unsure (DO NOT READ)	4
None of these (DO NOT READ)	5

E_21COOL

Prompted, multiple response

Which of the following applied to your building in terms of cooling in 2019?

The building suffers from heat gains due to the sun shining on the building	1
The building has external shading to prevent heating from the sun	2
The building regularly uses night-time ventilation in warm weather	3
Cooling is only used in very hot weather (top cooling)	4
Cooling is available 24h for special areas only (e.g. servers, control rooms)	5
Unsure (DO NOT READ)	6
None of these (DO NOT READ)	7

E_22MONTHS

Number up to 12. Enter 999 for don't know

In 2019, how many months per year did you switch on your cooling system?

E_23LOWCARB

Were there any low carbon or renewable energy technologies supplying the building other than ...... in 2019? [Researcher note, the following technologies were cited earlier by the respondent] <compheat1>, <compheat2>, <compheat3>, <compheat4>

Yes	1

No	2
Unsure	3

E_24TECH
Which low carbon or renewable technologies did you have dedicated to the building in 2019?

Photovoltaic panels	1
Wind turbine	2
Other - what?	3
Unsure	4

E_25WATER
Prompted, multiple response
Thinking about hot water in the building, what uses does centrally heated hot water have in your building?

Hot water taps	1
Hot water showers	2
Other - what?	3

E_26WATER2
Do you have any undersink/wall mounted electric water heaters?

Yes	1
No	2
Unsure	3

E_26WATER2A
Enter 999 for don't know
How many?

Section F: Energy using equipment - Lighting

F_1LIGHTS
Prompted, multiple response
Thinking now about the lighting, which of following lighting types did the building have in 2019?

LED	1
Incandescent	2
GLS lamp	3
Compact fluorescent	4
Halogen	5

Other - what?	6
Unsure	7

F_2CONTROLS

Prompted, multiple response

What controls were present to control lighting in the building?

Light switches that are easily accessible	1
Light switches that are hard to access	2
Automatic controls (daylight or presence detectors)	3
Lighting management systems	4
Unsure (DO NOT READ)	5

F_2ALIGHTS

Which of the following best describes how lighting was used in the building in 2019?

Lighting is usually off in unoccupied spaces

Yes	1
Sometimes	2
No	3

F_2BLIGHTS

Which of the following best describes how lighting was used in the building in 2019?

Lighting is usually off where and when daylight is sufficient

Yes	1
Sometimes	2
No	3

FH1LIGHTS

Prompted, multiple choice

In 2019, which of the following specialist lighting types did your premises have?

Strobe or club disco lighting	1
Stage lighting	2
LED ceiling panels	3
LED dance floor	4
LED furniture	5
Other - please describe	6
None (DO NOT READ)	7

FH2LIGHTSA

Number 7 or less. Enter 999 for don't know

In 2019, how many days per week was/were......... in use?

the strobe or disco lighting

FH2LIGHTSB

Number 7 or less. Enter 999 for don't know
In 2019, how many days per week was/were......... in use?
the stage lighting

FH2LIGHTSC

Number 7 or less. Enter 999 for don't know
In 2019, how many days per week was/were......... in use?
the LED ceiling panels

FH2LIGHTSD

Number 7 or less. Enter 999 for don't know
In 2019, how many days per week was/were......... in use?
the LED dance floor

FH2LIGHTSE

Number 7 or less. Enter 999 for don't know
In 2019, how many days per week was/were......... in use?
the LED furniture

FH2LIGHTSF

Number 7 or less. Enter 999 for don't know
In 2019, how many days per week was/were......... in use?
the other lighting

FH3LIGHTSA

Number 24 or less. Enter 999 for don't know
In 2019, on days when.......... was in use, typically how many hours were they switched on?
the strobe or disco lighting

FH3LIGHTSB

In 2019, on days when.......... was in use, typically how many hours were they switched on?
the stage lighting

FH3LIGHTSC

In 2019, on days when.......... was in use, typically how many hours were they switched on?
the LED ceiling panels

FH3LIGHTSD

Number 24 or less. Enter 999 for don't know

In 2019, on days when.......... was in use, typically how many hours were they switched on?
the LED dance floor

FH3LIGHTSE

Number 24 or less. Enter 999 for don't know
In 2019, on days when.......... was in use, typically how many hours were they switched on?
the LED furniture

FH3LIGHTSF

Number 24 or less. Enter 999 for don't know
In 2019, on days when.......... was in use, typically how many hours were they switched on?
the other lighting

SECTIONGA
Please continue to answer the following question on energy using equipment and processes in relation to the whole building for the year 2019

SECTIONGB
Please continue to answer the following question on energy using equipment and processes in relation to <B_5name:o> for the year 2019

SECTIONGC
Please continue to answer the following question on energy using equipment and processes in relation to the premises you occupy within the building for the year 2019

Section G: Other energy using processes and equipment

G_1EQUIP

Prompted, multiple response
Which of the following, if any, did you have in your building in 2019?

Catering facilities serving hot or cold meals	01
Swimming pool or Jacuzzi	02
Laundry facilities	03
Refrigerated storage for food sales	04
Chilled drinks/ Cellar/ bar equipment	05
Sauna or steam room	06
Lifts or escalators	07
Sound system	08
Hot drinks facilities	09
Fruit or arcade machines	10
None of the above (DO NOT READ)	11

Other high energy equipment - what?	12

G_2ABUSY

Enter 999 for don't know. Enter 0 for none.

Approximately, how many hot meals does the catering facility produce in a typical ....

busy day

G_2BQUIET

Enter 999 for don't know, Enter 0 for none.

Approximately, how many hot meals does the catering facility produce in a typical .... Enter

quiet day

G_3KITCHEN

Prompted, multiple response

Thinking about preparation of hot meals, which of the following do you use as part of your catering facilities

Full catering kitchen	1
Standalone alone food heating facilities e.g. panini grills	2
Hot plates or show cases	3
Other - what?	4

G_4PROPA

Number 100 or less. Enter 999 for don't know

What proportion of hot meals served are made in the full catering kitchen?

On a typical BUSY day

G_4PROPB

Number 100 or less. Enter 999 for don't know

What proportion of hot meals served are made the full catering kitchen?

On a typical QUIET day

G_5PROPHOTA

Number 100 or less. Enter 999 for don't know

What proportion of hot meals served are:

Bought in chilled and reheated

G_5PROPHOTB

Number 100 or less. Enter 999 for don't know

What proportion of hot meals served are:

Prepared from scratch

G_6COLDA

Enter 999 for don't know. Enter 0 for none.

Approximately, how many cold meals does the catering facility produce in a typical day

G_7TYPE

Prompted, multiple response

What type of meals does your catering kitchen serve?

Breakfast served in a set time-period	1
Lunch served in a set time-period	2
Dinner served in a set time-period	3
Food is served all day	4

G_8ENERGY

Which of the following do you use for cooking in your kitchen?

Choices	
All electric	1
All gas	2
Mix of gas and electric	3
Unsure	4

G_10GLASS

Enter 999 for don't know

How many glass/dishwashers do you operate?

G_11GLASSA

Enter 999 for don't know. Enter 0 for none.

On average how many times do you run your glass/dishwasher
on a typical busy day?

G_11GLASSB

Enter 999 for don't know. Enter 0 for none.

On average how many times do you run your glass/dishwasher
on a typical quiet day?

GLASSUNSURE

DO NOT ASK

If they have greatly differing run frequencies for glass wahsers and dishwashers capture information here

G_14SWIM

Enter 999 for don't know. Enter 0 for none.

How many of the following did you have in 2019?
Swimming pools

G_14JACUZZI

Enter 999 for don't know. Enter 0 for none.

How many of the following did you have in 2019?

Jacuzzis or Hot tubs

G_15SWIM1L

Enter 999 for don't know

How big is swimming pool 1?

What is the length in metres?

G_15SWIM1W

Enter 999 for don't know

How big is swimming pool 1?

What is the width in metres?

G_15SWIM1D

Enter 999 for don't know

How big is swimming pool 1?

What is the depth in metres?

G_15SWIM2L

Enter 999 for don't know

How big is swimming pool 2?

What is the length in metres

G_15SWIM2W

Enter 999 for don't know

How big is swimming pool 2?

What is the width in metres?

G_15SWIM2D

Enter 999 for don't know

How big is swimming pool 2?

What is the depth in metres?

G_16SWIM1

Was swimming pool 1 heated in 2019?

Yes	1
No	2
Unsure	3

G_16SWIM2

Was swimming pool 2 heated in 2019?

Yes	1
No	2

Unsure	3

G_16ASWIM
Capture here details of any other swimming pools if they have 3 or more.

G_17JAC1
Enter 999 for don't know
**I´d like to understand more about the size of your jacuzzi/s and/or hot tub/s
How many people could fit in jacuzzi / hot tub 1?**

G_17JAC2
Enter 999 for don't know
**I´d like to understand more about the size of your jacuzzi/s and/or hot tub/s
How many people could fit in jacuzzi / hot tub 2?**

G_17AJAC
Capture here details of any other jacuzzis if they have 3 or more.

Capture verbatim	1

G_19LAUNDRY
In 2019, did your laundry facilities include:

Standard washers	1
Commercial washers	2
A mix of standard and commercial washers	3
None of these	4

G_19LAUNDRY2
And did they include:

Standard dryers	1
Commercial dryers	2
A mix of standard and commercial dryers	3
None of these	4

G_20LAUNDRY3
Enter 999 for don't know
How much laundry was processed in the building's laundry facility per week in 2019?
number of wash cycles per week

G_20LAUND3A
Enter 999 for don't know

How much laundry was processed in the building's laundry facility per week in 2019?

number of dry cycles per week

G_20LAUNDRY4

Enter 999 for don't know

How much laundry was processed in the building's laundry facility per week in 2019?

tonnes of laundry processed per week

G_21FRIDGE1

Enter 999 for don't know

Thinking now about refridgeration, how many of each of the following did you have in 2019?

Refrigerators

G_21FRIDGE2

Enter 999 for don't know

How many of each of the following did you have in 2019?

Freezers

G_21FRIDGE3

Did customers have access to your refrigerator(s)?

Yes	1
No	2

G_21FRIDGE4

Enter 999 for don't know

How many did they have access to?

G_22FRIDGE5

Did customers have access to your freezers?

Yes	1
No	2

G_22FRIDGE6

Enter 999 for don't know

How many did they have access to?

G_24FRIDGE

In 2019, were all your refrigerators a similar age?

Yes	1
No	2
Unsure	3

G_25FRIDGAGE

Can you estimate how old your refrigerator/s were in 2019?

Capture age in years	1
Unsure	2

G_25FRIDGAG2

Can you estimate on the following scale how old the fridges were in 2019?

Less than 5 years	1
5 to 10 years	2
10 to 15 years	3
15 to 20 years	4
20 years or more	5
Still unsure (DO NOT READ)	6

G_26AGE1

Can you estimate on average how old your fridges were in 2019?

Choices	
Capture age in years	1
Unsure	2

G_26AGE1B

Can you estimate on the following scale on average the age of your fridges?

Less than 5 years	1
5 to 10 years	2
10 to 15 years	3
15 to 20 years	4
20 years or more	5
Still unsure (DO NOT READ)	6

G_26AGE2

Can you estimate how old your refrigerator/s were in 2019?

Refrigerator 2

Capture age in years	1
Unsure	2

G_26AGE2B

Can you estimate on the following scale

Refrigerator 2

Less than 5 years	1

5 to 10 years	2
10 to 15 years	3
15 to 20 years	4
20 years or more	5
Still unsure (DO NOT READ)	6

G_26AGE3

Can you estimate how old your refrigerator/s were in 2019?

Refrigerator 3

Capture age in years	1
Unsure	2

G_26AGE3B

Can you estimate on the following scale

Refrigerator 3

Less than 5 years	1
5 to 10 years	2
10 to 15 years	3
15 to 20 years	4
20 years or more	5
Still unsure (DO NOT READ)	6

G_26FRIDGE

Capture details of all other fridges if they have more than 3 and they are not all the same age.

Capture verbatim	1

G_27FREEZE

In 2019, were all your freezers a similar age?

Choices	
Yes	1
No	2
Unsure	3

G_28FREEZAGE

Can you estimate how old your freezers/s were in 2019?

G_28FREEZAG2

Can you estimate on the following scale

Less than 5 years	1
5 to 10 years	2
10 to 15 years	3
15 to 20 years	4
20 years or more	5
Still unsure (DO NOT READ)	6

G_29AGE1
Can you estimate on average how old your freezer/s were in 2019?

G_29AGE1B
Can you estimate on the following scale on average how old your freezers were in 2019?

Less than 5 years	1
5 to 10 years	2
10 to 15 years	3
15 to 20 years	4
20 years or more	5
Still unsure (DO NOT READ)	6

G_29AGE2
Can you estimate how old your freezer/s were in 2019?
Freezer 2

Capture age in years	1
Unsure	2

G_29AGE2B
Can you estimate on the following scale
Freezer 2

Less than 5 years	1
5 to 10 years	2
10 to 15 years	3
15 to 20 years	4
20 years or more	5
Still unsure (DO NOT READ)	6

G_29AGE3
Can you estimate how old your freezer/s were in 2019?
Freezer 3

Choices	
Capture age in years	1
Unsure	2

G_29AGE3B

Can you estimate on the following scale

Freezer 3

Less than 5 years	1
5 to 10 years	2
10 to 15 years	3
15 to 20 years	4
20 years or more	5
Still unsure (DO NOT READ)	6

G_29FREEZE

Capture details of all other freezers if they have more than 3 and they are not all the same age.

Capture verbatim	1

G_30BARA

Enter 999 for don't know

How many of each of the following do you have?

Draught pumps

G_30BARB

Enter 999 for don't know

How many of each of the following do you have?

Real ale pumps

G_30BARC

Enter 999 for don't know

How many of each of the following do you have?

Flash Coolers

G_30BARD

Enter 999 for don't know

How many of each of the following do you have?

Remote coolers

G_30BARE

Enter 999 for don't know

How many of each of the following do you have?

Cellar A/C units

G_30BARF

Enter 999 for don't know

How many of each of the following do you have?

Chilled drinks cabinets behind the bar

G_30BARG

Enter 999 for don't know

How many of each of the following do you have?

Ice making machines

G_31GLASS

Enter 999 for don't know

How many glass/dishwashers do you operate?

G_32GLASSA

Enter 999 for don't know. Enter 0 for none.

On average how many times do you run your glass/dishwasher

on a typical busy day?

G_32GLASSB

Enter 999 for don't know. Enter 0 for none.

On average how many times do you run your glass/dishwasher

on a typical quiet day?

G_40SAUNA

Enter 999 for don't know

How many of each of the following do you have:

Saunas

G_40STEAM

Enter 999 for don't know

How many of each of the following do you have:

Steam room

G_41LIFTA

Enter 999 for don't know

How many of each of the following do you have:

Escalators

G_41LIFTB

Enter 999 for don't know

How many of each of the following do you have:

Passenger lifts

G_41LIFTC

Enter 999 for don't know

How many of each of the following do you have:

Goods lifts

G_41LIFTD

Enter 999 for don't know

How many of each of the following do you have:
Platform lifts

G_42SOUND
Enter 999 for don't know
In 2019, how many hours on a typical working day would the sound system be running?

G_43DRINKA
Enter 999 for don't know. Enter 0 for none.
In 2019, approximately, how many hot drinks did you serve on a typical ....?
busy day

G_43DRINKB
Enter 999 for don't know. Enter 0 for none.
In 2019, approximately, how many hot drinks did you serve on a typical ....?
quiet day

G_44FRUIT
Enter 999 for don't know.
How many fruit machines/arcade machines do you have?

G_46BEDA
Number 100 or less. Enter 999 for don't know
I´d like to ask a few questions about the energy use and equipment in your guest bedrooms in 2019… What proportion of bedrooms need a key card to activate power use?

G_46BEDB
Number 100 or less. Enter 999 for don't know
What proportion of bedrooms have ......?
Kitchenettes

G_46BEDC
Number 100 or less. Enter 999 for don't know
What proportion of bedrooms have ......?
Mini fridges

G_46BEDD
Number 100 or less. Enter 999 for don't know
What proportion of bedrooms have ......?
Televisions

G_46BEDE
Number 100 or less. Enter 999 for don't know

What proportion of bedrooms have ......?
Air conditioning units

G_48BEDF

Number 100 or less. Enter 999 for don't know
What proportion of bedrooms have their own thermostat/temperature controls?

G_50OUTSIDE

I´d now like to understand more about outside space use in 2019…. Which of the following types of outdoor area do you have?

Car Park	1
Other outdoor area - please describe	2
None	3

G_50CP

Are any of these car parks associated exclusively with the building?

Yes	1
No	2

G_50CP2

And are these car parks for your organisation's sole use?

Yes	1
No	2

G_50OTH

Are any of these other spaces associated exclusively with the building?

Yes	1
No	2

G_50OTH2

Are any of these other spaces for your organisation's sole use?

Yes	1
No	2

G_51CARPARK

Enter 999 for don't know
How many parking spaces do you have? [if unknown ask for estimate for example does it accommodate a few staff, most staff, staff and visitors]

G_52LIGHT

When is car park lighting on?

Mornings/evenings when required (e.g. switched on in winter)	1
At all times outside daylight hours	2
At all times, but automatic controls reduce lighting when not needed	3
There is no lighting	4

Section I: Actors with responsibility for energy and energy efficiency measures installed

I_1RESP

Prompted, single response

This final set of questions looks to understand responsibilities for energy for [your building/ the building your premises is in] and whether you have made any changes over the past 2 years. Who is responsible for energy management in your building?

An organisation energy manager who does not normally work in the building	1
An energy manager who does normally work in the building	2
A dedicated energy team	3
Someone who is not a full-time energy manager e.g. building or operations manager but with formal role to look after energy	4
An enthusiast or energy champion in the building without formal role to look after energy	5
No-one / there is no energy management	6

I_2IMP

Over the past five years, has your business done anything to improve your energy efficiency?

Yes	1
No	2

I_3IMPA

Which of the following have you done since 2017?

Had an energy audit

Done between 2017 and now	1
2020	2
2019	3
2018	4

2017	5
Not done	6

I_3IMPC

Which of the following have you done?

Hired an energy manager and/ or created a sustainability arm of the business

Done between 2017 and now	1
2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPK

Which of the following have you done?

Implemented behavioural or cultural changes in the business

Done between 2017 and now	1
2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPD

Which of the following have you done?

Improved control and monitoring systems

Done between 2017 and now	1
2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPE

Which of the following have you done?

Implemented an energy management system ISO5001

Done between 2017 and now	1
2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPF

Which of the following have you done?

Implemented an energy management system - other

Done between 2017 and now	1
2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPG

Which of the following have you done?

Introduced a plan for behaviour change

Done between 2017 and now	1
2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPH

Which of the following have you done?

Replaced industrial equipment

Done between 2017 and now	1
2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPI

Which of the following have you done?

Made improvements to industrial processes

Done between 2017 and now	1
2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPJ

Which of the following have you done?

Invested in building improvements

Done between 2017 and now	1

2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPP
Which of the following have you done?

Heat supply and heat related improvements

Done between 2017 and now	1
2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPL
Which of the following have you done?

Other

Done between 2017 and now	1
2020	2
2019	3
2018	4
2017	5
Not done	6

I_3IMPM
You mentioned that you made behavioural and cultural changes in the businesses - what were these?

I_3IMPN
You mentioned that you introduced a plan for behaviour change - could you please describe this?

I_3IMPOTH
You mentioned that you made other changes - what were these?

I_4CHALLENGA
What are the main challenges for you / your business in monitoring your energy consumption?

I_4CHALLENGB
What are the main challenges for you / your business in reducing your energy consumption?

I_4CHALLENGC

What are the main challenges for you / your business in improving the energy rating of your building(s)?

I_5SUPP

Is there any support from government (including policy change) that you would value in helping the business with energy management, and particularly in overcoming the challenges you described in the previous questions?

Yes, funding - what this would be used for?	1
Yes, other - please describe	2
No	3

ACCA

In terms of your responses given to questions where factual information is provided, how accurate do you think your responses have been?

Mainly accurate	1
Mix of some accurate and some guesswork	2
Mainly guesswork but should be about right	3
Unsure	4

RECONTACT

Thank you for your time. Would it be possible to call you back if we need to check anything?

Yes	1
No	2

VISIT

We will be contacting some organisations to request a site visit that could take between half a day to a day to complete. This will enable us to source data from physical meters and equipment. As a thank you, you will be offered a short information pack covering energy and emissions reduction opportunities in your sector. This would take place in the next 2-3 months. Would you be happy for us to contact you again in the future to explain more about what is involved and see if you would be willing to help?

Yes- capture any relevant details on availability	1
No	2

WYORKS2

We are aware of business support available in the West Yorkshire area to help businesses reduce their carbon emissions and operate more sustainably. Would you like to give consent for us to pass your contact details (name,

email, telephone number) to them in case they may be able to support you with future projects to work towards net zero?

Choices	
Yes	1
No	2

CONTACTA

What would be the best email

CONTACTB

and what would be the best phone number

CALLR

Finally, would you like to take Winning Moves number or the Market Research Society freephone number just in case you wanted to check something about the company or the work we are doing? That's all that I was hoping to cover with you today so thank you for your time.

Choices	
Winning Moves - 0121 285 3800	1
Market Research Society freephone - 0800 975 9596	2
None	3
Both	4

ACCB

DO NOT ASK - INTERVIEWER TO CODE

In terms of the responses given by the respondents, how accurate do you think their responses have been? (capture open end and code)

Capture verbatim and code	1
Mainly accurate	2
Mix of some accurate and some guesswork	3
Mainly guesswork but should be about right	4
Unsure	5

Annex 6 Lessons learned from survey processes

Sampling processes

Sample attribute	Recommendation
Accuracy of sample	There are some instances of variance in sector as specified by secondary sources used in constructing the database. It is good practice to request sector and subsector from commercial providers in addition to contact details so this can be further checked. Targeting contacts where there is agreement between the database and commercial providers reduces the number of calls made to organisations that do not consider themselves to be in the sector of interest.
Sample scope	For the Hospitality sector pilot, the reference point for equipment had to relate to 2019 to enable linking to the latest available meter data. This required businesses to be screened out where they were not present in the building in 2019. For future sectors it is recommended that the reference point be as near to the fieldwork period as possible to minimise the impact of screening out.
Sampling approach	Stratification of the sample by size in other sectors where larger buildings may be associated with high energy consumption, should be considered. This was not always the case for hospitality; for example, large warehouse style buildings without energy intensive equipment and small takeaways that were comparatively energy intensive. However, in the interest of ensuring fieldwork is conducted in a timely period, reducing the number of strata in fieldwork would be advantageous.
	However the strata are defined, it is likely that there will be strata jumpers (i.e. records assigned to a certain strata that on contact turn out to be in a different strata). This can occur for several reasons including incorrect matching of contact details by commercial providers, disagreement between business sector where drawing on varying sources and change in business function. In the case of Hospitality, this resulted in diminished populations, with some approached businesses operating outside of the sector entirely. This included records approached after requesting additional sector data from data providers and was a reason not to apply strict stratification. Strata need to be monitored as fieldwork progresses with population and sample sizes reassessed as appropriate.
	Random sampling was applied to a subset of the sample as a random sampling approach across the full population would have resulted in prohibitively long fieldwork requirements. This finding is consistent with findings from the Building Energy Efficiency Survey.
	Due to the timing and provision of data, fieldwork commenced before all data was available in the model used to construct the sample. For the remaining sectors it would be beneficial to review the distribution of energy consumption across sub-sectors and consider structuring the sample to ensure that the distribution of interviews is proportional by energy consumption.
Sample management	Consideration should be given as to whether closing some strata at different times of day or on different days would be beneficial for some sectors during fieldwork.
	With each contact attempt made there are diminishing returns in terms of completed interviews. We would recommend a maximum of 5 attempts.

Audience	Survey element	How success was assessed
Single site	Value of sending a printed official BEIS letter ahead of a telephone call	Comparison of response rate between those who did and did not receive a letter
	Sending emails when requested	Completed interviews following receipt of an email
Multi-site	Best approach to involvement of head offices	Response rate to head office letters; number of individual sites requesting that we contact head office.

Single site

Use of a letter only made a marginal difference to response rate. In total, 674 contacts were sent a letter prior to receiving a telephone call. 38 of these completed the survey, a response rate of 5.6%.[16] Of the remaining 4,132 cases contacted, 208 completed the survey, a response rate of 4.8%.

81 emails were sent out to organisations. 14 of these completed an interview. Whilst this appears to be a much higher response rate (17%), the time and resources required to follow this process were very high. Emails were most effective when used to book an appointment with those uncontactable via telephone, and the majority of the 14 completed interviews were email requests of this nature.

Multi-site chains and franchises – head offices

The most successful method for contact proved to be contacting individual sites directly despite multi-site status which comes of testing various approaches outlined below:
- Initially we attempted to make contact with head offices to establish the most appropriate person who would be able to direct us to respondents at particular premises. When this proved to be unsuccessful we sent out emails to head office to request their support. None of the head offices emailed responded.

Some organisations with more than 3 sites are however franchises and as such were treated as an individual organisation. We were unable to identify franchises without making telephone contact and so where we had identified the possibility of some cases or a particular organisation being a franchise these were then allocated as part of the telephone sample as per standard recruitment.

- A total of 10 completed interviews came from organisations that were identified as part of a chain but where there had been no input from head office in order to recruit this respondent. Instead respondents were encouraged that they would be able to help, knowing as they did about the day to day running of their organisation and the activity/occupancy that was happening in the building where they were based.

- In other cases, potential respondents simply felt that they wouldn't be able to help and requested we contact head office in order to take part. In these cases, head office was contacted either by telephone or email. In total 36 head offices of this type were contacted – 3 of these cases then became a completed interview, although not as a result of an email sent to head office rather encouraging the respondent of their ability to answer our questions.

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[16] Calculated as number completed as a proportion of those contacted.

Future considerations for recruitment approach

The following outlines considerations for recruitment of respondents in other sectors.

	Future considerations
Timing and length	Timing for respondent convenience will vary by sector. Offering interviews outside of the traditional office hours of 9am-5pm should be considered to maximise response rate.
	Offering flexibility in the timing of appointments means having a long enough fieldwork period to accommodate respondent preferences and also potentially to reschedule where necessary.
	For the Hospitality sector pilot, the team of researchers were encouraged to manage their own contacts and make follow up calls as this rapport and familiarity with the history of the contact this helped to secure a better response rate. We would suggest considering a similar approach for other sectors.
	Care should be taken to ensure that surveys for other sectors are as short and concise as possible, and in any case, less than 30 minutes in length to avoid significant recruitment challenges.
BEIS and Sector support	We recommend that where possible in other sectors, support from prominent sector organisations is sought. It would be beneficial to have such endorsement for use in recruitment either by telephone or in emails.
	We would recommend that BEIS endorse the surveys for other sectors via their own website and it would be beneficial to explore further the use of sector bodies in promotion of the survey.
Incentive	An information pack on energy and emissions, offered as an incentive to respondents, did not seem to encourage participation. Further work should be conducted to see if different incentives are more productive in securing response.
Respondent	We would recommend sourcing the name of a senior individual at an organisation as a point of contact from commercial database providers. It will be important to monitor in the early stages of fieldwork whether this named contact is typically the most appropriate respondent as this may vary by sector.
	The job title of the most appropriate respondent is likely to vary by size and sector (owner/manager in the case of smaller businesses, energy / facilities manager in larger businesses) and this should be tested.
Telephone introductions	An approach of giving as brief information as needed to get from gatekeeper to respondent to interview was the most effective recruitment strategy and we would recommend giving minimal information to gatekeepers in order to get to the correct respondent as this is likely to be the case in other sectors.
Letters and emails	Targeted email contact of specific, named individuals who request this personally or who cannot be contacted any other way should be considered to maximise response rate.
	Whilst the response rate for those receiving a letter was slightly higher than those who did not, referring to the letter initially in telephone recruitment was off putting where the respondent hadn't received/seen the letter. We recommend that instead, follow up emails be used where required to verify the work.
Chains and Head Offices	Where chains or organisations with multiple sites can be identified in other subsectors we recommend exploration of whether contacting HO to find most suitable respondents would be beneficial.

	Clear communication of the type of information required for the survey and good interviewing techniques are an effective way of improving response rate.

Future considerations for remote survey instruments

Remote survey instruments should be prepared that are as short as possible for the data requirement and no longer than 30 minutes. Other areas for consideration include:

	Future considerations
Remote survey instruments	Some sections of the questionnaire will require sector specific adaptions; buildings and premises, occupancy and running hours and equipment (including specialist lighting). We recommend further refinement of questions to accommodate the building types, occupancy and equipment in other sectors.
Testing	Adequate time for piloting the survey instruments for other sectors to test for length, recruitment approach and data points that could be more challenging for respondents should be allowed for. There are some sector specific differences and so a round of cognitive testing is recommended to understand how respondents interpret and are able to answer questions.
Accuracy	We recommend a question is included to understand whether respondents were able to give information accurately or whether they made rough estimates. Response options to this question should be discreet. There will need to be a balance between the full accuracy of data and length of interview/ number of respondents required to get the overall required accuracy of information. To improve accuracy we would recommend adding options to the question covering wall types to allow for walls that are neither solid construction nor traditional or where a building has a mix of wall types. We would recommend tweaks be made to questions around partial (20-50%) and full (50% or more) occupancy in order to improve clarity and accuracy of response. Fluctuations in occupancy are likely to vary by sector and so we recommended testing options to establish the most appropriate wording of questions. Energy bill data is one of the more difficult data points for businesses to access through a remote survey. Reducing the gap between the data reference point (in the case of Hospitality 2019) and the time of fieldwork would be beneficial.
Training	A training plan should be developed for the research team that covers project background, sampling and respondents, recruitment techniques, technical information relating to questions and specific subsectors. Opportunity to role play interviews prior to fieldwork is beneficial to both recruitment of respondent and data quality
Quality	Quality of data should be monitored throughout the fieldwork. We would recommend listening to interviews and checking of data sets to monitor outliers and missing data points.

Key learnings and considerations for future verification surveys

The CATI software platform selected for the telephone interviews met the needs of the telephone interviewers, however it had no offline functionality for the entering of verification data, as a result it was necessary to export the telephone survey data to Excel for transmission to the verification auditors. On arrival the data had to be processed to make it usable for the verification auditors. The transmitted data set contained answers to all questions in the survey script whether asked by the interviewer or not, to make this data set intelligible it was necessary to strip out all unused data points. This process required double handling, was time

consuming and required quality assurance to ensure that data wasn't removed in error. After an on-site survey had been conducted the verification data had to be standardised and later uploaded to a summary workbook for all on-site surveys.

This shortcoming in the software increased the work required to accommodate telephone survey script changes part way through the program; whilst these undoubtedly made the telephone survey more useful the requirement to change the excel formulae built to identify questions requiring verification added additional handling time and cost.

These challenges could have been circumvented by the selection of a telephone interview software platform more suited to the remote verification needs of the project.

Any future project should use a software able to provide abstracts of survey response data for offline verification surveys with the ability to upload the verification data set on completion.

Lead generation and follow up

The total population of sites for which a verification survey was an option was de facto limited to the 246 sites for which a remote survey was achieved. The verification lead dropout rate was high for this segment, some participants of phone surveys were contacted on 7 occasions before finally confirming they weren't interested in participating. It was decided to limit contact attempts to 5 per contact.

The verification audit team experienced a low conversion rate from agreement during the phone survey to participating in a verification audit to confirming a date for audit with the verification auditor; respondents claimed not to have been aware of anyone having given prior agreement to an onsite survey. It is believed this was either an excuse not to participate or a result in many cases, of the contact person answering the phone survey questions not being the same contact person given for the site verification visit. This appears to have been so in the case of chain branches and where the phone respondent was an owner or manager of the responding business and the verification contact was a member of a different team. In any future study, efforts should be made to further qualify lead contact details, for instance to establish that the contact person has authorisation to book the site visit and will be made aware they will be contacted. An ideal solution would be to organise the site visit at the time of the telephone survey and confirm the visit prior to attendance with the same telephone respondent to minimise abandoned visits. This could be achieved by making auditor availability viewable by the telephone interviewers using online calendars for each verification auditor.

The participation drop-out could also have been affected by the lead time from remote survey to when the verification auditors received contact details and were able to commence booking arrangements. Initially new leads came in a batch on an unspecified day of the week, as the project evolved the structure changed to a weekly or bi-weekly leads update on Wednesday. This led to a quick follow up call from the on-site surveyors, who were able to schedule contact calls and emails to when they knew contact details would become available. A more frequent update could be beneficial for audit confirmation rates, though too frequently would lead to a loss of the structure for the on-site surveyors. Therefore, a twice-weekly update on Monday and Wednesday or Tuesday and Thursday would be ideal.

Lead prioritisation

Challenges in booking verification visits were found to be exacerbated further where it was necessary to postpone a visit. This only happened due to a circumstance beyond the auditors' control, in one instance, for example the audit was cancelled due to a train strike. In these

instances, it proved impossible to rebook a new date within a reasonable timescale. In one example, the audit team were asked to wait over a month before attending site, a date beyond the scheduled end of the project phase.

Future projects should have a clear priority set between verification audit types, in order to ensure resource is assigned to the highest priority verification audits first. This will help to ensure that survey segments with low response rates, as in this case with the LOGG sites, are allocated priority audit slots, this will minimise the chances of high priority site verification audits being delayed or cancelled.

Continuity of contact

Where the verification team experienced issues booking audit visits with site respondents through a lack of response to emails and phone calls, the audit was issued back to the telephone survey team who then approached the respondent again to try and reengage them, this approach proved successful on a minority of occasions and verification audits were subsequently scheduled.

Grouping of surveys

Assigning verification candidate sites to clusters and attempting to book in more than one site in a cluster on the same day would improve the overall efficiency of the verification process. It would be possible under these circumstances to complete two surveys in one day, making better use of time and finances to achieve the result, albeit the program would have potentially been slowed down waiting for confirmed details of all sites within a cluster. This could have been achieved by structuring the on-site survey selection by location instead of when the corresponding remote survey had been performed. This would have enabled the surveyors to easily follow up on a cluster of leads in the same vicinity. Given the challenges completing the remote surveys in this instance this methodology may well have proved too challenging to implement effectively, however it offers a potential alternative approach for any future projects.

The surveyed premises

The 25 hospitality sector premises subject to verification audit fell into the following sub-sectors Table 19 demonstrates the number of sites in each Hospitality sub sector which received a verification audit.

Public house, Pub, Bar, Nightclub, Discotheque	11
Self-catering accommodation	1
Guesthouse, boarding house, hostel, hotel and hotel (luxury)	10
Cafes/restaurants and takeaways	3