Department for Business, Energy & Industrial Strategy

The Non-Domestic National Energy Efficiency Data-Framework 2020 (England and Wales) Geographical Annex

30th March 2021 **Official Statistics**

This report summarises analysis of the geographical differences in the non-domestic building stock and non-domestic building energy consumption in England and Wales using the latest version of the Non-Domestic National Energy Efficiency Data-Framework (ND-NEED) published in November 2020.

What you need to know about these statistics:

The statistics in ND-NEED cover all non-domestic buildings in England and Wales, under the ND-NEED definition (see main ND-NEED 2020 report for detail).

Information on the non-domestic building stock (building number, building use, building size, off-gas grid) reflects the position at the end of March 2020.

Information on energy consumption is presented for 2018, and comprises electricity and gas consumed via the public distribution system (onsite generated electricity, oil, LPG and biomass consumption are not included).

All geographic maps and associated data are split using the administrative boundaries in England and Wales for 2020.

The key results are:

- Electricity and gas consumption from ND-NEED non-domestic buildings varies substantially between regions in England and Wales.
    - London consumed the most electricity in 2018, three times as much as Wales which consumed the least.
    - The North West consumed the most gas in 2018, three times as much as the North East which consumed the least.
- The proportion of electricity and gas consumption from ND-NEED non-domestic buildings in a particular sector varies between regions in England and Wales.
    - London is responsible for 30% of electricity consumption from offices, while the North East is responsible for just 3%.
    - Yorkshire and The Humber is responsible for 21% of gas consumption from factories, while the South East is responsible for just 3%.

Responsible statistician: Maya Fooks & Jeremy Knott
Email: energy.stats@beis.gov.uk
Media enquiries: 0207 215 1000
Statistical enquiries: 0300 068 6551

- The proportion of factories, offices, shops, or warehouses in a region is broadly similar to the proportion of all non-domestic buildings in that region.
    - The key exception to this is London which contains 14% of non-domestic buildings in England and Wales, but 21% of offices and 4% of factories.
- There are 256,000 off-gas grid ND-NEED non-domestic buildings in England and 22,000 in Wales, 17% of the ND-NEED non-domestic building stock.

Responsible statistician: Maya Fooks & Jeremy Knott
Email: energy.stats@beis.gov.uk
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1.Introduction

The Non-Domestic National Energy Efficiency Data-Framework (ND-NEED) 2020 Geographical Annex (Geographical ND-NEED) provides additional geographical insight into the ND-NEED 2020 publication.

It provides information and analysis into the differences in electricity and gas consumption of non-domestic buildings within England and Wales in 2018 by region, local authority (LA) and parliamentary constituency (PC).

Additionally, it provides information and analysis into the differences in the non-domestic building stock – under the ND-NEED definition - within England and Wales in 2020 by region, LA and PC. Further splits are provided for ND-NEED building uses, building sizes and for non-domestic buildings in areas that have no buildings connected to the gas distribution network (off gas grid buildings). This is summarised in Table 1.

Table 1: Summary of the data presented in the Geographical ND-NEED annex

Metric	Regional	Local Authority & Parliamentary Constituency
Number of buildings	Sector Larger than or smaller than or equal to 1,000m^2 Off Gas Grid – rural or urban	Sector Off Gas Grid – rural or urban
Floor area	Aggregated sectors	Aggregated sectors
Electricity and gas consumption	Total consumption (from meter population) Sector (from weighted ND-NEED matched sample)	Total consumption (from meter population)

This is an annex to ND-NEED to provide information regarding geographical differences in non-domestic building energy use and the non-domestic building stock within England and Wales, which has not previously been published. It is intended that the data tables will be updated alongside or following the main ND-NEED publication, the next update of which is planned for the summer of 2021.

The geographical ND-NEED annex used postcode information in the ND-NEED dataset and geographical datasets from the Office for National Statistics (ONS) to split the ND-NEED data by geography. Data from Xoserve/Centre for Sustainable Energy (CSE) was used to identify buildings in postcodes that have no buildings connected to the gas distribution network (off gas grid buildings).

The datasets used in Geographical ND-NEED are:

1. The ND-NEED 2020 dataset[1] of all non-domestic buildings in England and Wales (under the ND-NEED definition) which includes information on building postcode, building use, building size, and building energy consumption.

2. The ONS National Statistical Postcode Lookup (NSPL)[2] which relates postcodes in the UK to ONS area codes (region, LA, PC). This also includes information on whether a postcode is in a rural or urban area.

3. The ONS Names and Codes lookup tables[3] which relates the names of geographical areas to ONS area codes used in the NSPL.

4. The ONS Boundary shapefiles[4] which contain the boundary shape of UK LAs and PCs. This is used to produce maps of the geographical data.

5. Xoserve off-gas grid data made publicly available by the CSE[5]. This lists postcodes in Great Britain in which there are no buildings, domestic or non-domestic, connected to the national gas grid.

The 1,656,000 non-domestic buildings in the ND-NEED dataset were matched by postcode to the ONS NSPL, with a 99.6% match rate. This allowed the region, LA and PC codes of the 1,649,000 matched non-domestic buildings to be identified. More information about this matching process can be found in the methodology.

The ONS Names and Codes lookup tables were used to obtain the area names corresponding to these codes and the ONS Boundary shapes files were used to obtain the shape of these areas so geographical maps could be created.

The postcodes in the ND-NEED dataset were also matched to the CSE off-gas grid dataset and a flag was created for non-domestic buildings in postcodes where no buildings, domestic or non-domestic, are connected to the national gas grid.

[1] ND-NEED 2020: https://www.gov.uk/government/statistics/non-domestic-national-energy-efficiency-data-framework-nd-need-2020
[2] ONS NSPL: https://geoportal.statistics.gov.uk/search?collection=Dataset&sort=name&tags=all(PRD_NSPL%2CNOV_2020)
[3] ONS LA Names and Codes: https://geoportal.statistics.gov.uk/search?collection=Dataset&sort=name&tags=all(NAC_LAD)
ONS PC Names and Codes: https://geoportal.statistics.gov.uk/search?collection=Dataset&sort=name&tags=all(NAC_WPC)
[4] ONS LA Boundaries: https://geoportal.statistics.gov.uk/search?collection=Dataset&sort=name&tags=all(BDY_LAD%2CDEC_2020)
ONS PC Boundaries: https://geoportal.statistics.gov.uk/search?collection=Dataset&sort=name&tags=all(BDY_PCON%2CDEC_2019)
[5] CSE Xoserve data: https://www.cse.org.uk/news/view/2441

What questions can be answered by ND-NEED Geographical Annex?

- How many non-domestic buildings were there in a particular geographical area (region, LA, PC) in England and Wales in 2020, split by sector?
- How much non-domestic building floor area was there in a particular geographical area (region, LA, PC) in England and Wales in 2020, split by sector?
- How many non-domestic buildings were there in a particular geographical area (region, LA, PC) in England and Wales in 2020 that were off the gas grid?
- How did the non-domestic electricity/gas consumption vary by geographical area (region, LA, PC) of England and Wales in 2018?
- How did the non-domestic electricity/gas consumption/intensity vary by region of England and Wales in 2018, split by sector?

What questions cannot be answered by ND-NEED Geographical Annex?

- What are the variations in characteristics or energy consumption of the non-domestic building stock across Scotland and Northern Ireland?
- How much of other fuels (e.g. biomass/LPG/oil) do non-domestic buildings consume in each geographical area?
- How does non-domestic building characteristics or energy use differ between in each geographical area between:
    - Rented or owner-occupied buildings?
    - Public or private buildings?
    - Buildings occupied by small, medium, or large businesses?

2.Results

The following data is presented in the data tables accompanying this publication. An asterisk* indicates that this data is also presented in this report for further analysis.

At regional level:

- RG1 shows the number of ND-NEED non-domestic buildings split by sector*.
- RG2 shows the ND-NEED number of non-domestic buildings larger than 1,000m^2 split by sector*.
- RG3 shows the ND-NEED number of non-domestic buildings smaller than or equal to 1,000m^2 split by sector*.
- RG4 shows the floor area of ND-NEED non-domestic buildings split by sector*.
- RG5 shows the number of ND-NEED non-domestic off-gas grid buildings, split by rural and urban.
- RG6 shows the energy consumption from ND-NEED meters*.
- RG7 shows the scaled ND-NEED non-domestic electricity consumption, split by sector*.
- RG7b shows the scaled ND-NEED non-domestic gas consumption, split by sector*.

At local authority level:

- LA1 shows the number of ND-NEED non-domestic buildings* split by sector.
- LA2 shows the floor area of ND-NEED non-domestic buildings split by sector.
- LA3 shows the number of ND-NEED non-domestic off-gas grid buildings, split by rural and urban.
- LA4 shows the energy consumption from ND-NEED meters.

At parliamentary constituency level:

- PC1 shows the number of ND-NEED non-domestic buildings* split by sector.
- PC2 shows the floor area of ND-NEED non-domestic buildings split by sector.
- PC3 shows the number of off-gas grid ND-NEED non-domestic buildings, split by rural and urban*.
- PC4 shows the energy consumption from ND-NEED meters.

England and Wales ND-NEED non-domestic building stock

Under the ND-NEED definition, there were 1,656,000 non-domestic buildings in England and Wales at the end of March 2020. Of these, 1,649,000 were successfully matched to a location in England and Wales and 7,000 non-domestic buildings failed to match due to the postcode not being present in the NSPL. More information about this matching process can be found in the methodology.

The ND-NEED definition covers all non-domestic buildings included in the Valuation Office Agency (VOA)'s non-domestic ratings list (NDR)[6], excluding premises that are not considered to be buildings for ND-NEED purposes. These are caravan parks, advertising premises, car parks, beach huts, quarries, and telecoms units. For more information on non-buildings, see page 31 of ND-NEED 2020.

Note, in the NDR the data is at the hereditament[7] (UARN) level. In ND-NEED it is aggregated up to the building (UPRN) level.

Number of non-domestic buildings by region

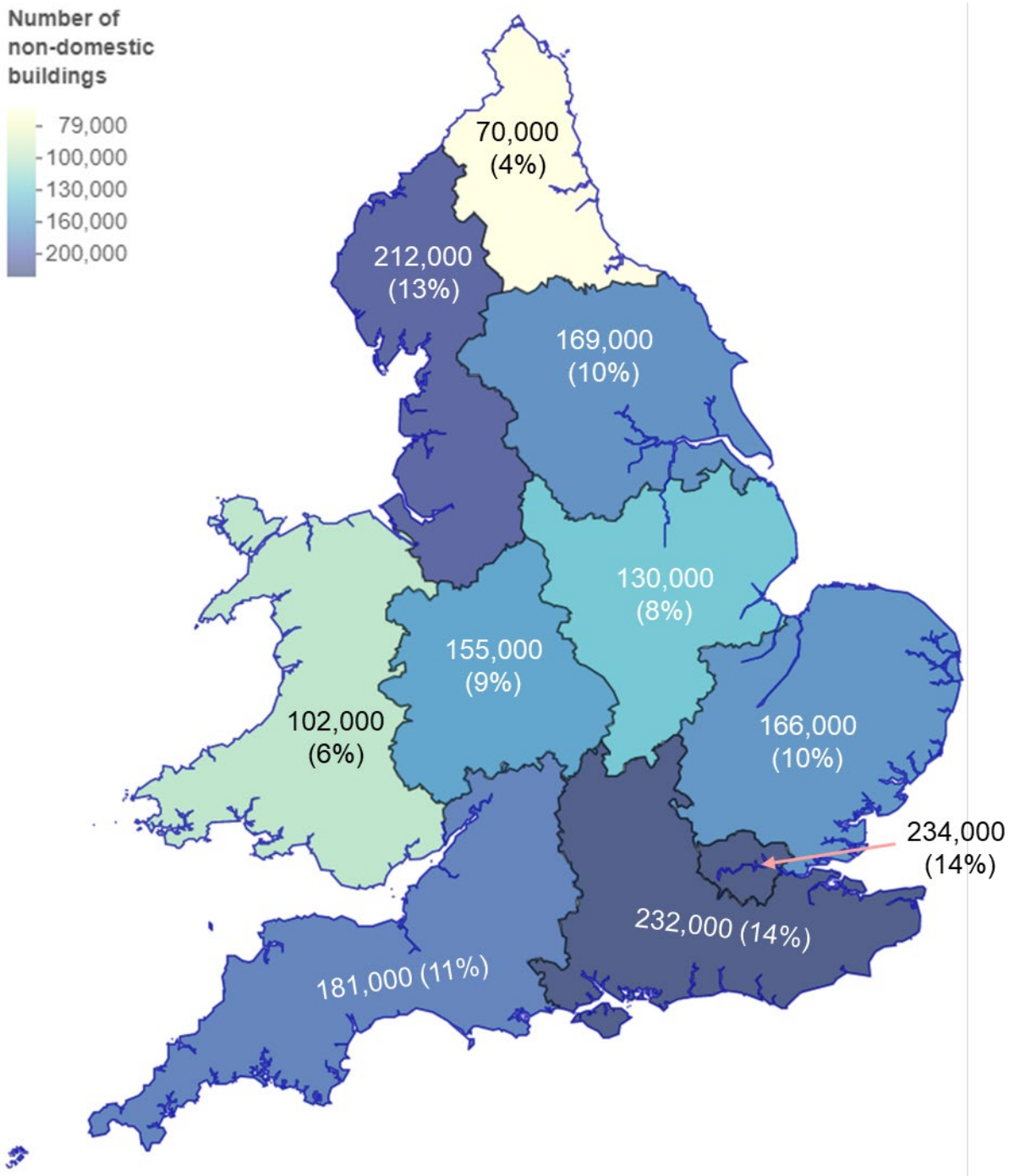
The number of ND buildings can be presented for each region of England and Wales. This is displayed as a heatmap in Figure 1. The corresponding data can be found in table RG1.

Note, as it is common for most areas to have values closer the median than the outliers, all heat maps use a log scale to improve clarity by better highlighting differences. Darker blues indicate a comparatively higher number of non-domestic buildings, and lighter yellows indicate a comparatively lower number of non-domestic buildings.

From Figure 1 we can see that the regions with the highest number of non-domestic buildings are London and the South East, while the North East and Wales have the lowest number of non-domestic buildings. This variation in non-domestic building number between regions is broadly consistent with the variation in population. London and the South East have the highest populations, whilst the North East and Wales have the lowest populations (ONS, 2020)[8]. This suggests that these is a strong correlation between the number of people that live in a particular area and the number of non-domestic buildings it contains.

[6] Non-domestic rating 2020: https://www.gov.uk/government/collections/non-domestic-rating-stock-of-properties-collection
[7] A hereditament is a rateable property for the purpose of business rates
[8] Data from ONS population estimates: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland

Figure 1: Number of non-domestic buildings by region in England and Wales



Number of non-domestic buildings by region and sector

The number of non-domestic buildings by region can also be disaggregated by sector. This can be seen for the four non-domestic sectors with the highest building numbers (factories; offices; shops; and warehouses), in Table 2. Information about the other ND-NEED sectors (arts, community, and leisure; education; emergency services; health; hospitality; and other) can be found in RG1 in the accompanying data tables.

Table 2 shows that the proportion of factories, offices, shops and warehouses in a region are all broadly in line with the proportion of all non-domestic buildings in that region.

The one notable exception is London. London has a disproportionately high number of offices (21% of all offices in England and Wales) compared to the 14% of all non-domestic buildings that are London.

London also has a disproportionately low number of factories and warehouses (9% of those in England and Wales compared to 14% for all non-domestic buildings).

Table 2: The proportion of factories, offices, shops and warehouses in England and Wales that are in each region[9].

Region	Factories	Offices	Shops	Warehouses	All Sectors
England	**94%**	**95%**	**94%**	**94%**	**94%**
North East	5%	4%	5%	3%	**4%**
North West	12%	12%	14%	14%	**13%**
Yorkshire and The Humber	11%	10%	10%	11%	**10%**
East Midlands	10%	7%	7%	8%	**8%**
West Midlands	11%	8%	9%	11%	**9%**
Eastern	11%	9%	9%	12%	**10%**
London	9%	21%	18%	9%	**14%**
South East	14%	15%	13%	15%	**14%**
South West	11%	8%	9%	11%	**11%**
Wales	**6%**	**5%**	**6%**	**6%**	**6%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Number of non-domestic buildings by region, sector and building size

The number of non-domestic buildings by region and sector can also be disaggregated further, by building size. This analysis excludes the 17% (287,000) of non-domestic buildings in the ND-NEED Geographical Annex dataset that are missing floor area data. More information about why these buildings are missing floor area information can be found in the methodology.

The proportion of buildings that are missing floor area information varies substantially between sectors from 96% missing from emergency services buildings to only 2% missing from factory

[9] These four sectors are presented here as they are the four largest ND-NEED sectors by building number and because they align with the floor area figures presented later in the report.

buildings. Because of this, sectoral splits are only presented for the four sectors that have over 80% of floor area present (factories, offices, shops, and warehouses).

Table 3 contains the proportion of all non-domestic buildings larger than 1,000m^2 [10] in England and Wales in each region, split by sector.

In general, the proportion of factories, offices, shops, and warehouses in a region are all similar to the proportion of all non-domestic buildings in that region. This is the same pattern as was seen for all non-domestic buildings in Table 1.

As in Table 2, the exception to this is London. London contains 10% of large non-domestic buildings in England and Wales, but 28% of offices larger than 1,000m^2. This is more than the 21% of all offices that are located in London.

This could be because companies often locate their headquarters in London, which are likely to be larger than offices in other areas.

London also contains 4% of factories larger than 1,000m^2 (compared to 10% of all large non-domestic buildings).

Table 3: Proportion of non-domestic buildings larger than 1,000m^2 in England and Wales that are in each region, split by key sectors.

Region	Factories	Offices	Shops	Warehouses	All Sectors
England	**93%**	**96%**	**93%**	**95%**	**94%**
North East	6%	4%	5%	4%	**5%**
North West	14%	12%	14%	14%	**14%**
Yorkshire and The Humber	14%	7%	10%	12%	**11%**
East Midlands	12%	6%	8%	9%	**9%**
West Midlands	15%	7%	11%	12%	**12%**
Eastern	10%	8%	10%	12%	**11%**
London	4%	28%	11%	9%	**10%**
South East	11%	17%	14%	14%	**14%**
South West	9%	7%	11%	9%	**9%**
Wales	**7%**	**4%**	**7%**	**5%**	**6%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

[10] This threshold has been chosen as it is an important threshold for non-domestic building decarbonisation policy. For example the performance based policy framework - https://www.gov.uk/government/consultations/introducing-a-performance-based-policy-framework-in-large-commercial-and-industrial-buildings

Table 4 contains the proportion of non-domestic buildings smaller than or equal to 1,000m^2 that are in each region in England and Wales, split by sector.

Again, the proportions by region in each sector are generally in line with the proportion of all non-domestic buildings smaller than or equal to 1,000m^2 in the region. London is still an exception, but this difference is less than for all non-domestic buildings or for non-domestic buildings larger than 1000m^2.

Table 4: Proportion of non-domestic buildings smaller than or equal to 1,000m^2 in England and Wales that are in each region, split by key sectors.

Region	Factories	Offices	Shops	Warehouses	All Sectors
England	**94%**	**95%**	**94%**	**94%**	**94%**
North East	5%	4%	5%	3%	**4%**
North West	12%	12%	14%	14%	**13%**
Yorkshire and The Humber	11%	10%	10%	10%	**10%**
East Midlands	10%	7%	7%	8%	**8%**
West Midlands	11%	8%	9%	11%	**10%**
Eastern	11%	9%	8%	12%	**10%**
London	9%	21%	18%	9%	**15%**
South East	15%	15%	13%	15%	**14%**
South West	12%	8%	9%	12%	**10%**
Wales	**6%**	**5%**	**6%**	**6%**	**6%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

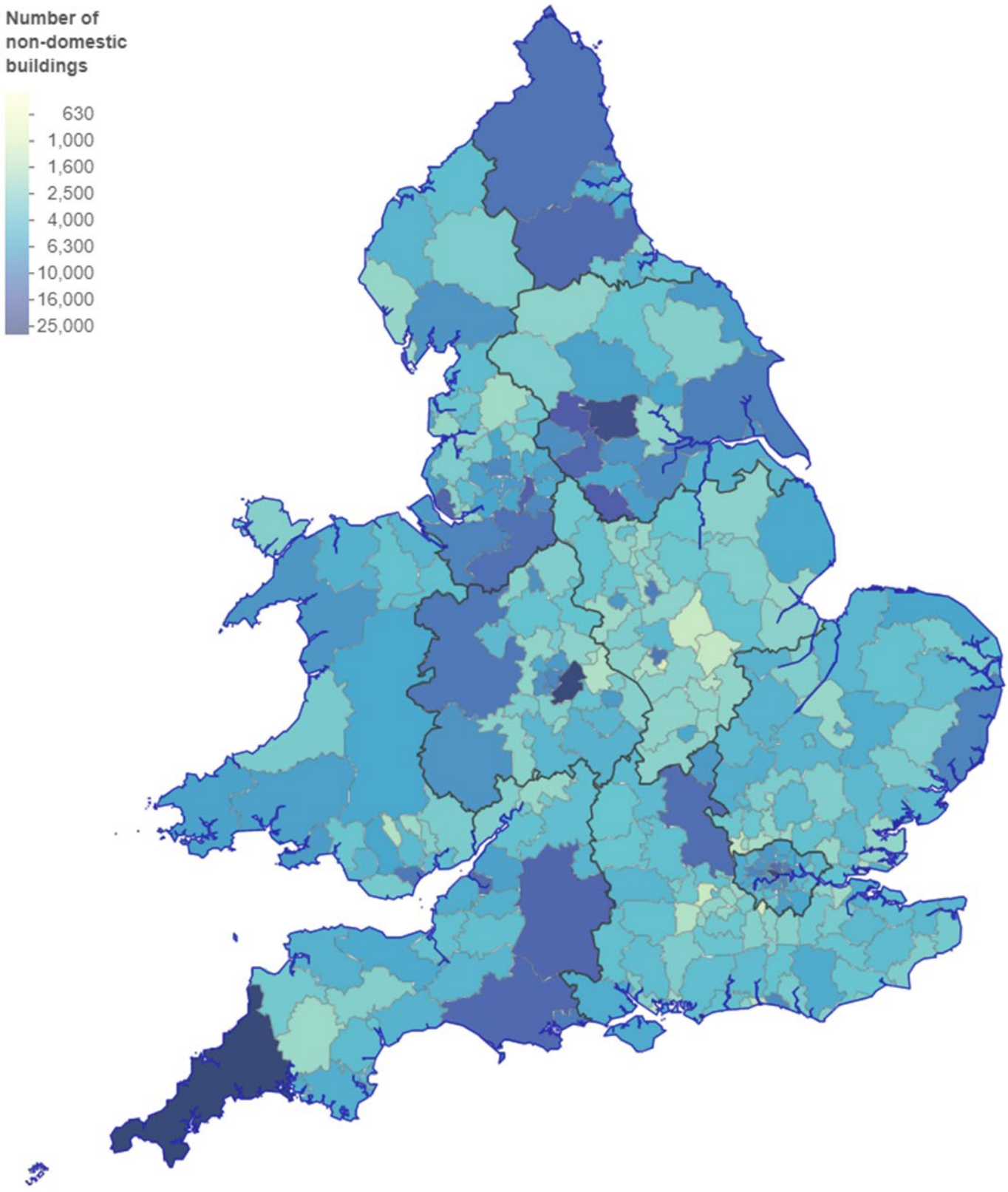
Number of non-domestic buildings by local authority (LA)

The number of non-domestic buildings in each LA was also calculated. This is presented as a heatmap in Figure 2. The corresponding data can be found in Table LA1 in the accompanying data tables.

Cornwall has the highest number of non-domestic buildings with 29,000. LAs covering major cities including Birmingham, Leeds, Bradford, Sheffield, Manchester, and Liverpool are all in the top 10, with 14,000 non-domestic buildings or higher. Westminster in London is third highest with 28,000 non-domestic buildings.

The Isles of Scilly have the lowest number of non-domestic buildings at 430. All other LAs have more than 1,000 non-domestic buildings.

Figure 2: Number of non-domestic buildings by LA in England and Wales



Note, there are large variations in the population of local authorities. For example, the Metropolitan District of Birmingham has a population of 1,140,000 (ONS, 2020)[11] whilst the Isles of Scilly has a population of 2,200 (ONS, 2020)[11].

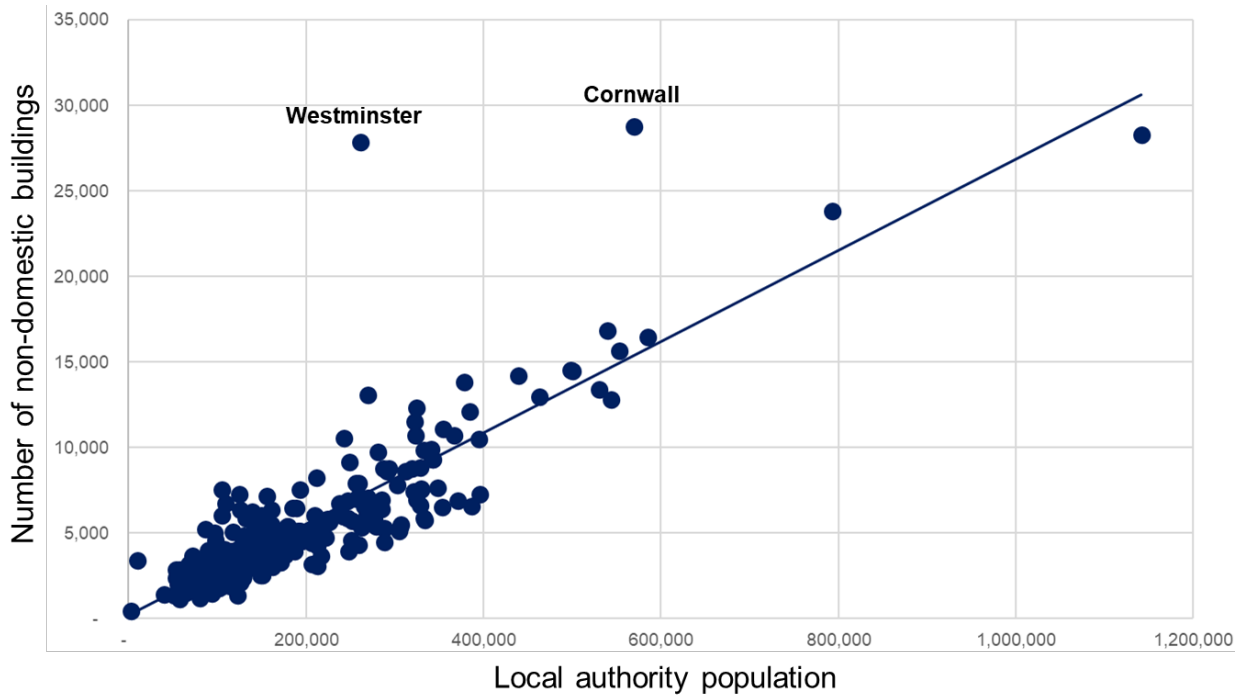
As there is a correlation between the population of a local authority and the number of non-domestic buildings it contains (see Figure 3), population differences should be considered when interpreting results at the local authority level.

To help with this the number of buildings in a local authority per 100,000 population is also presented in the data tables (see Table LA1).

The number of non-domestic buildings in each parliamentary constituency is also presented in this report below. Parliamentary constituencies have broadly similar populations, so patterns seen will not be driven by population differences.

From Figure 3 we can see that there is a correlation between the population of the local authority and the number of non-domestic buildings it contains, which at least partly explains the results described above. There are however two prominent outliers: both Cornwall and Westminster have a much higher number of non-domestic buildings than would be expected based on their population.

Figure 3: Variation of the number of non-domestic buildings with population for LA in England and Wales[11]



[11] Population data from ONS Population Estimates for LAs, MYE3: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland

In Cornwall this could be due to the relatively high number of tourists; 16 million holiday nights were spent in Cornwall per year on average between 2017 and 2019, 10% of England's total[12]. Tourists increase the demand for hospitality buildings, but will not be counted in the population estimates, increasing the number of non-domestic buildings per 100,000 population.

The demand for hospitality buildings in Cornwall can been seen table LA1: Cornwall contains 6.4% of hospitality buildings in England and Wales, but only 1.7% of all non-domestic buildings.

In Westminster this could be due to the disproportionately high number of office buildings in this area. Westminster contains 5.2% of all offices in England and Wales, but only 1.7% of all non-domestic buildings. Many of the workers in these offices will not live in the local area but will commute from elsewhere, and so will not be included in the population estimates. The high number of offices in the area will also drive demand for other non-domestic buildings such as hospitality buildings, to cater for the workforce.

Adjusting for population, the City of London, the Isles of Scilly and Westminster have the most non-domestic buildings of any LA (35,000, 19,000 and 11,000 non-domestic buildings per 100,000 population respectively). Bracknell Forest in the South East has the lowest rate, at 1,100 non-domestic buildings per 100,000 population. Bracknell Forest also has the fourth lowest number of non-domestic buildings of any LA in England and Wales at 1,400. Of the 10 LAs with the lowest number of non-domestic buildings per 100,000 population, eight are in the South East and outer London areas.

Number of non-domestic buildings by parliamentary constituency (PC)

Figure 4 shows the number of non-domestic buildings in each PC. The corresponding data can be found in PC1 in the accompanying data tables.

> PC boundaries are drawn so that they contain voting populations of broadly the same size (House of Commons, 2021)[13]. Because of this, data presented at PC level will be relatively unaffected by variations in population.

The PC of the Cities of London and Westminster has the highest number of non-domestic buildings in England and Wales, with 29,000 non-domestic buildings or 1/50th of the non-domestic buildings in England and Wales.

The constituency of Ladywood in central Birmingham has the second highest number of non-domestic buildings, with constituencies in central Leeds, Manchester, Bristol, Liverpool, and Sheffield joining three other London constituencies to complete the ten PCs with the most non-domestic buildings.

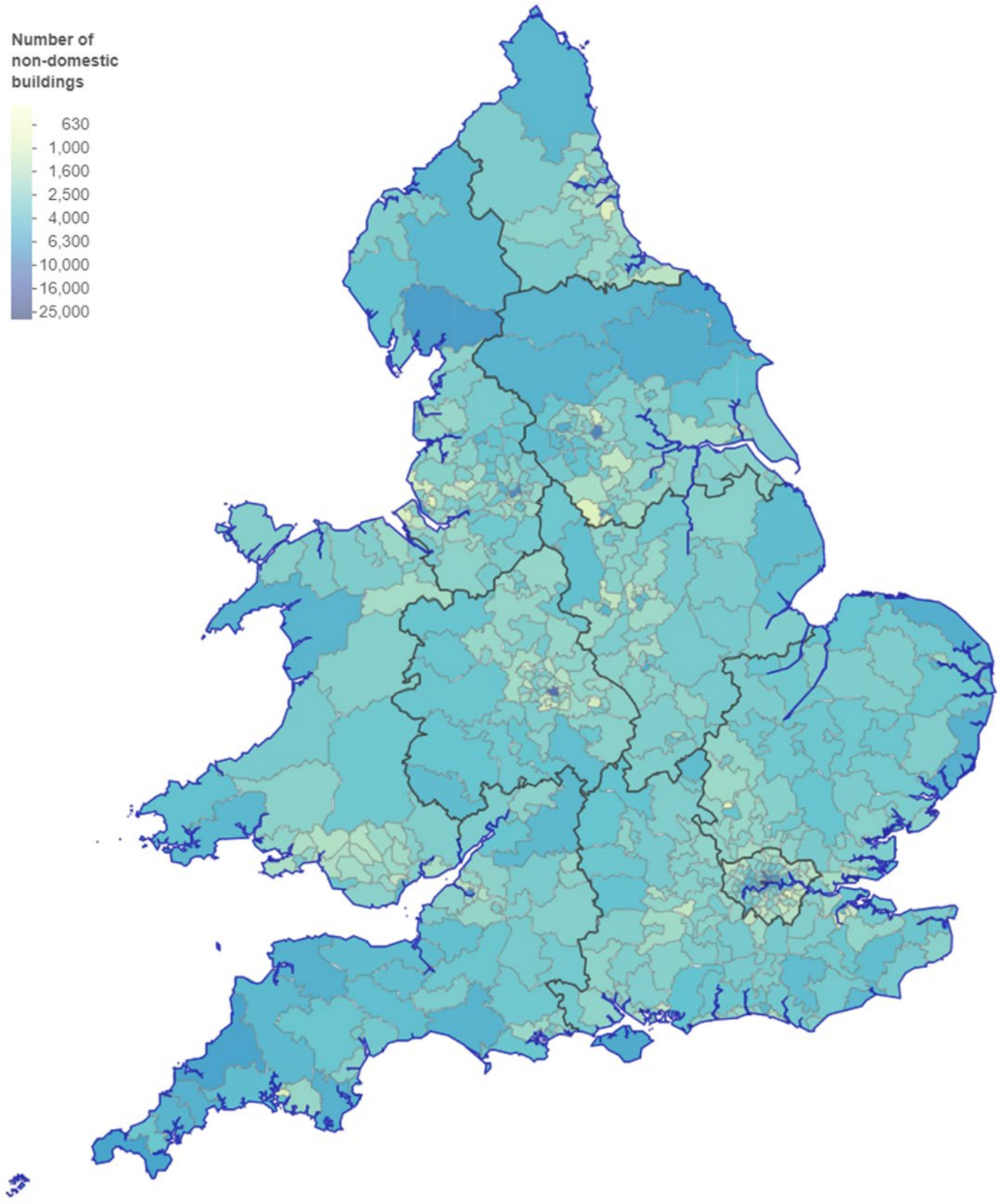
This suggests that as parliamentary constituencies in the centre of large cities tend to have the highest number of non-domestic buildings, perhaps city centres tend to have few domestic properties and densely packed non-domestic properties.

The PCs with the lowest number of non-domestic buildings are also in urban areas but tend to be located towards the outskirts of towns and cities, rather than in the centre. For example, Luton North is the smallest PC with 930 non-domestic buildings (note Luton North does not

[12] Visit Britain Local Authority Data: https://www.visitbritain.org/destination-specific-research
[13] House of Commons Research Briefing on PC boundaries: https://commonslibrary.parliament.uk/research-briefings/sn05929/

include the centre of Luton). Eltham in South-East London, Liverpool West Derby in West Liverpool and Sheffield Hallam in West Sheffield also all have less than 1,000 non-domestic buildings. This could be because suburban areas towards the edge of large cities/towns have a higher proportion of domestic buildings and fewer non-domestic ones.

Figure 4: Number of non-domestic buildings by PC in England and Wales



Number of non-domestic off-gas grid buildings

Further analysis has been undertaken to identify the geographical distribution of the non-domestic buildings in England and Wales that are off the gas grid. Full results at PC, LA and regional level can be found in the Accompanying Data tables (PC3, LA3, RG5).

Buildings in the ND-NEED Geographical Annex were identified as either 'on-gas grid', or 'off-gas grid', using Xoserve/CSE data containing postcodes with no connections to the national gas grid (2017). More information on the classification of off-gas grid buildings is available in the Method section.

> The ND-NEED definition of an off-gas grid non-domestic building is a non-domestic building in a postcode where no building, domestic or non-domestic, has a connection to the gas distribution network.

This analysis shows that 17% (278,000) of non-domestic buildings in England and Wales are off-gas grid. The proportion of buildings that are off-gas grid varies substantially between regions from only 11% in London to 27% in the South West (see table RG5 in the accompanying data tables).

Data is also available for the number of domestic properties that are not connected to the gas grid[14]. Whilst this is on a slightly different basis from the method used for non-domestic buildings (see Method section), the headline results are similar, with 15% of domestic properties in Great Britain not connected to the gas grid.

Number of off gas grid buildings by parliamentary constituency

Analysis of the number of off-gas grid buildings by parliamentary constituency found that the PCs with the highest proportion of off-gas grid non-domestic buildings were in the predominantly rural South Norfolk (61%), and Penrith and the Border (57%). The PCs with the lowest proportion of off-gas grid non-domestic buildings were in the predominantly urban areas such as Leicester East, Liverpool West Derby and Lewisham West and Penge where less than 1% of non-domestic buildings are off-gas grid.

Rural/Urban split

As the PC level data indicates that there is a difference between the number of off gas grid buildings in rural and urban area, the data can be disaggregated further, using the ONS NSPL rural-urban classification method.

This showed that 165,000 off-gas grid non-domestic buildings are located in rural areas (59%), and 114,000 off-gas grid non-domestic buildings are located in urban areas (41%).

The number of off-gas grid non-domestic buildings in each PC that are urban or rural respectively are presented in Figure 5.

> Note, the map in Figure 5 is at the PC level, whereas the urban/rural split is at the 2011 Census Output Areas level, which are much smaller than PCs. This means the majority of PCs are coloured in both the urban and rural maps, as they contain both urban and rural Output Areas.

[14] https://www.gov.uk/government/statistics/lsoa-estimates-of-households-not-connected-to-the-gas-network

The PCs with the highest number of urban off-gas grid non-domestic buildings are in city centres, including the Cities of London and Westminster (9,000), Manchester Central (1,500) and Leeds Central (1,500). The PCs with the highest total number of rural off-gas grid non-domestic buildings are in North Cornwall (3,400), St Ives (2,800) and North Norfolk (2,300).

The top rural PCs have a higher number of off gas-grid buildings than the top urban PCs. As urban PCs are likely to be more densely populated, this suggests that rural PCs tend to have larger geographical areas that are off the gas grid than urban PCs. The higher number of off-gas grid buildings in rural areas also ties in with the fact that 59% of all off-gas grid buildings are in rural areas.

Figure 5: Number of off-gas grid buildings by PC in England and Wales, split by rural and urban

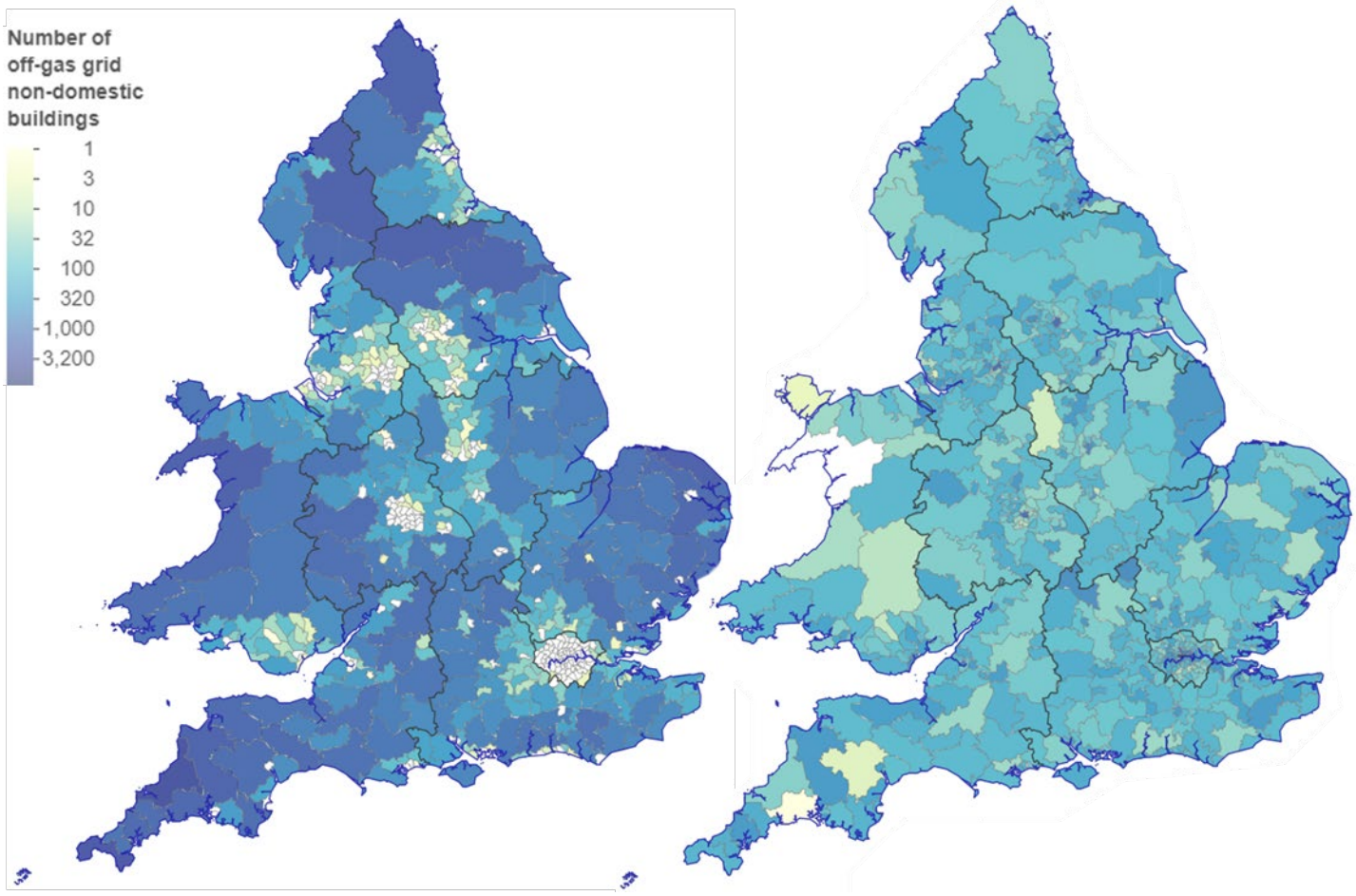


Figure 5b: Urban off-gas grid buildings

Floor area of non-domestic buildings by region and sector

Analysis has also been done to disaggregate non-domestic building floor area in England and Wales by region, local authority and parliamentary constituency. Analysis of the results at the regional level can be found below. Data at the local authority level can be found in table LA2 in the accompanying data tables, and at the parliamentary constituency level in table PC2.

Note, 287,000 (17%) of the 1,649,000 non-domestic buildings in the ND-NEED Geographical Annex dataset do not have floor area information, and so are excluded from this analysis.

The proportion of buildings missing floor area information varies slightly between regions, ranging from 13% in London to 25% in the South West (see Table 9 in the methodology). This may inflate the results from regions with a higher proportion of floor area present and deflate the results from the regions with a lower proportion of floor area present.

Table 5 shows the proportion of floor area of non-domestic buildings in each region in England and Wales, split by sector. As in tables 2 and 3, data are only presented for sectors that have floor area for more than 80% of buildings.

Table 5 shows that floor area has a similar pattern to building number. The proportion of factories, offices, shops, and warehouses in each region are all generally in line with the proportion of all non-domestic floor area in that region. Again, London is the exception, with a disproportionately high share of office floor area (28%), and a disproportionately low share of factory floor area (4%), compared with 11% of non-domestic building floor area.

Table 5: Proportion of floor area of non-domestic buildings in each region in England and Wales, by sector

Region	Factories	Offices	Shops	Warehouses	All Sectors
England	**93%**	**96%**	**94%**	**96%**	**95%**
North East	6%	4%	5%	4%	**5%**
North West	15%	12%	14%	14%	**14%**
Yorkshire and The Humber	14%	8%	10%	12%	**12%**
East Midlands	12%	6%	8%	12%	**10%**
West Midlands	14%	7%	10%	13%	**11%**
Eastern	10%	8%	10%	12%	**11%**
London	4%	28%	14%	8%	**11%**
South East	10%	16%	14%	13%	**13%**
South West	9%	7%	10%	8%	**9%**
Wales	**7%**	**4%**	**6%**	**4%**	**5%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

England and Wales non-domestic building energy consumption

This section of the report analyses the distribution of non-domestic building electricity and gas consumption, in England and Wales.

Two methods are used to produce this analysis. A brief outline of these methods, summarised in Figure 6, and the implications this has on the resulting analysis is provided below.

Please consider this when deciding which energy consumption method is most appropriate for your work. More information and a comparison of the methods used, including how these methods compare to the sub-national statistics[15], and their impact on the energy consumption analysis, can be found in the methodology.

1. ND-NEED meter population total consumption

Consumption data by geographical area can be presented using the entire underlying ND-NEED meter population. This is the meter level data of all non-domestic buildings in England and Wales and is what the ND-NEED sample consumption data is scaled to (see the methodology of the main ND-NEED report).

The key advantage of this method is that all electricity and gas consumption from non-domestic buildings is captured. This allows meaningful comparisons of consumption between all geographical areas.

The key disadvantages of this method are that:

1. The data cannot be split by sector or building size. This is because these meters have not been matched to their corresponding buildings, so the characteristics of the buildings they are in are unknown.

2. The data includes consumption from ‘non-buildings’ that are excluded under the ND-NEED definition, for example car parks or quarries. This adds an extra 10-15% to the weighted matched sample consumption figures also presented here.

Due to the lack of a geographical component in the weighting method, this is the best representation of the distribution of total electricity and gas consumption across region, local authority or parliamentary constituency.

2. ND-NEED weighted matched sample consumption

Due to the limitations of the address-matching process, just over 40% of buildings in the ND-NEED stock were successfully allocated 2018 electricity consumption meter data. This creates a sample of 699,000 non-domestic buildings with 2018 electricity consumption data. Of these, 287,000 non-domestic buildings were also matched to gas 2018 consumption meter data.

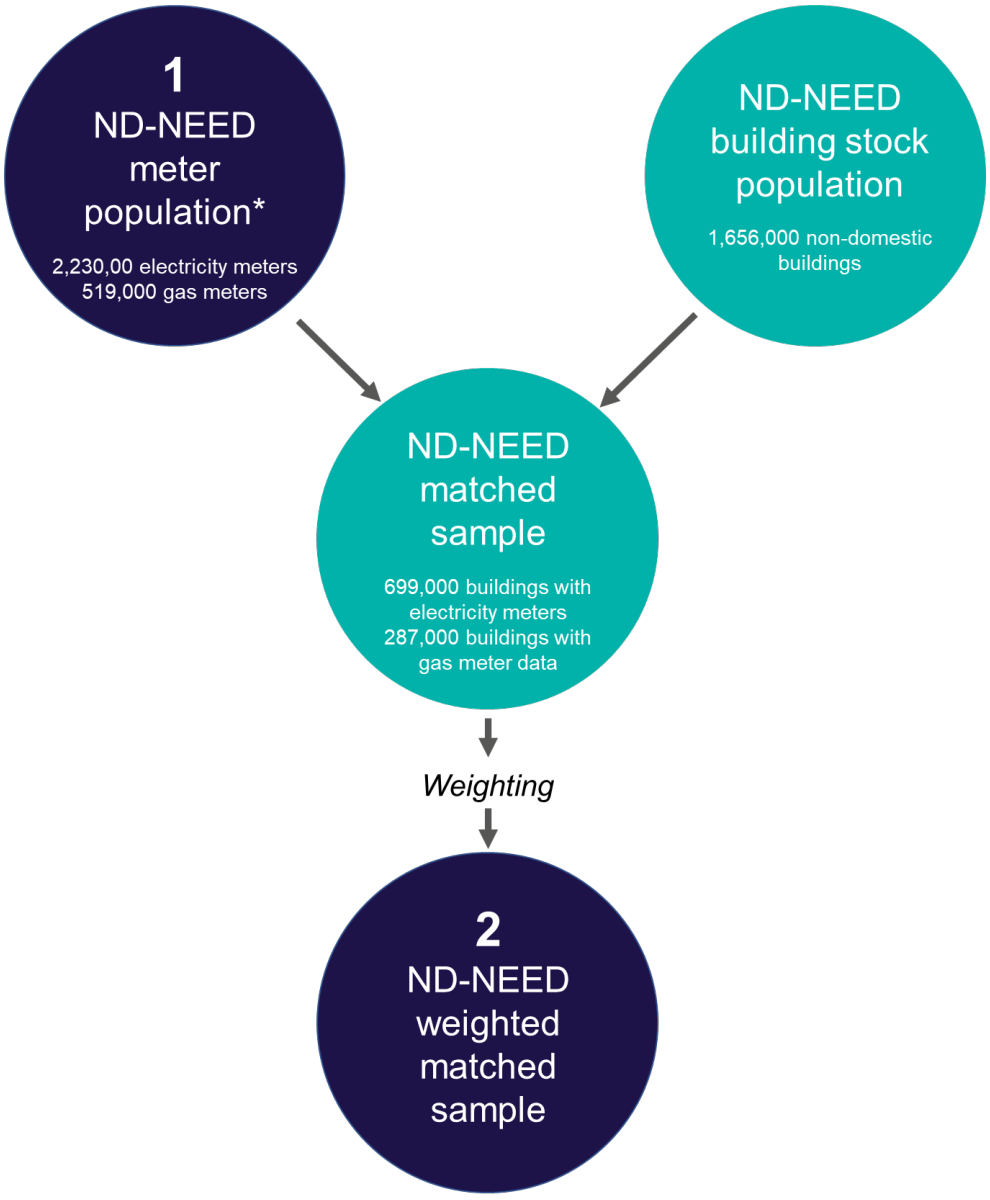
[15] Sub-national electricity and gas consumption statistics: https://www.gov.uk/government/statistics/sub-national-electricity-and-gas-consumption-summary-report-2019

As the sample of matched buildings is not representative of the entire building stock, ND-NEED weights the sample to the population level. The weights scale a building in the matched sample based on its use and size. Full details of the weighting process can be found in the methodology section of ND-NEED 2020.

The key advantage of this method is that the consumption data can be split by sector. This is because the consumption data has been linked to the corresponding ND-NEED buildings.

The key disadvantage of this method is that the number of buildings missing electricity or gas consumption information in the matched sample differs between geographical areas. This bias in the matching process is not fully accounted for in the weighting process. Because of this bias, data from the ND-NEED meter population method should be used when sector or building size splits are not needed.

Figure 6: Methods for calculating consumption of non-domestic consumption from ND-NEED data



* Includes meter data from 'non-buildings', under the ND-NEED definition

Non-domestic total consumption by region (ND-NEED meter level population)

As outlined above, this report presents consumption from the ND-NEED meter population, split by region. The results of this analysis at regional level are summarised in Figure 7, while the ND-NEED meter population consumption data at local authority and parliamentary constituency level can be found in tables LA4 and RG6 in the accompanying data tables.

The ND-NEED meter population dataset (England and Wales) differs from the non-domestic sub-national dataset (GB) because it includes consumption from low-consuming 'domestic-like' non-domestic meters.

Electricity consumption
The non-domestic subnational electricity consumption dataset[16] contains all electricity meters in non-domestic profile classes (3-9). ND-NEED meter population dataset contains all these meters and any meters in domestic profile classes (1-2) that can be matched to a non-domestic address.

Gas consumption
The non-domestic subnational gas consumption dataset[17] contains all gas meters that consume greater than 73.2 MWh. ND-NEED meter population dataset contains all these meters and any meters that consume less than 73.2 MWh that can be matched to a non-domestic address.

More information on the differences between the ND-NEED meter population dataset and the non-domestic subnational dataset can be found in the methodology.

Figure 7a shows that meter level electricity consumption is highest in London and the South-East (16% and 14% of the total ND-NEED electricity meter level consumption respectively), and lowest in the North East and Wales (5% and 6% respectively). This is in line with the number of non-domestic building in these regions, with London and the South East containing the highest number of non-domestic buildings, and the North East and Wales containing the lower number of non-domestic buildings.

Figure 7b shows that the meter level gas consumption has a slightly different regional pattern than electricity. It is highest in the North West (15%) and Yorkshire and the Humber (13%). This could be driven by the high gas demands of factories in these traditionally industrial areas, as factories consume more than twice as much gas as any other ND-NEED sector[18]. This interpretation is supported by the fact that the North West is the region that contains the most factories (12%), followed closely by Yorkshire and the Humber is joint second (11%).

Like meter level electricity consumption, the regions with the lowest meter level gas consumption are in the North-East (5%) and Wales (6%).

[16] Subnational electricity consumption dataset – https://www.gov.uk/government/collections/sub-national-electricity-consumption-data
[17] Subnational gas consumption dataset - https://www.gov.uk/government/collections/sub-national-gas-consumption-data
[18] ND-NEED 2020 - https://www.gov.uk/government/statistics/non-domestic-national-energy-efficiency-data-framework-nd-need-2020

Figure 7: Meter level consumption of non-domestic buildings by region in England and Wales

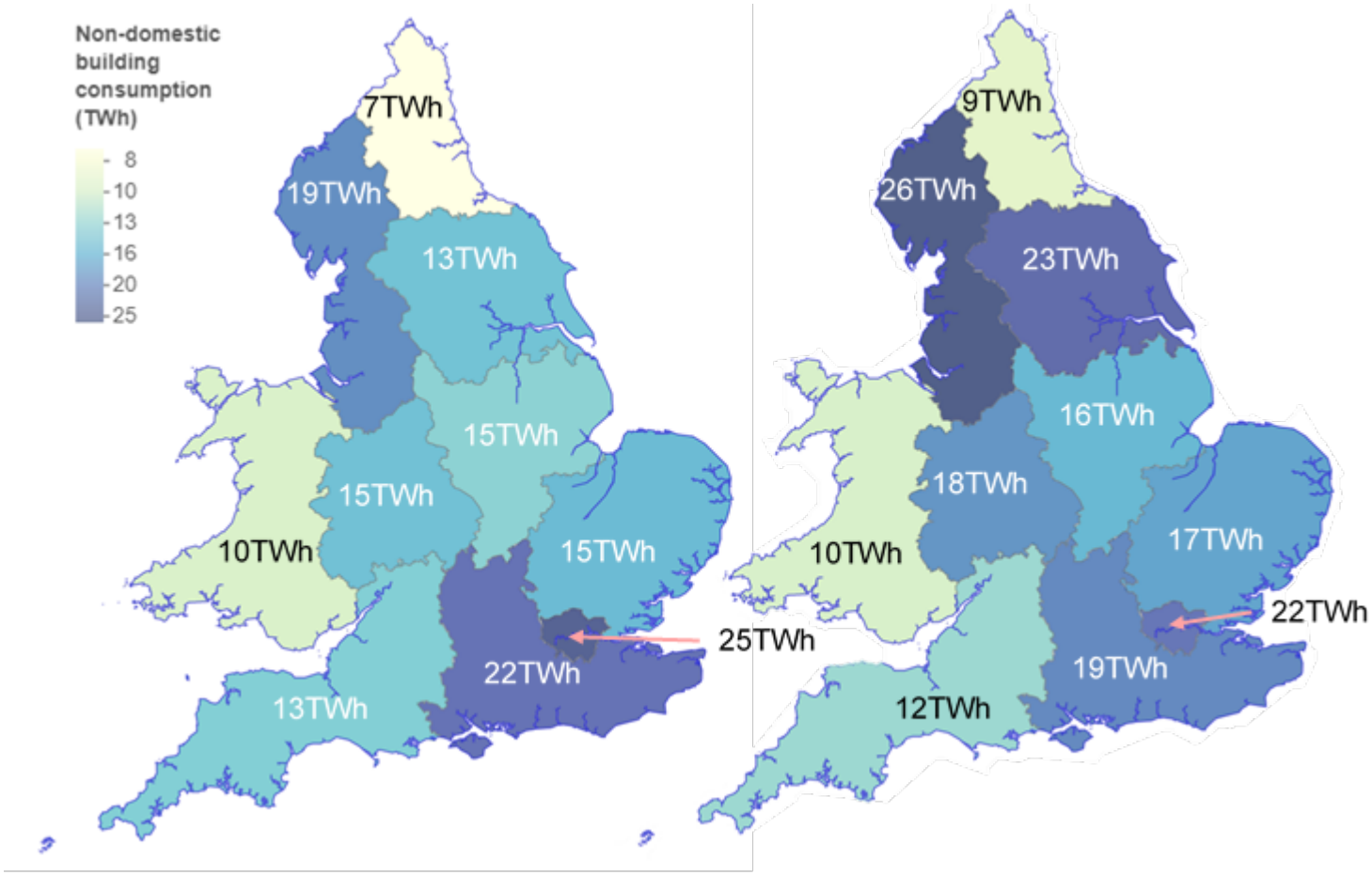


Figure 7a: Electricity meter consumption **Figure 7b: Gas meter consumption**

Non-domestic total consumption by region, split by sector (ND-NEED weighted matched sample)

Non-domestic building consumption can also be estimated using the ND-NEED weighted matched sample. This method relies upon a sample which is weighted up to represent the population, and therefore will be less accurate than the ND-NEED meter population data. However, this data includes building stock information, and therefore can be presented at a sector level. An analysis of the accuracy of the weighted matched sample when compared to the meter level data is available in the methodology section.

Tables 6 and 7 show the proportion of electricity and gas consumed by region in England and Wales based on the weighted ND-NEED matched sample. This is shown for the four ND-NEED sectors with the largest number of buildings. These are the same sectors that were presented for the building stock in Tables 2-5. Consumption data for other sectors can be found in the accompanying data tables RG7a and RG7b.

Table 6 shows that 30% of electricity consumed by offices is consumed in London. Table 1 shows that 21% of offices are in London, which suggests that offices in London consume an above average amount of electricity. On average, offices in London are larger than in other parts of England and Wales (average office floor area in London is 343m^2, compared to 257m^2 in England and Wales). This may contribute to their high electricity consumption.

Table 6: Proportion of electricity consumption by region in England and Wales split by sector using ND-NEED weighted matched sample data

Region	Factories	Offices	Shops	Warehouses	All Sectors
England	**95%**	**95%**	**95%**	**97%**	**95%**
North East	11%	3%	5%	3%	**6%**
North West	18%	8%	13%	11%	**13%**
Yorkshire and The Humber	14%	8%	10%	10%	**11%**
East Midlands	13%	6%	8%	13%	**10%**
West Midlands	12%	7%	9%	15%	**10%**
Eastern	10%	10%	10%	12%	**10%**
London	4%	30%	18%	11%	**14%**
South East	5%	17%	13%	15%	**11%**
South West	8%	6%	9%	7%	**9%**
Wales	**5%**	**5%**	**5%**	**3%**	**5%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Table 7 shows that Yorkshire and the Humber and the North West are each responsible for around 20% of the gas consumed in factories. Table 1 shows that the North West contains 12% of factories and England and Wales, and Yorkshire and the Humber contains 11%. Table 4 shows that both regions contain around 15% factory floor area in England and Wales. This suggests these factories are larger than average, which may contribute to their high gas consumption.

Table 7: Proportion of gas consumption by region in England and Wales split by sector using ND-NEED weighted matched sample data.

Region	Factories	Offices	Shops	Warehouses	All Sectors
England	**96%**	**97%**	**95%**	**98%**	**95%**
North East	3%	4%	4%	3%	**5%**
North West	20%	11%	14%	12%	**15%**
Yorkshire and The Humber	21%	10%	11%	11%	**14%**
East Midlands	14%	9%	8%	17%	**11%**
West Midlands	15%	8%	11%	15%	**11%**
Eastern	8%	12%	9%	10%	**10%**
London	5%	24%	17%	14%	**13%**
South East	3%	13%	14%	11%	**9%**
South West	5%	7%	7%	5%	**7%**
Wales	**4%**	**3%**	**5%**	**2%**	**5%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**

3.Method

To produce the results in the ND-NEED geographical annex two new datasets created. These are:

The ND-NEED Geographical Annex dataset.

The ND-NEED Geographical Annex dataset is the ND-NEED dataset used in the main report, with geographical area information added.

The ND-NEED dataset contains all ND-NEED non-domestic buildings in England and Wales. It is based on the non-domestic ratings data from the VOA[19] which contain all non-domestic hereditaments that pay business rates. This data is aggregated to the building level. Certain building uses are excluded as they are not considered to be buildings. This creates a dataset of 1.7 million ND-NEED non-domestic buildings with information on their building use and building size.

These 1.7 million non-domestic buildings are then matched to electricity and gas consumption information held by BEIS, using address matched. This matches around 40% of buildings to their electricity consumption data and 20% of buildings to their gas consumption data. Consumption from these 'matched' buildings is weighted to produce consumption figures for the whole non-domestic building population.

This dataset is used to produce geographical breakdowns of non-domestic building number, non-domestic floor area and non-domestic electricity/gas consumption (by sector only).

The ND-NEED Geographical meter dataset.

The ND-NEED Geographical meter dataset is the ND-NEED meter population dataset with geographical area information added.

The ND-NEED meter population dataset contains all non-domestic meters and is used in the main ND-NEED report to inform the weights used to scale up consumption of the matched buildings in the ND-NEED dataset.

This dataset is used to produce geographical breakdowns of non-domestic electricity and gas consumption.

Creating the ND-NEED Geographical Annex Dataset

The ND-NEED dataset contains all non-domestic buildings in England and Wales with information about their building use and building size. The following steps were taken to convert this to a geographical annex dataset.

[19] OA non-domestic rating- https://www.gov.uk/government/collections/non-domestic-rating-stock-of-properties-collection

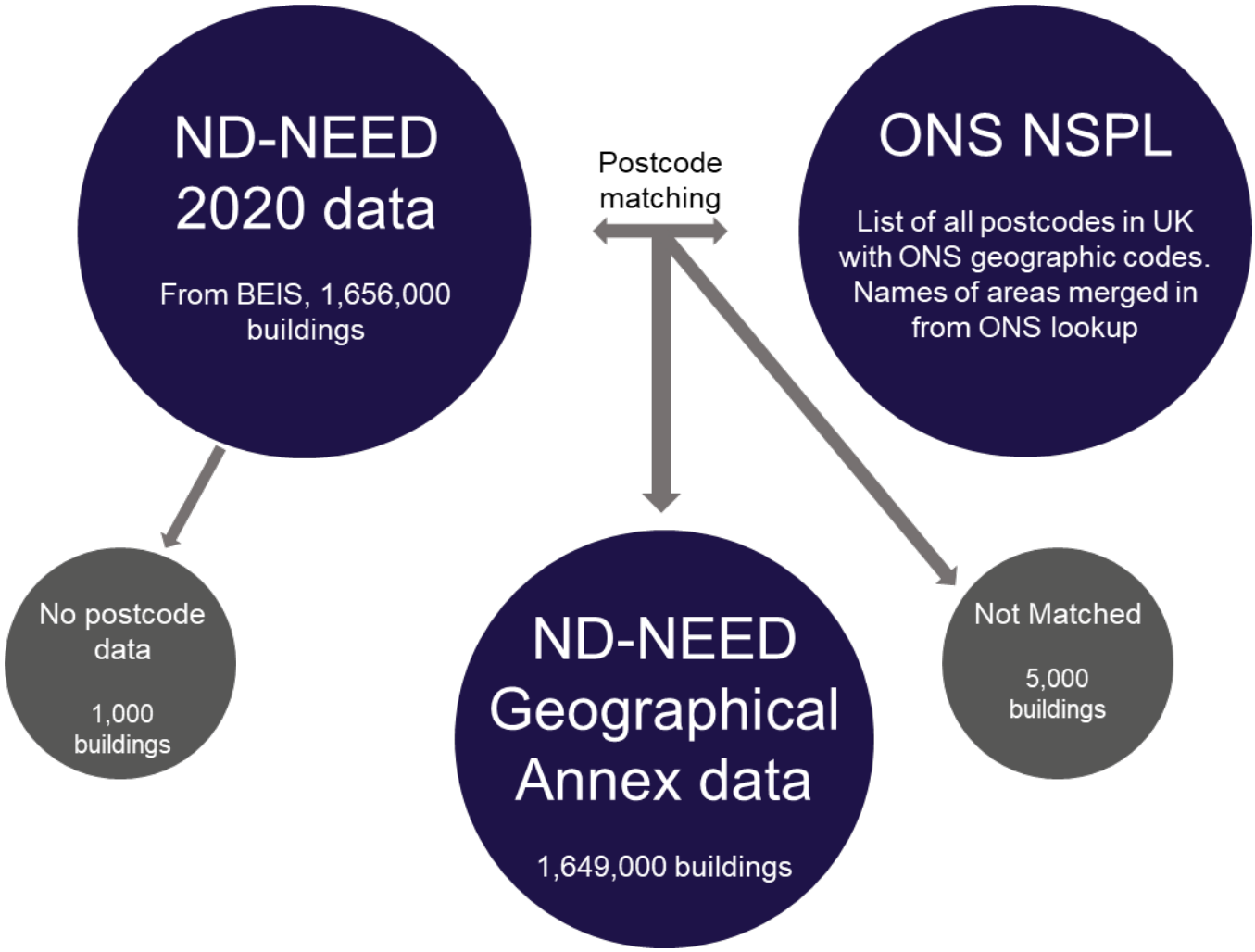
Adding geographical area information

The ND-NEED dataset contains postcode information for over 99.9% of the UK's 1,656,000 non-domestic buildings. This enabled 1,655,000 buildings in the ND-NEED dataset to be matched against the ONS NSPL (November 2020) by postcode. This is summarised in Figure 8.

During matching, 5,000 buildings failed to match because their postcode were not in the NSPL, leaving an ND-NEED Geographical dataset of 1,649,000 non-domestic buildings which have associated geographical area codes (region, LA, PC). This is 99.6% of the main ND-NEED dataset.

The region, LA and PC codes were matched against the codes in the ONS Names and Codes lookup tables to provide names for the PC, LA and regions (last updated December 2020).

Figure 8: Graphic summarising the production of the ND-NEED geographical annex dataset



Rural/urban flag

The NSPL also contains information on whether a building is rural or urban. This is used to add a flag to all non-domestic buildings in a rural rather than urban postcode, according to the ONS definition.

Off gas grid flag

To determine whether a building was in an area where it could not reasonably connect to the gas National Transmission System – Great Britain's interconnected gas supply network ('the gas grid') - the Xoserve/CSE off-gas grid postcode dataset is used, as outlined below and summarised in Figure 9.

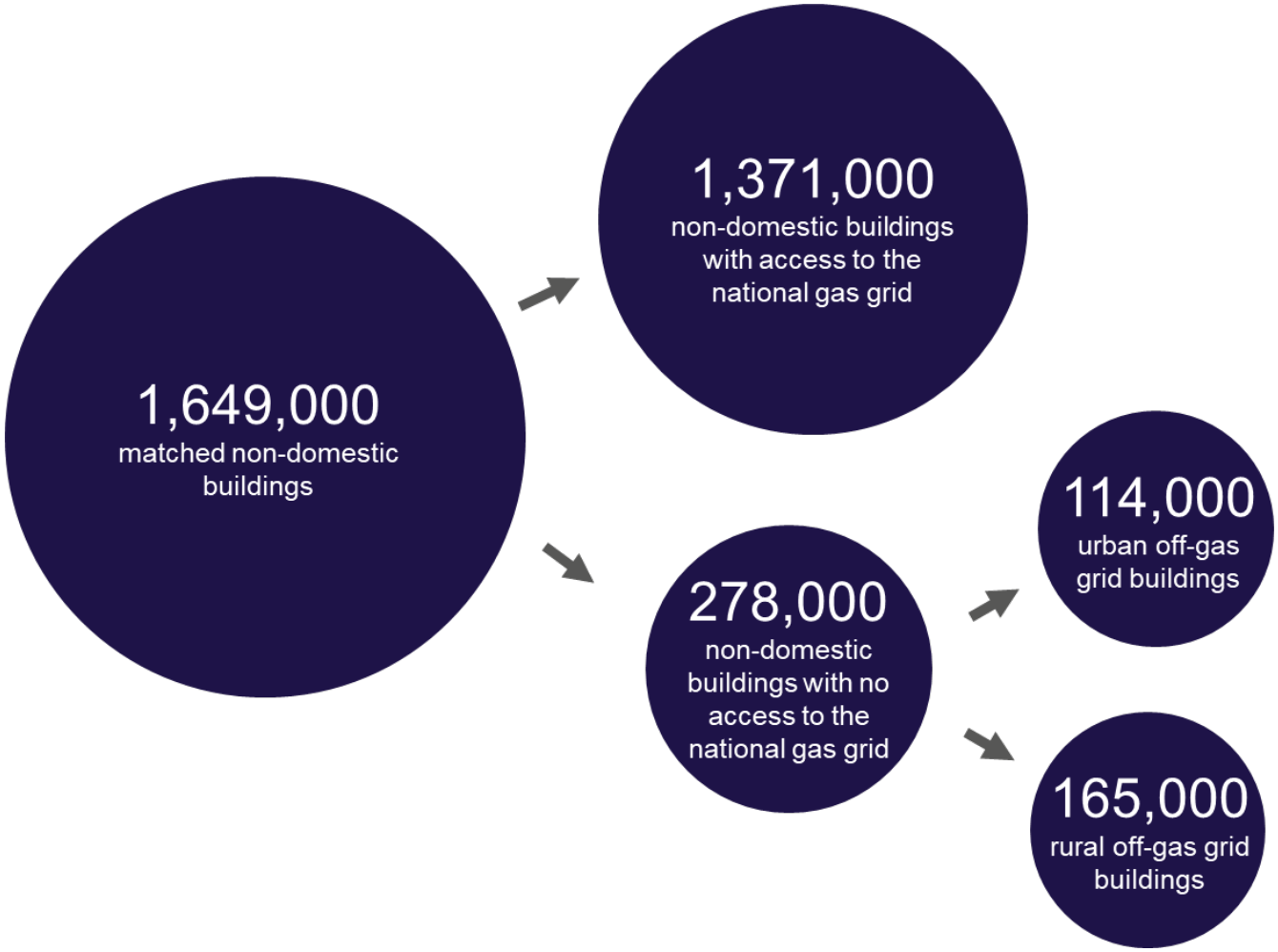
The Xoserve/CSE dataset contains all postcodes in the Great Britain that have no connections to the gas grid in 2017. This is then matched against the ND-NEED data by postcode. Where a building is in a postcode identified by the Xoserve/CSE dataset to have no buildings, domestic or non-domestic, with a connection to the gas distribution network, it if initially flagged as 'off-gas grid'. A total of 280,000 non-domestic buildings were flagged as off-gas grid.

The buildings flagged as off-gas grid were checked to see if they had a gas meter reading in 2018. There were 1,800 buildings marked as in a postcode with no buildings connected to the gas grid in 2017, but had a gas meter reading in 2018. The off-gas grid flag was removed from these buildings, leaving 278,000 off-gas grid buildings.

However, an unknown number of buildings are missing gas consumption data as described in the ND-NEED matched sample method section. It is therefore likely that more than 1,800 buildings marked as in an off-gas grid postcode consumed gas in 2018. Assuming that the address matching success rate for gas meters is similar to electricity data (about 50%), this suggests that the true number of buildings marked as in on off-gas grid postcodes, but consuming gas, to be 3,000-4,000. This would suggest that 278,000 off-gas grid buildings is a small overestimate.

All buildings not matched to an off-gas grid postcode, with no postcode or with a gas meter reading of greater than 0 kWh are considered to be 'on-gas grid'. This means that buildings that have chosen not to be connected to the gas grid are considered to be 'on-gas grid'.

Figure 9: Merging ND-NEED with Xoserve/CSE Off-Gas Grid data



Comparison with domestic off-gas grid method

The method used for estimating the number of domestic properties not connected to the gas grid[20] differs slightly from that used here. It deducts the number of gas meters in a region from the number of properties. This method is less suitable for non-domestic buildings due to:

1. Deducting the number of gas meters in a region from the number of non-domestic buildings would overestimate the number of off-gas grid buildings. This is because low consuming non-domestic buildings are identified by address-matching; if a gas meter matches to an ND-NEED non-domestic building address, it is considered to be non-domestic. However, due to limitations of the address-matching algorithm, not all low consuming non-domestic meters are detected in ND-NEED. The number of gas meters is therefore an underestimate, causing the difference between the number of buildings and the number of gas meters to be too large.
2. The domestic approach would also capture buildings that lay in on-grid areas but have chosen not to connect.

[20] https://www.gov.uk/government/statistics/lsoa-estimates-of-households-not-connected-to-the-gas-network

Weighted Matched Sample Consumption Data

The ND-NEED Geographical Annex dataset contains 1,649,000 non-domestic buildings all of which have geographic area information, information about building use and building size (though 17% of buildings are missing building size information as described in the 'missing floor area' section) and rural/urban and off-gas grid flags.

A sample of around 40% of the buildings in this dataset also have electricity consumption information, and around 20% also have gas consumption information. This sample is scaled up with weights calculated based on a building's use and sector, to remove bias in the matching process. This weighting does not take into account geographical biases in the matching process. This is described in the 'missing consumption data' section.

Information about the non-domestic building stock and energy use in each region, LA and PC could then be obtained by summarising this dataset. This could optionally be split or filtered by building use or building size.

This data was calculated based on the methods described in Table 8.

Table 8: Methods for summarising non-domestic building data by geography

Variable	Method
Total Number	Count the number of rows of data
Floor Area, Weighted Electricity or Gas Consumptions	Sum all values of non-domestic buildings floor area or weighted electricity and gas consumption data, including zero values where the data is missing from ND-NEED.
Sample size of *variable*	Count the number of non-domestic buildings in the ND-NEED dataset with a non-zero and non-NA value for: Floor area; Electricity and Gas Consumption.
Share of *variable*	Divide variable for each geography by the England and Wales total and multiply by 100. The England and Wales total is taken as the matched ND-NEED Geographical Annex total, ignoring buildings that were not matched to a geography, to allow for direct comparisons between geographies. This was done for the following variables: Number of Buildings; Floor area; Energy, Electricity and Gas Consumption.

Disclosure: where there are fewer than three buildings in a consumption data point, or a building represents over 90% of the total, consumption data will be removed. Where there is only one geographical area (for example, region) that meets this condition, to avoid disclosure by residual, the next closest data point laying within the same upper level area (for example, country) to also meeting it is also supressed.

Missing floor area data in ND-NEED Geographical Annex dataset

In ND-NEED 2020 dataset, 288,000 (17%) of buildings do not have floor area data. This is because:

1. This information is missing from the VOA data that ND-NEED is based on (44%).

2. The floor area information is removed from the NDNEED dataset because the data is believed to be unreliable, around 1 per cent of the total ND-NEED floor area.
    a. This is done for all buildings with a floor area of less than 15m^2 (53%). This removes around 1,000,000m^2 of floor area.
    b. This is done for buildings in subsectors not used to inform the VOA's building rating (2%). This removes around 5,000,000m^2 of floor area. For a full list of subsectors that have floor area removed for all ND-NEED buildings, please see *ND-NEED 2020, Annex D.*

This means that 287,000 (17%) of buildings in the ND-NEED Geographical Annex are also missing floor area data. The remaining buildings failed to match into the Geographical Annex due to missing or incorrect postcodes.

The exact amount of floor area missing from ND-NEED is not known and therefore cannot be accounted for. All floor area data presented is therefore believed to be an underestimate.

Table 9 shows the proportion of non-domestic buildings that are missing floor area data in each region, for the for largest ND-NEED sectors. The 'Totals' column shows that there is not a huge difference between the number of non-domestic buildings in each region that are missing floor area data, so comparisons between regions can reasonably be made.

However, this is not the case for sectors. From Table 9 it can be seen that the proportion of buildings missing floor area information in the ND-NEED Geographical Annex dataset varies substantially between sectors. Floor area data has therefore only been presented for sectors were less than 20% of buildings are missing floor area data. For all of these sectors the principal reason floor area data is missing is because it was removed from buildings with a floor area of <15m^2. This suggests that the absence of this floor area data doesn't have a large effect on the total floor area presented.

These sectors missing less than 20% of floor area data were: Factories; Offices; Shops; and Warehouses. The following remaining sectors were combined to create an 'All other sectors' category: Arts, Community and Leisure; Education; Emergency Services; Health; Hospitality; and Other. 54% of buildings in the 'All other sectors' category are missing floor area data.

Due to variations, floor area comparisons between sectors must be done with caution.

A full breakdown of total floor area and % of buildings missing floor area by region and sector is available in table RG4 in the accompanying data tables.

Floor area data is also presented at the LA and PC level for the four sectors where more than 80% of buildings have floor area present in the accompanying data tables (LA2, PC2).

Table 9: Percentage of non-domestic buildings missing floor area data

Region	Factories	Offices	Shops	Warehouses	All other sectors	All sectors
England	**2%**	**12%**	**3%**	**5%**	**53%**	**17%**
North East	1%	10%	2%	94%	56%	**18%**
North West	2%	11%	2%	5%	54%	**16%**
Yorkshire and The Humber	2%	12%	3%	6%	54%	**17%**
East Midlands	1%	11%	2%	2%	51%	**16%**
West Midlands	1%	11%	2%	3%	49%	**14%**
Eastern	1%	12%	3%	5%	54%	**19%**
London	6%	14%	3%	7%	39%	**13%**
South East	1%	12%	2%	5%	50%	**16%**
South West	2%	11%	3%	5%	65%	**25%**
Wales	**1%**	**12%**	**2%**	**9%**	**60%**	**23%**
Totals	**2%**	**12%**	**3%**	**5%**	**53%**	**17%**

Weighting the ND-NEED matched sample consumption dataset

ND-NEED matches VOA building stock data to meter level energy consumption data held by BEIS using an address matching algorithm. However, this matching process is only able to match 2018 electrical meter readings to 699,000 buildings out of the 1,656,000 buildings in the ND-NEED dataset. Of these 699,000 buildings, 287,000 were also successfully matched to gas consumption meter data.

This means that consumption data for 957,000 non-domestic buildings is not available. In ND-NEED 2020, weights are used to scale up the ND-NEED sample consumption to the ND-NEED population level.

The ND-NEED weights take into account differences in the address matching rate between building use and building size. This is done by stratifying the building population and the matched sample based on a building's use and size, creating a matrix. For each cell, the population count is divided by the matched sample count. This creates a weight for building.

This weighting for each building is then adjusted for electricity and gas consumption. The number of electricity or gas meters in the matched sample multiplied by their building weight is compared with the number of meters in the ND-NEED meter level population, split by consumption band and meter profile. The difference gives an electricity and gas weighting for each building in the matched sample. These weights allow the matched sample to represent the non-domestic building population in England and Wales.

However, this weighting process does not account for geography. Therefore, the ability to compare the data between geographical areas is dependent on the proportion of buildings that are missing consumption data being consistent between these areas.

Table 10 shows that this is broadly true for electricity consumption at the regional level with the number of non-domestic buildings missing 2018 electricity consumption data broadly similar (ranging from 54% to 61%) across the regions.

Note, it is assumed that all non-domestic buildings use electricity from the Great Britain National Grid, and therefore should have electrical consumption data in ND-NEED. Any building that does not have electricity consumption information is therefore considered to be missing this information.

Table 10: Number of non-domestic buildings with 2018 electricity consumption data in ND-NEED 2020

Region	Number of buildings	Number of buildings with electricity data	Proportion of buildings with electricity data
England	**1,548,000**	**658,000**	**43%**
North East	70,000	32,000	46%
North West	212,000	87,000	41%
Yorkshire and The Humber	169,000	74,000	44%
East Midlands	130,000	57,000	44%
West Midlands	155,000	67,000	43%
Eastern	166,000	71,000	43%
London	234,000	97,000	41%
South East	232,000	95,000	41%
South West	181,000	78,000	43%
Wales	**102,000**	**39,000**	**39%**
Totals	**1,649,000**	**698,000**	**42%**

Table 11 shows the number of non-domestic buildings with 2018 gas meter readings in the ND-NEED matched sample, split by region. It shows that the proportion of all non-domestic buildings that have gas meter data is similar (15-19%) across the regions. This suggests that regional comparisons are reasonable.

Note, as not all non-domestic buildings are thought to have a gas connection the proportion of non-domestic buildings missing gas consumption information cannot be calculated. To assess the validity of comparing gas consumption data between regions we therefore rely on the assumption that the proportion of buildings with gas connections is similar between regions.

Table 11: Sample size of non-domestic buildings with 2018 gas consumption data in unscaled ND-NEED matched sample

Region	Number of buildings	Number of buildings with gas data	Proportion of buildings with gas data
England	**1,548,000**	**271,000**	**18%**
North East	70,000	12,000	18%
North West	212,000	40,000	19%
Yorkshire and The Humber	169,000	31,000	19%
East Midlands	130,000	24,000	18%
West Midlands	155,000	29,000	18%
Eastern	166,000	27,000	16%
London	234,000	43,000	18%
South East	232,000	38,000	16%
South West	181,000	27,000	15%
Wales	**102,000**	**15,000**	**15%**
Totals	**1,649,000**	**287,000**	**17%**

This data is also available split by sectors in Accompanying Data Tables RG7a and RG7b.

However this data cannot be presented at PC and LA level. The extra granularity means that a there are large differences in the proportion of buildings missing consumption data between geographies. As the weighting process does not take into account these differences between geography, the weighted matched sample does not represent the population at these levels.

Creating the Geographical ND-NEED meter dataset

This method uses meter-level data from the 2,230,000 electricity and 519,000 gas meters in non-domestic buildings in England and Wales (the ND-NEED meter population).

The electricity and gas meters are matched to the ONS NSPL (November 2020) by postcode to obtain their associated geographical area codes (region, LA, PC). Due to missing postcodes, 6,000 electricity meters and four gas meters could not be matched. A further 24 electricty meters with postcodes failed to match to an active postcode in the NSPL.

The region, LA and PC codes were then matched against the codes in the ONS Names and Codes lookup tables to provide names for the PC, LA and regions (last updated December 2020). This created the Geographical ND-NEED meter dataset which contains contains 2,224,000 electricity meters and 519,000 gas meters, with information about their geographical location. This is summarised in Figure 10.

Information about the energy use in each region, LA and PC could then be obtained by summarising this dataset.

The key advantage of this method is that all electricity and gas consumption from all non-domestic buildings is captured. This allows meaningful comparisons of consumption between all geographical area.

However, as the meters have not been matched to the corresponding non-domestic building the data cannot be broken down by building use or building size or provide any information on the distribution of the non-domestic building stock.

Disclosure: in keeping with the method use for the sub-national consumption data[21], which provides the basis for this dataset, data for any geographical areas that contain five meters or less, or where two meters represent over 90% of the total, will be removed. Where there is only one geographical area (for example, parliamentary constituency) that meets this condition, to avoid disclosure by residual, the next closest data point - laying within the same upper level area (for example, region) - to also meeting the condition is also supressed. The total for the upper level area remains unchanged.

Note, the ND-NEED meter population dataset contains all non-domestic electricity and gas meters in England and Wales. This means it includes meters that are located in ‘non-buildings’ such as car parks.

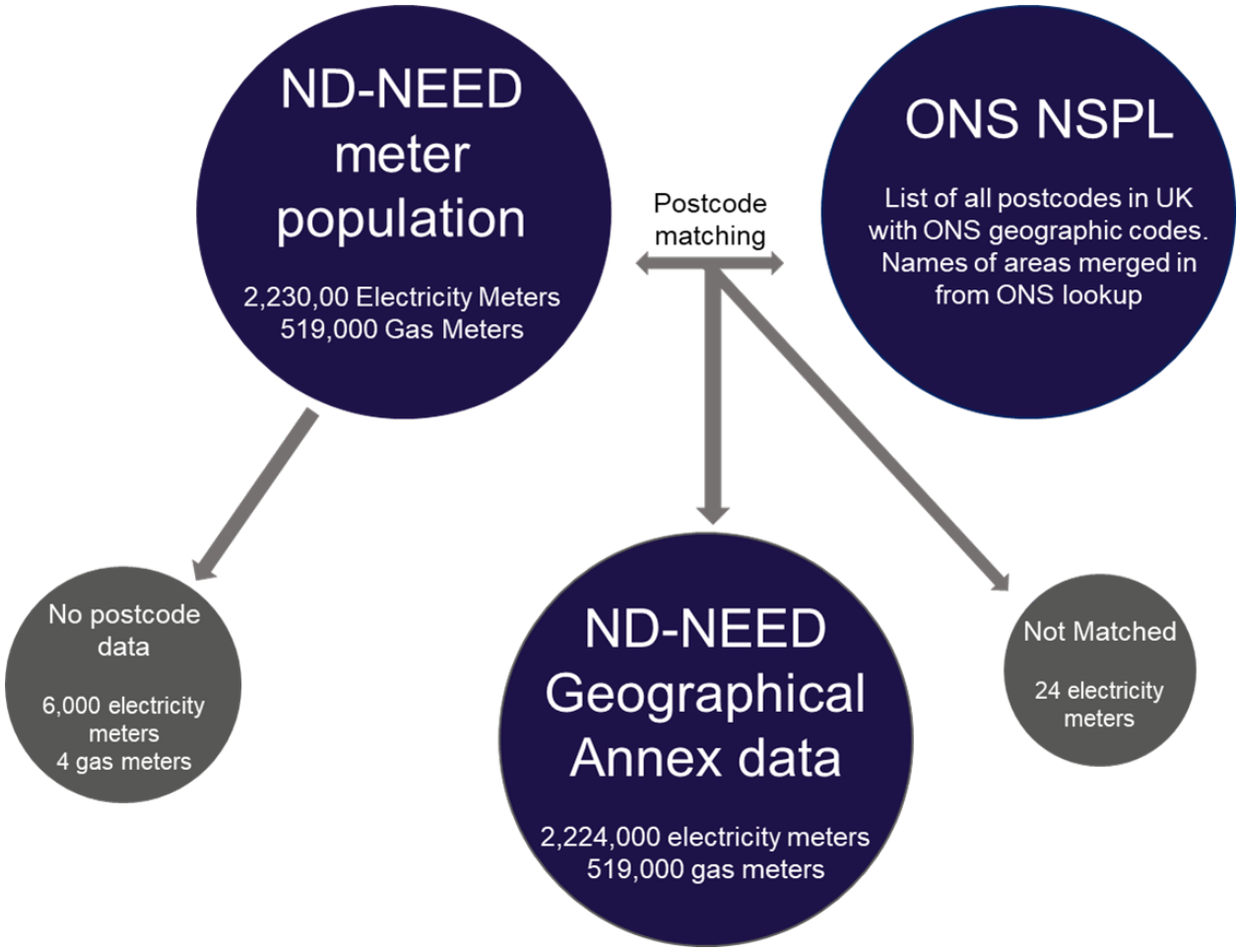
Consumption from these ‘non-buildings’ is excluded from the ND-NEED 2020 consumption totals. However, as the meters in the ND-NEED meter population dataset have not been associated with their corresponding building, the meters in these ‘non-buildings cannot be identified for removal.

The inclusion of these ‘non-buildings’ will inflate the consumption of the ND-NEED meter population by 10-15%.

More information on non-buildings can be found on page 31 of the ND-NEED 2020 report

[21] https://www.gov.uk/government/publications/regional-energy-data-guidance-note

Figure 10: Graphic summarising the production of the Geographical ND-NEED meter dataset



Comparing the measures of non-domestic consumption

Two methods of presenting non-domestic electricity and gas consumption have been presented: the weighted version of the matched ND-NEED sample; and the ND-NEED electricity and gas meter population used to create the sample. A third way is published in the sub-national electricity and gas consumption statistics[22]. Table 12 summarises the key differences between these measures.

Table 12: Comparison of measures of non-domestic consumption

Comparison		ND-NEED buildings: weighted matched sample	ND-NEED meter population	Sub-national consumption statistics: Non-domestic consumers
Non-domestic coverage		All non-domestic buildings that pay business rates, excluding 'non-buildings'	All electricity meters of profile 3+ and gas meters with annual consumption of >73 MWh, *plus* smaller non-domestic building consumers falling outside these bands	All electricity meters of profile 3+ and gas meters with annual consumption of >73 MWh
Geographical coverage		England and Wales	England and Wales	Great Britain
England & Wales 2018 consumption	**Electricity (GWh)**	139,909	154,839	155,230
	Gas (GWh)	153,448	173,244	167,849
England & Wales 2018 meters	**Electricity**	n/a	2,654,636	2,309,099
	Gas	n/a	670,771	252,890
Geography split		Regions	LA and PC	LA (and below)
Non-Domestic sector split		ND-NEED categories	No	No
Includes non-domestic "non-buildings"?		No	Yes	Yes
Includes smaller[23] non-domestic building consumers?		Yes	Yes	No

[22] Sub-national electricity and gas consumption statistics: https://www.gov.uk/government/statistics/sub-national-electricity-and-gas-consumption-summary-report-2019

[23] Non-domestic buildings with electricity meters in profiles 1 or 2, and/or gas meters with consumption of less than 73.2MWh. These would be considered domestic in sub-national data.

Validating the regional breakdown of ND-NEED weighted matched sample consumption data against ND-NEED meter level consumption data

The assumption that the ND-NEED matched sample is not regionally biased can be tested by comparing the ND-NEED weighted matched sample against the ND-NEED meter level population.

The ND-NEED meter level dataset includes consumption from 142,000 establishments that ND-NEED considers not to be buildings ('non-buildings'), and therefore are excluded from the ND-NEED 2020 dataset. The 15 TWh electricity and 20 TWh gas consumption difference between the meter level data and the weighted sample is therefore likely to be due to consumption from the 'non-buildings'.

However, assuming that the proportion of consumption from non-buildings is evenly distributed between the regions, a direct comparison, shown in Table 13, can be made between the proportion of consumption between the meter level data and the weighted matched sample.

Table 13: Comparison of proportion of non-domestic building consumption between meter level data and weighted matched sample.

Region	Share of electricity consumption (%)		Share of gas consumption (%)	
	Meter level	Weighted Matched Sample	Meter level	Weighted Matched Sample
England	**93.6%**	**95.0%**	**94.2%**	**94.9%**
North East	4.7%	6.5%	5.4%	4.9%
North West	12.3%	13.4%	15.1%	15.3%
Yorkshire and The Humber	9.4%	11.3%	13.4%	13.6%
East Midlands	8.4%	9.7%	9.0%	11.5%
West Midlands	9.5%	10.3%	10.6%	11.0%
Eastern	9.9%	9.9%	9.9%	9.8%
London	16.3%	14.0%	12.5%	12.7%
South East	14.2%	11.4%	11.3%	9.2%
South West	8.7%	8.7%	7.1%	6.8%
Wales	**6.4%**	**5.0%**	**5.8%**	**5.1%**

This shows that the proportion of electricity and gas consumed by non-domestic buildings in each region is highly correlated between meter level consumption data and the weighted matched sample data (88% and 95% correlation for electricity and gas respectively.)

For example, electricity consumption in the North East makes up 4.7% of the total for England and Wales according to ND-NEED meter level data, and 6.5% of the total electricity consumption in the ND-NEED matched sample, a difference of 1.8 percentage points. There is less than 2.5 percentage points difference in the proportions between meter level data and weighted matched sample data for most regions in both electricity and gas consumption.

Consumption data using both meter level data and weighted matched sample data is available in the accompanying tables at regional level.

The strong correlation at regional level between the meter population and the weighted matched sample is not seen once the consumption is broken down into smaller geographical areas. The extra granularity in the breakdown of the data makes any geographical bias in the weighted matched sample more visible. This causes the correlation between meter level consumption and the weighted matched sample consumption at PC level to drop to 78% for electricity and 55% for gas. Furthermore, in 12% of PCs the weighted matched sample consumption value is more than 50% larger or smaller than the meter level data. This data is therefore not presented in the data tables.

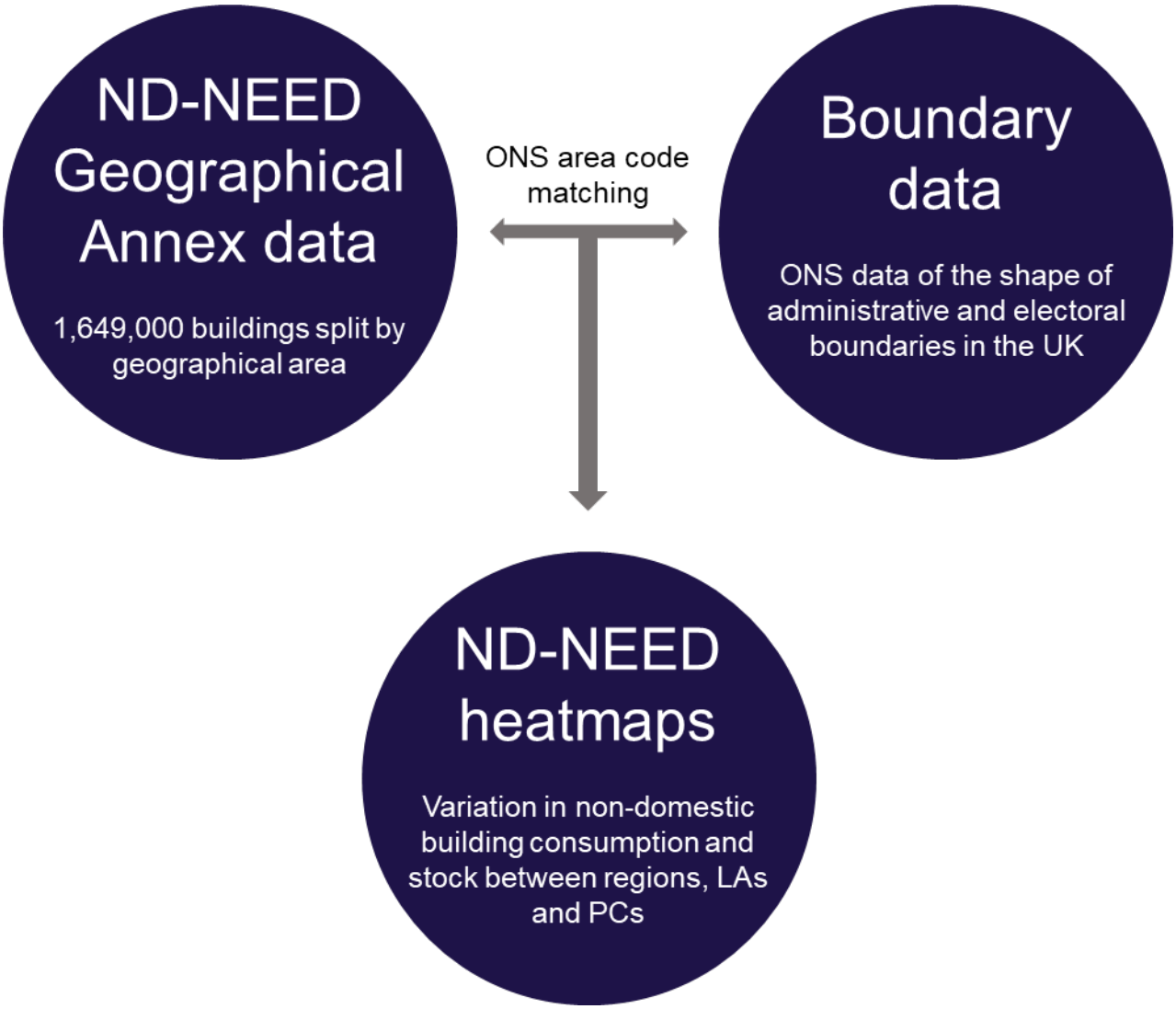
Creating Geographical ND-NEED maps

The ND-NEED Geographical Annex dataset was also matched to ONS boundary shapefiles of each PC (updated Dec 2019) or LA (updated May 2020) by PC code or LA code respectively. Thi9s is summarised in Figure 11.

Region boundaries were calculated by grouping PCs together by region and merging boundaries to form regional boundaries. The regional boundaries could then be matched to the regional ND-NEED data by region name.

Heatmaps could then be produced, by filling each PC’s, LA’s or region’s boundaries with a colour based on the concentration of a variable in each geography. This was done using the R Leaflet package. As it was common for most areas to have values closer to the average than to the outliers, a base 10 log scale was used to determine the colour scales, allowing the heatmaps to show differentiation between areas more clearly.

Figure 11: Graphic summarising the production of the Geographical ND-NEED heatmaps



4.Further information

Accompanying tables

The following tables are available on the department's statistics website: https://www.gov.uk/government/collections/non-domestic-national-energy-efficiency-data-framework-nd-need

At regional level:

- RG1 shows the number of ND-NEED non-domestic buildings split by sector*.
- RG2 shows the ND-NEED number of non-domestic buildings larger than 1,000m^2 split by sector*.
- RG3 shows the ND-NEED number of non-domestic buildings smaller than or equal to 1,000m^2 split by sector*.
- RG4 shows the floor area of ND-NEED non-domestic buildings split by sector*.
- RG5 shows the number of ND-NEED non-domestic off-gas grid buildings, split by rural and urban.
- RG6 shows the energy consumption from ND-NEED meters *.
- RG7 shows the scaled ND-NEED non-domestic electricity consumption, split by sector*.
- RG7b shows the scaled ND-NEED non-domestic gas consumption, split by sector*.

At local authority level:

- LA1 shows the number of ND-NEED non-domestic buildings* split by sector.
- LA2 shows the floor area of ND-NEED non-domestic buildings split by sector.
- LA3 shows the number of ND-NEED non-domestic off-gas grid buildings, split by rural and urban.
- LA4 shows the energy consumption from ND-NEED meters.

At parliamentary constituency level:

- PC1 shows the number of ND-NEED non-domestic buildings* split by sector.
- PC2 shows the floor area of ND-NEED non-domestic buildings split by sector.

- PC3 shows the number of off-gas grid ND-NEED non-domestic buildings, split by rural and urban*.

- PC4 shows the energy consumption from ND-NEED meters.

Future updates to these statistics

The next release of these statistics is intended to be alongside or following the main ND-NEED publication, the next update of which is planned for the summer of 2021.

The following updates will also be considered for future editions:

- With regards to the ND-NEED matched sample consumption data, an improved weighting method will be considered. This may include adapting the weighting methodology to take into account geographical biases in the ND-NEED matched sample. This would allow sector level consumption data to be presented at a LA and PC level.

- Additional analysis and weighting will be considered to improve the reliability of floor area data. This would allow floor area data to be presented for more sectors.

- The publication of geographical breakdowns of ND-NEED consumption and building stock data for additional years prior to or after 2018 and 2020 respectively will be considered.

Related statistics

The Non-Domestic National Energy Efficiency Data-Framework 2020

Previous release of the ND-NEED statistics, March 2020.

Non-domestic National Energy Efficiency Data-Framework: energy statistics 2006-2012

Previous release of the ND-NEED statistics, March 2015.

The non-domestic National Energy Efficiency Data-Framework (ND-NEED)

Overview of the concept of ND-NEED, known issues, plans for improvement, preliminary results and the proposed weighting methodology, May 2014.

National Energy Efficiency Data-Framework (NEED)

Summary statistics of domestic energy consumption 2005-2018, June 2020.

Revisions policy

The BEIS statistical revisions policy sets out the revisions policy for these statistics, which has been developed in accordance with the UK Statistics Authority Code of Practice for Statistics.

User engagement

Users are encouraged to provide comments and feedback on how these statistics are used and how well they meet user needs. Comments on any issues relating to this statistical release are welcomed and should be sent to: energy.stats@beis.gov.uk.

The BEIS statement on statistical public engagement and data standards sets out the department's commitments on public engagement and data standards as outlined by the Code of Practice for Statistics.

Contact

- Responsible statistician: Maya Fooks & Jeremy Knott
- Email: energy.stats@beis.gov.uk
- Media enquiries: 0207 215 1000
- Statistical enquiries: 0300 068 6551

This publication is available from: https://www.gov.uk/government/collections/non-domestic-national-energy-efficiency-data-framework-nd-need

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