Department for Business, Energy & Industrial Strategy

UK local authority carbon dioxide emissions estimates 2019

24 June 2021 **National Statistics**

This publication presents the latest estimates of end-user carbon dioxide (CO_2) emissions for local authority areas in the UK for 2005-2019. The main findings are:

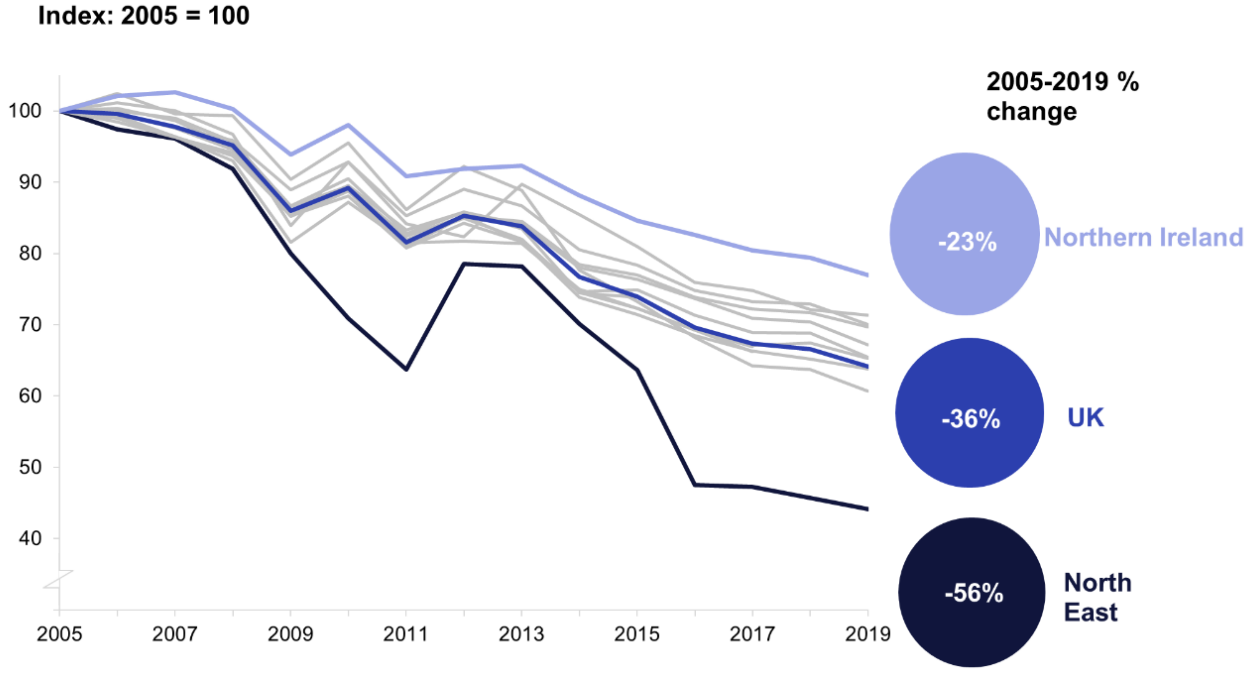
- Between 2018 and 2019, CO_2 emissions decreased in 360 out of the 379 local authorities in the UK (95%). This is consistent with the decrease in overall UK emissions from 2018 to 2019 (3.6% fall). The main driver of the decrease in UK emissions in 2019 was a change in the fuel mix for electricity generation, with a decrease in the use of coal and more use of renewables.

- Overall, in 2019, 36% of end-user CO_2 emissions assigned to Local Authority areas were attributed to the transport sector (excluding emissions from Land Use, Land Use Change and Forestry (LULUCF) and those that could not be allocated), 27% to the domestic sector, 24% to the industrial sector, 9% to commercial, and 4% to public. There are wide local variations, mainly because of the economy and geography of different local areas.

- The transport sector had the highest share of end-user CO_2 emissions in 63% of authorities. The domestic sector had the highest share in 26% and the industrial sector had the highest share in 10% of authorities.

- Between 2005 and 2019 end-user CO_2 emissions fell by 23% in Northern Ireland, 29% in Wales, 35% Scotland and by 36% in England. The North East of England was the region with the largest fall in emissions over this period at 56%, in part due to industrial closures.

Figure 1: End-user carbon dioxide emissions by region



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Introduction

This National Statistics publication provides the latest estimates of territorial carbon dioxide (CO_2) emissions for Local Authority (LA) areas for 2005-2019. This report explains the background to the estimates, summarises the key results, and discusses some of the issues which need to be considered when using the data. Full details of the results and methodology are available in the accompanying tables and the Technical Report, which can be found at the link below: https://www.gov.uk/government/collections/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics

Emissions have been assigned to all 379 Local Authorities in the UK: 314 of these are in England, 32 in Scotland, 22 in Wales and 11 in Northern Ireland. The statistics show emissions allocated on an "end-user" basis where emissions are distributed according to the point of energy consumption (or point of emission if not energy related). Except for the energy industry, emissions from the production of goods are assigned to where the production takes place. Therefore emissions from the production of goods which are exported will be included, and emissions from the production of goods which are imported are excluded.

The UK compiles an annual inventory of its greenhouse gas (GHG) emissions to monitor progress against domestic and international targets such as the Kyoto Protocol. Disaggregated versions of the UK inventory are also produced for England, Scotland, Wales and Northern Ireland, along with maps estimating the geographical distribution of the sources of emissions.

Carbon dioxide is the main greenhouse gas, accounting for 80% of GHG emissions in the UK in 2019. This publication combines data from the UK's GHG inventory with data from a number of other sources, including local energy consumption statistics, to produce a nationally consistent set of carbon dioxide emissions estimates at Local Authority level.

In this year's publication, additional breakdowns for some of the data has been provided to give more granularity. A new breakdown of the previous 'Industrial and Commercial' sector has been included in the Full dataset and Subset dataset to show the Industrial, Commercial and Public sectors separately.

The statistics are largely consistent with the UK national GHG inventory and with the Devolved Administration (DA) GHG inventories, but there are some minor methodological differences which are explained later in this publication. If you are looking for emissions figures at UK or DA level, you should use the UK[1] or DA[2] inventories rather than this publication.

These statistics cover the period from 2005 to 2019. A consistent time series has been produced by re-calculating the 2005 to 2018 estimates to reflect the methodological changes used in calculating the 2019 estimates. This is important as it allows changes to be monitored over time.

[1] Final UK greenhouse gas emissions, 1990-2019
https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics
[2] Devolved Administration Greenhouse Gas Inventories: https://naei.beis.gov.uk/reports/reports?report_id=1019

Full details of the results and methodology are available in the supplementary reports and files published alongside this statistical release.

Use of the Estimates

The purpose of these estimates is to assist those wishing to understand and assess changes in emissions from Local Authority areas. Local Authorities are not mandated to have greenhouse gas emissions reductions targets, but some Local Authorities do have such targets. These statistics allow Local Authorities to track their CO_2 emissions trends over time, and measure progress against any targets they have. While Local Authorities are the main users of the statistics, other users include non-profit organisations, the Devolved Administrations, government departments and academia.

It is important to be aware that circumstances vary greatly between authorities, and that Local Authorities have relatively little influence over some types of emissions. For all these reasons, these statistics should be interpreted with caution. However, used with care they can provide help in setting priorities. In particular, the dataset is sufficiently robust to set a baseline against which action on climate change can be monitored at a local level.

It should be noted that the results for regional level, which are also available from the dataset, are much more robust. Most of the difficulties in allocating data to Local Authorities have little impact at regional level. Problems of interpretation, such as economic activity or transport taking place across boundaries, still exist but are less acute at the regional level than at the local level.

There are some important limitations that users of these estimates should be aware of. These include:

- Unallocated electricity, where electricity sales within the sub-national dataset cannot be successfully allocated to specific Local Authorities due to lack of information.
- Road transport emission estimates rely on national road traffic estimates, and distribution of traffic on minor roads has had to be imputed at local level from regional level data.
- The local distribution of emissions from sources other than gas, electricity generation or transport largely has to be estimated from proxy information such as population or employment data.
- Some of the key sources used for mapping emissions do not cover the whole of the UK, and therefore alternative methods have had to be used for authorities in Northern Ireland.

Further details on data quality and the methods used are available in the supplementary reports published alongside this statistical release.

2019 Emissions

Estimates of carbon dioxide emissions have been produced for each Local Authority in the UK from the following broad source categories:

- Industry (including electricity-related emissions)
- Commercial (including electricity-related emissions)
- Public sector (including electricity-related emissions)
- Domestic (including electricity-related emissions)
- Transport
- Land use, land use change and forestry (including removals of carbon dioxide from the atmosphere, so that net emissions from this sector can sometimes be negative)

The level of sectoral detail is constrained by BEIS data available for local electricity and gas use. To estimate a more detailed breakdown would involve further general assumptions about energy use for different sectors, since local data is not available. However, further details, mostly in terms of fuel types, are shown in the Technical Report in order to provide additional insight into how the estimates are constructed.

2019 emissions by region

Figure 2 shows a summary of the end-user emissions by region and sector. Results for individual Local Authorities can be found in the spreadsheet published alongside this statistics release. There is a great deal of variation between Local Authorities. In particular a significant amount of industrial emissions are concentrated in a few areas, so the contribution of industrial and commercial emissions for specific Local Authorities may be different from the regional averages.

The largest overall reduction in emissions since 2018 can be seen in Yorkshire and the Humber (down 4.9%). This is largely due to a decrease in industrial emissions.

Figure 2: End-user carbon dioxide emissions by region and sector, 2019

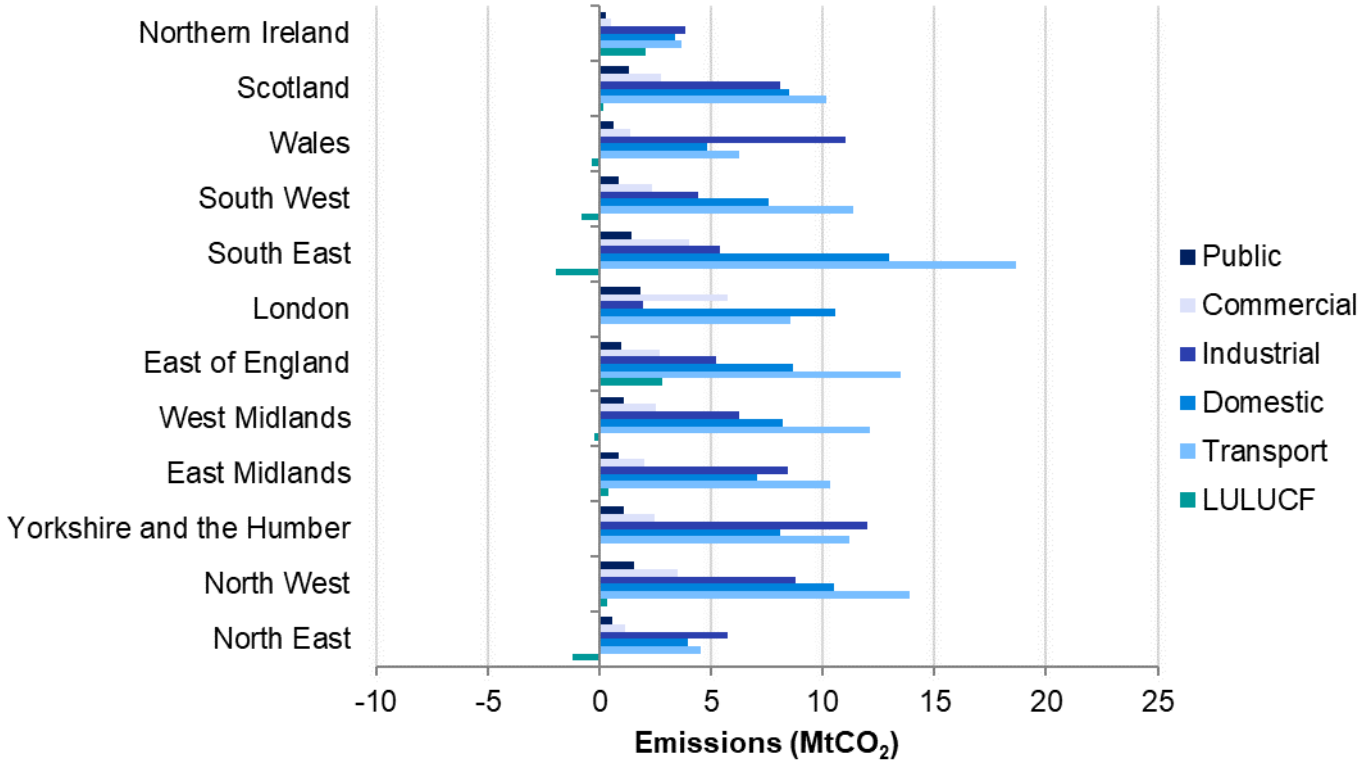
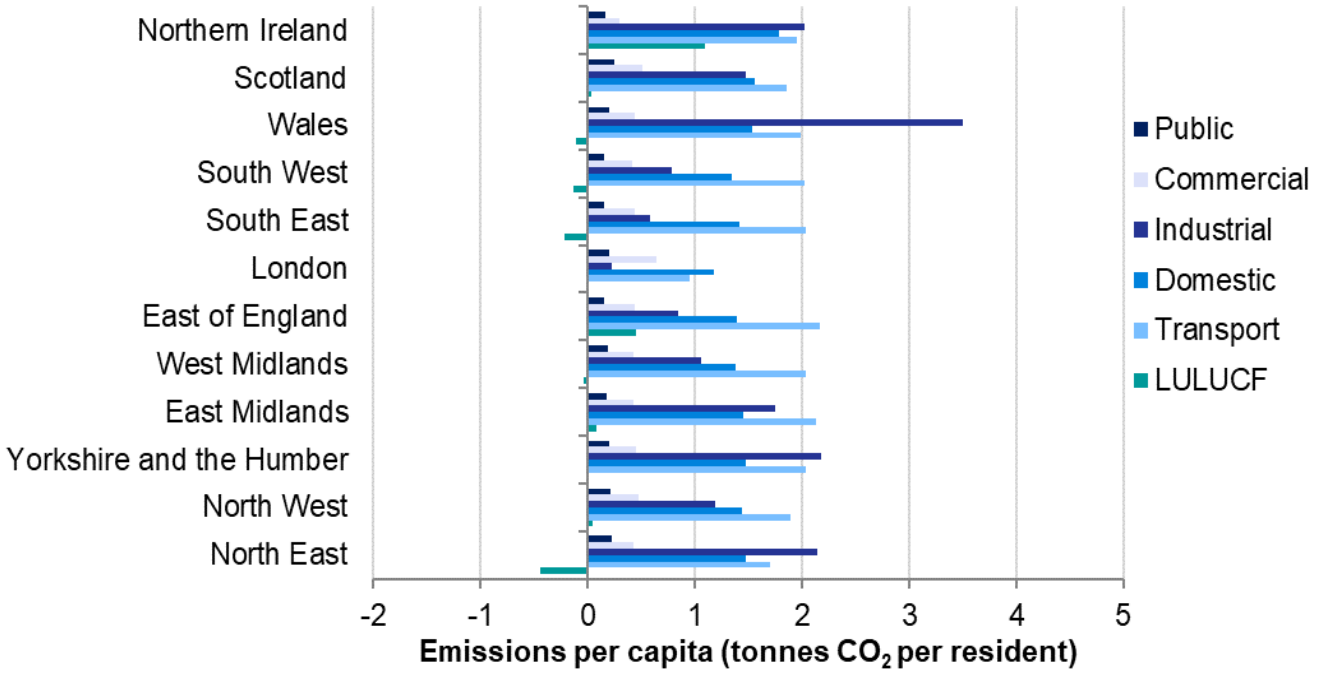


Figure 3 shows annual emissions per capita to make some allowance for the different sizes of regions. However, it should be noted that while emissions per capita may be a useful measure for domestic emissions, emissions from industry and transport are driven by many factors other than resident population. Therefore, industrial, commercial, public and transport emissions per capita should be interpreted with caution.

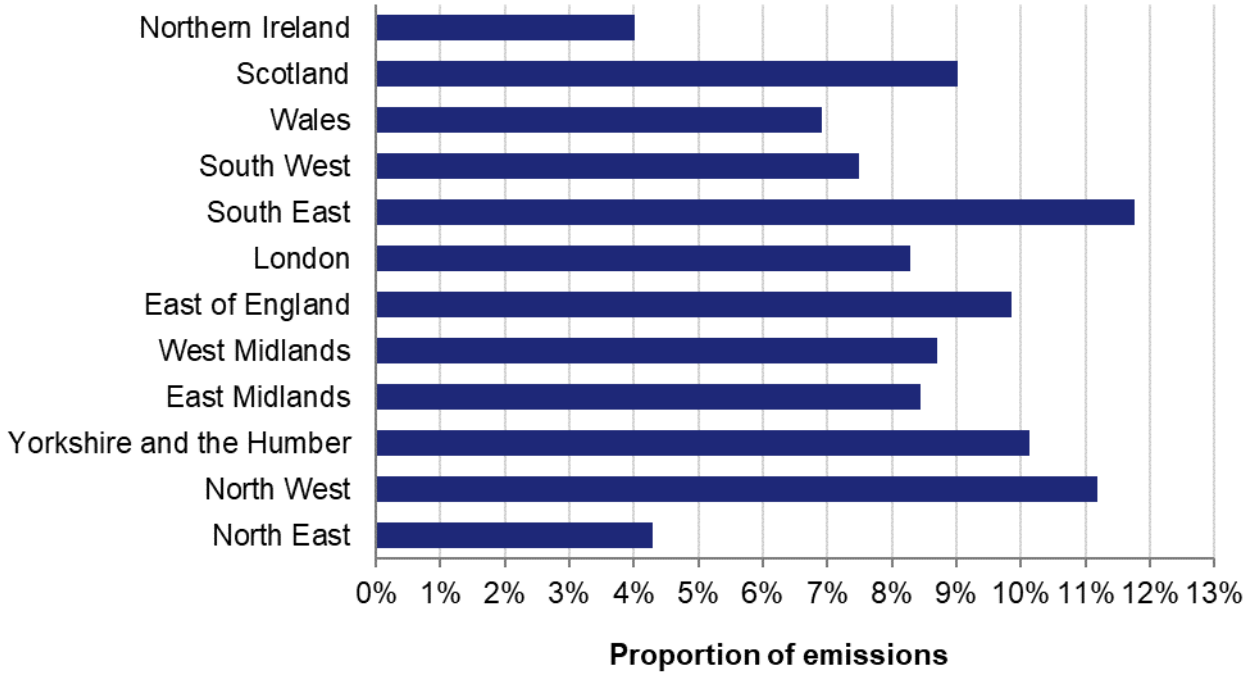
Figure 3: Annual per capita end-user carbon dioxide emissions by region and sector, 2019



Emissions per capita allow comparison between areas of different population size. Wales, Northern Ireland, and Yorkshire and the Humber have the highest annual emissions per capita. This is mainly due to higher emissions per capita from the industrial sector reflecting the industrial base present in these regions, except for Northern Ireland where per capita emissions from the domestic and LULUCF sectors are also higher than the UK average.

London has the lowest per capita emissions, as the urban nature of the transport system and the high population density results in lower emissions than the UK average when total emissions, including non-domestic emissions, are spread across residents. Additionally, in London there are a greater proportion of residential areas which means that large industrial facilities are unlikely to be located there, which contributes to the low per capita emissions. Figure 4 shows how total emissions are split across the various regions.

Figure 4: Proportion of UK emissions in each region: 2019

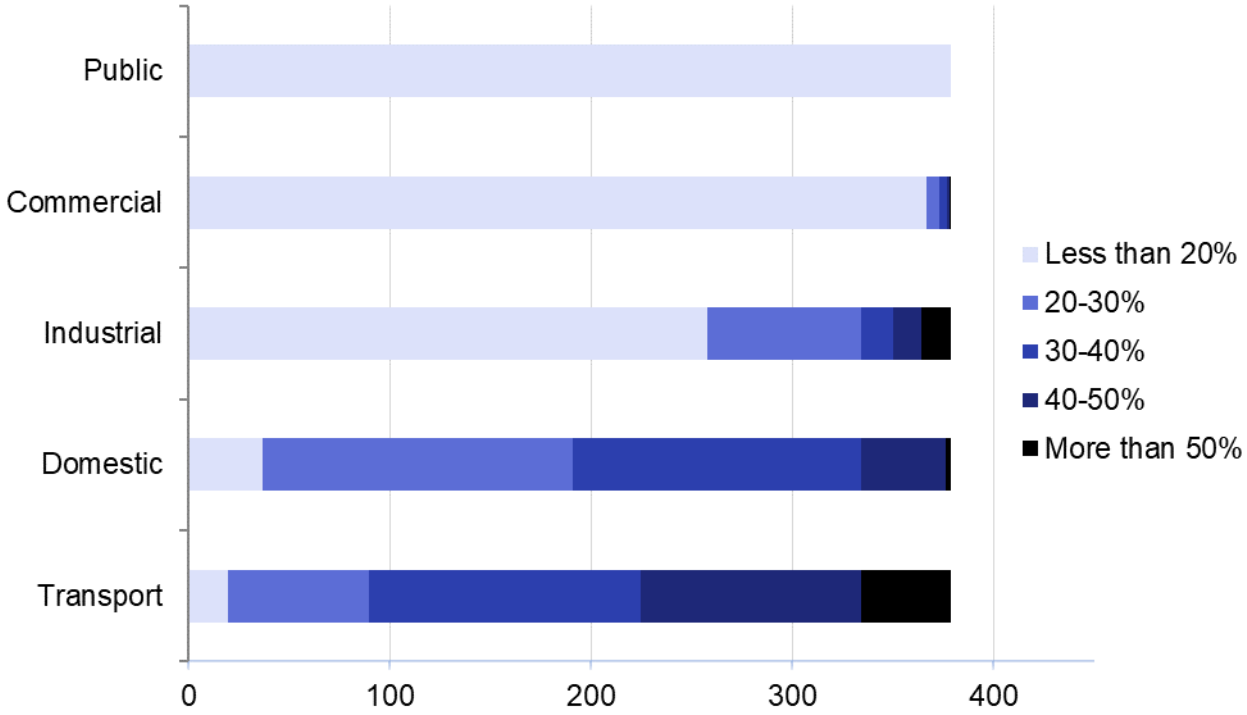


Note: Unallocated emissions are not shown in this figure.

2019 emissions by sector

Figure 5 shows for each sector the number of Local Authorities with different proportions of CO_2 emissions coming from that sector. The proportion of emissions attributable to the industrial, commercial, public, domestic and transport sectors differ considerably across the Local Authorities. There are 45 Local Authorities (12%) where transport accounts for over 50% of emissions and 15 (4%) where industrial emissions do.

Figure 5: Sectoral breakdown of emissions: Number of UK Local Authorities by proportion of carbon dioxide emissions in each sector (excluding LULUCF), 2019



Domestic sector

In 2019, domestic sector CO_2 emissions were lower than in 2018 for all Local Authorities. The main driver for this was a decrease in the use of coal for electricity generation, which led to a decrease in emissions for domestic electricity, and gas for heating decreased due to a warmer February and March than in 2018[3]. In 2019, about 65% of domestic end-user emissions arose from gas use, 23% from electricity and 11% from consumption of other fuels.

Looking at longer term trends, national emissions of CO_2 from the domestic sector have decreased since 2005 and the same is true for all Local Authorities. The Local Authorities with the largest decreases in domestic sector end-user emissions since 2005 are Isles of Scilly (53%), Shetland Islands (52%) and Argyll and Bute (47%), having each reduced their emissions from domestic electricity by more than 63%. The larger falls in these areas are also partly because other Local Authorities have higher levels of domestic gas consumption, from which emissions have generally fallen more slowly than for electricity. Whereas the Isles of Scilly and Shetland Islands do not have a gas network, and Argyll and Bute has a high proportion of properties without a gas supply.

Emissions per capita for the domestic sector have the least variation between Local Authorities and are dominated by gas and electricity consumption. BEIS publishes metered domestic

[3] https://www.gov.uk/government/statistics/energy-trends-section-7-weather

energy consumption data based to regional and Local Authority level[4,5]. These data have been used to estimate emissions for the domestic sector for all Local Authorities, related to gas and electricity consumption. Domestic emissions here represent emissions from energy consumption in and around the home, but not activities by private individuals elsewhere, such as personal travel. Table 1 shows the range of emissions per capita in this sector across Local Authorities. There are slightly more Local Authorities in the lower categories than in 2018, this is due in part to emissions from electricity generation which have decreased since 2018 reflecting changes in the fuel mix used.

Table 1: Breakdown of UK Local Authorities by annual carbon dioxide emissions per capita in the domestic sector, 2018-2019

Number of Local Authorities, percentages

Tonnes of CO_2 per person	NO. OF LAS 2018	% OF LAS 2018	NO. OF LAS 2019	% OF LAS 2019
<1.0	5	1%	7	2%
1.0 to 1.5	177	47%	220	58%
1.5 to 2.0	192	51%	149	39%
2.0 to 2.5	5	1%	3	1%
2.5 to 3.0	0	0%	0	0%
Total	379	100%	379	100%

For 26% of Local Authorities (100 of 379) the domestic sector was the greatest contributor to end-use emissions in 2019. This sector can be influenced by the fuel types used, the type and condition of the housing (including its insulation), the average temperature (urban areas can be much warmer and therefore easier to heat than rural areas), average household size, type of household and the income and preferences of the occupiers.

Transport sector

Transport emissions include freight and passenger transport, both for private and business purposes. The estimates are made on the distribution of traffic, therefore some of the emissions within an authority represent through traffic, or part of trips into or out of the area, whether by residents or non-residents. In some authorities this can be particularly significant, and this should be considered when looking at either totals or per capita estimates. The Technical Report shows how the road traffic estimates break down between major and minor roads, to help with consideration of this point. As they are on an end-user basis, the transport emissions include a share of emissions from oil refineries.

At a national level, transport CO_2 emissions saw a decrease of 1.8% in 2019 compared to 2018. Around 83% (315 out of 379) of Local Authorities had a decrease in transport emissions, and 17% (64 out of 379) had an increase in transport emissions since 2018.

[4] https://www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level

[5] For gas and electricity consumption estimates are also available for Lower and Middle Super Output Areas, and at a postcode level.
Gas: https://www.gov.uk/government/collections/sub-national-gas-consumption-data
Electricity: https://www.gov.uk/government/collections/sub-national-electricity-consumption-data

Since 2005 national transport emissions have decreased, even though there has been an increase in both the number of passenger vehicles[6] and the vehicle kilometres travelled[7]. This is due to lower petrol consumption by passenger cars outweighing an increase in diesel consumption, and improvements in fuel efficiency of both petrol and diesel cars[8]. This is reflected in Local Authorities where 92% (349 out of 379) have seen a decrease in emissions since 2005.

Industrial, commercial, and public sectors

For the first time, the industrial sector, commercial sector and public sector are presented separately in this publication and accompanying data tables, to further improve the availability of Local Authority emissions statistics. Previously, these three sectors have been grouped together as the 'Industrial and Commercial' sector.

These emissions have historically been dominated by industrial and commercial electricity consumption, although these have reduced following the falls in emissions from power stations in recent years, with electricity consumption now accounting for 29% of overall industrial, commercial, and public emissions in 2019. The estimates are based on sub-national electricity consumption data published by BEIS[9], which have been used to map carbon dioxide emissions from electricity generation to the point of consumption. For some Local Authorities, emissions from large industrial installations will be the dominant factor, and these have been mapped using the National Atmospheric Emissions Inventory database of point sources.

Industrial sector

A large number of Local Authorities, 87% (329 out of 379), in the UK experienced a decrease in CO_2 emissions from the industrial sector between 2018 and 2019. This is consistent with national trends where emissions decreased driven by a decrease in the use of coal for electricity generation and a reduction in emissions from all industrial fuel categories. Looking at longer term trends, all Local Authorities have seen decreases in emissions from this sector since 2005.

Commercial sector

In the commercial sector, similar trends show a decrease in emissions between 2018 and 2019, reflected by 90% (340 of 379) Local Authorities presenting a decrease. Almost all (99%, 375 of 379) Local Authorities saw a decrease in longer term emissions since 2005. Again, this is likely driven by the reduction in emissions resulting from electricity use in this sector.

Public sector

To a lesser extent than seen in the industrial and commercial sectors, the majority, 83% (313 of 379), of Local Authorities in the UK showed a decrease in emissions from the public sector

[6] https://www.gov.uk/government/statistical-data-sets/tsgb09-vehicles
[7] https://www.gov.uk/government/statistical-data-sets/tsgb01-modal-comparisons
[8] https://www.gov.uk/government/statistical-data-sets/tsgb03
[9] https://www.gov.uk/government/collections/sub-national-electricity-consumption-data

since 2018. Almost all (97%, 369 of 379) Local Authorities saw a decrease in emissions from the public sector since 2005.

However, CO_2 emissions in 17% (66 of 379) of Local Authorities increased between 2018 and 2019. This is mostly driven by an increase in use of gas in the public sector for these Local Authorities between 2018 and 2019.

Local Authorities with large changes in emissions since 2018

Overall, CO_2 emissions decreased in 360 out of 379 Local Authorities between 2018 and 2019, reflecting around a 4% decrease in the national emissions total between 2018 and 2019. For many Local Authorities, the sub-sectors largely responsible for the changes in emissions from 2019 were domestic electricity, industrial electricity, and commercial electricity. This reflects changes in emissions at the national level mainly due to a decrease in the use of coal for electricity generation. The exceptions to this are generally those Local Authorities that have shown changes in large industrial installations following closures or expansions of large industrial sites in those areas. There are also authorities where the LULUCF sector provides a large emissions sink, giving them a small net emissions total that can be subject to large percentage changes when other sources of emissions change.

Table 2 shows some examples of Local Authorities that had particularly big increases or decreases in emissions and the sub-sector that made the largest contribution to this change in each case. The largest falls between 2018 and 2019 were seen in Tonbridge and Malling (19%), Ryedale (18%) and Flintshire (12%). Tonbridge and Malling saw a substantial fall in emissions from large industrial installations since 2018, whilst the decreases seen in Ryedale and Flintshire were both mainly driven by industry ‘other fuels’ (i.e., not gas).

West Dunbartonshire and Highland saw the biggest increases between 2018 and 2019 (24% and 14%, respectively). The increase in Highland was driven by a large fall in the size of the emissions sink provided by wetlands[10]. The increase in emissions in West Dunbartonshire was mainly due to emissions from forest land. Excluding LULUCF, emissions in Highland actually fell by 5% and in West Dunbartonshire by 1%. Neath Port Talbot saw a 7% increase in emissions since 2018, mainly due to a change in large industrial installations, where increased activity at a Port Talbot site was seen.

[10] There were major methodology changes made this year to better represent emissions from drained and rewetted inland organic soils (peatlands) consistent with the 2013 IPCC Wetlands Supplement, which is explained in the 2019 Final greenhouse gas emissions statistical release: https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2019

Table 2: Local Authorities that had the largest changes in CO_2 emissions between 2018 and 2019

Percentages

Local Authority	Percentage change	Sub-sector most responsible for changes in that area
Tonbridge and Malling	-19%	Large Industrial Installations
Ryedale	-18%	Industry 'Other Fuels'
Flintshire	-12%	Industry 'Other Fuels'
Neath Port Talbot	7%	Large Industrial Installations
Highland	14%	Net Emissions: Wetlands
West Dunbartonshire	24%	Net Emissions: Forest Land

Emissions trends since 2005

When the Local Authority emissions are aggregated, estimated total CO_2 emissions decreased by around 36% since 2005 (the earliest year for which data are available at Local Authority level) – falling from 537 million tonnes to 345 million tonnes. Whilst emissions have decreased over time there have been periods of fluctuation, with emissions increasing between 2009 and 2010 (largely due to exceptionally cold weather in 2010 and relatively low emissions in 2009 as a consequence of economic factors) and between 2011 and 2012 (largely due to variations in temperature). For information on the drivers of trends at national level, see National Statistics on Final UK Greenhouse Gas Emissions[11].

Regional trends since 2005

Figures 6 and 7 show how total CO_2 emissions and annual CO_2 emissions per capita compare between 2005 and 2019 in each region and country in the UK. Emissions have decreased in all regions since 2005. The largest percentage decrease in emissions (56%) and the largest decrease in per capita terms of 7.6 tonnes per person were seen in the North East. The smallest decreases in both percentage terms (23%) and per capita terms (3.1 tonnes per person) were seen in Northern Ireland.

[11] https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics

Figure 6: End-user carbon dioxide emissions by region, 2005 and 2019

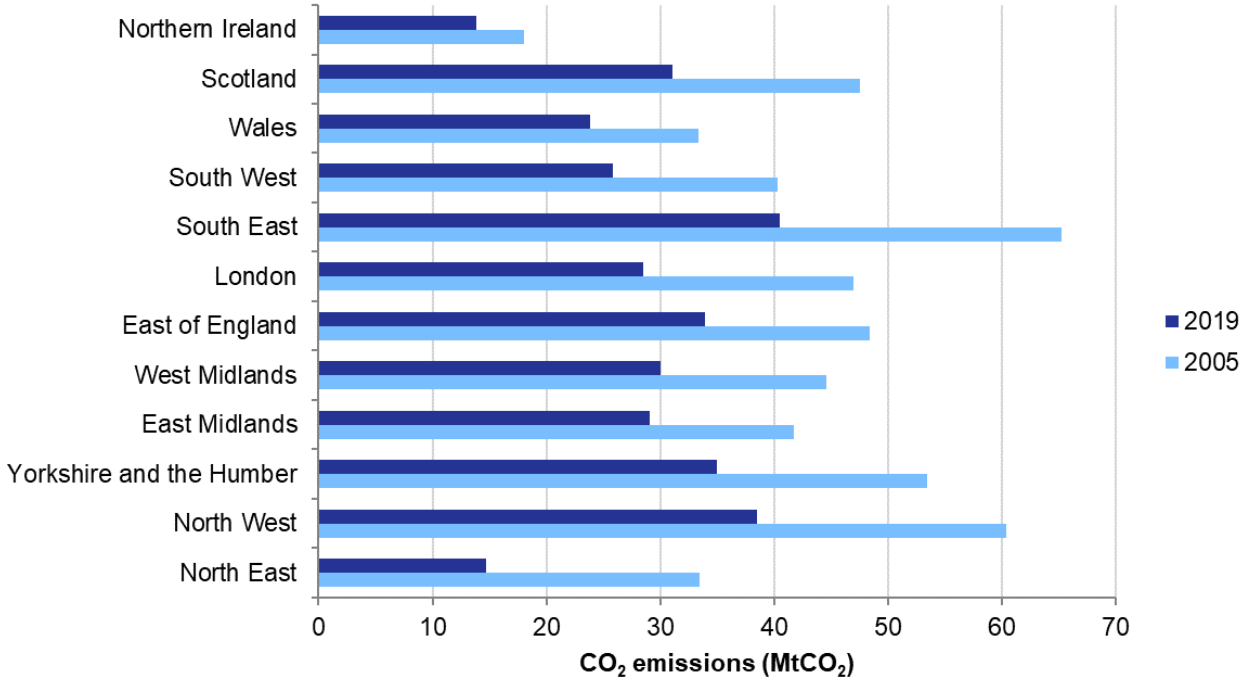


Figure 7: Annual end-user carbon dioxide emissions per capita by region, 2005 and 2019

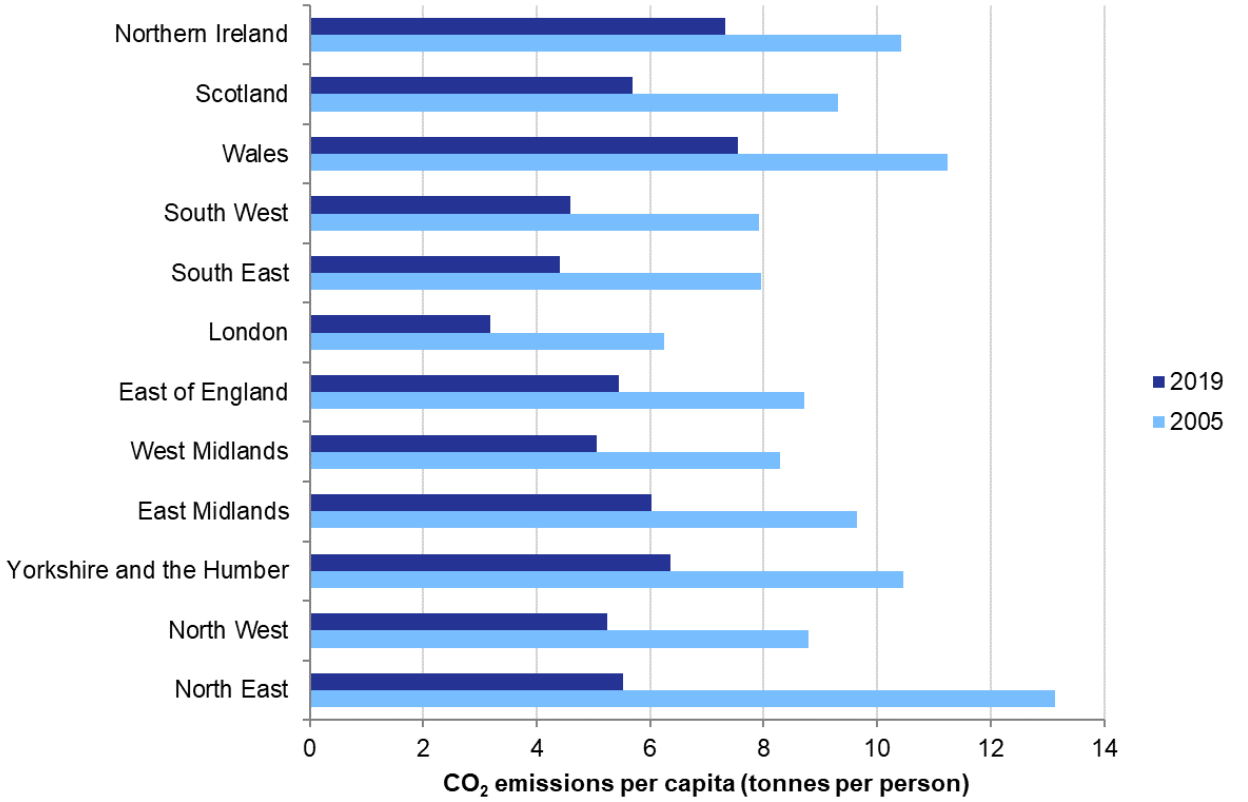


Table 3 shows how total CO_2 emissions and CO_2 emissions per km^2 compare between 2005 and 2019 in each region and country in the UK. The highest emissions per km^2 are generally in urban areas and areas with large industrial site, and at a regional level the largest emissions per km^2 are in London, at 17.9 $MtCO_2$ per km^2 in 2019, due to London's high population density.

Table 3: End-user carbon dioxide emissions and carbon dioxide emissions per km^2 by region, 2005 and 2019

$MtCO_2$, tCO_2

Region / country	2005		2019		Difference between 2005 and 2019 per km^2 (tCO_2)
	Total emissions ($MtCO_2$)	Per km^2 (tCO_2)	Total emissions ($MtCO_2$)	Per km^2 (tCO_2)	
UK	537	2.2	345	1.4	-0.8
Wales	33	1.6	24	1.1	-0.4
Scotland	48	0.6	31	0.4	-0.2
Northern Ireland	18	1.3	14	1.0	-0.3
England	435	3.3	276	2.1	-1.2
North East	33	3.9	15	1.7	-2.2
North West	60	4.0	39	2.6	-1.5
Yorkshire and the Humber	53	3.4	35	2.2	-1.2
East Midlands	42	2.6	29	1.8	-0.8
West Midlands	45	3.4	30	2.3	-1.1
East of England	48	2.5	34	1.7	-0.7
London	47	29.5	29	17.9	-11.6
South East	65	3.4	41	2.1	-1.3
South West	40	1.7	26	1.1	-0.6

Local Authority trends since 2005

There is more variation in trends at Local Authority level than at regional level, as seen in Table 4. Emissions for many Local Authorities are heavily influenced by activities at industrial sites, and changes at a single site can have a big impact on emissions trends.

All 379 Local Authorities have shown a decrease in total emissions between 2005 and 2019. This reflects the decrease in overall emissions for the UK during this period driven mainly by reductions in emissions from power stations and industrial combustion. The reduction from power stations is driven by change in the fuel mix used for electricity generation with a large reduction in the amount of coal, which is a carbon intensive fuel. The reduction in industrial combustion is largely driven by the closure or reduced activity of industrial plants, a large portion of which occurred during 2009, likely due to economic factors.

From 2005 to 2019, the largest percentage decrease:

- in total emissions was in Northumberland (down 82% since 2005), driven by the closure of some large industrial installations over this period.
- in emissions from the industrial sector was in Gravesham (down 92%) due to the closure of a cement works during 2008.
- in emissions from the commercial sector was Dover (down 77%) due to reductions in emissions from gas consumption.
- in emissions from the public sector was Fife (81%) due to reductions in emissions from gas consumption.
- in emissions from the domestic sector was in Isles of Scilly (down 53%) due to reductions in emissions from electricity consumption, however in absolute terms this reflects only a small decrease in emissions (3.2 kt of CO_2).
- in emissions from transport was in Westminster (down 33%), due to a decrease in traffic on major roads.

From 2005 to 2019, the largest percentage increase:

- in commercial emissions was in Thanet (up 15%), due to increases in gas consumption at commercial sites.
- In emissions from the public sector was Ryedale (up 59%), driven by a large increase in public sector gas consumption over this period.
- in the transport sector was Isles of Scilly (up 20%) due to an increase in emissions from non-road transport. However, in absolute terms this is a low increase in emissions (0.5 kt of CO_2).
- in total emissions, industrial sector and the domestic sector, no local authorities showed an increase.

Table 4: Breakdown of size of decrease in CO_2 emissions between 2005 and 2019

Change in emissions since 2005	Number of local authorities
Decrease of more than 40%	75
Decrease of 35%-40%	110
Decrease of 30%-35%	90
Decrease of 25%-30%	56
Decrease of 20% to 25%	34
Decrease of 0-20%	14

Sub-Sectoral Trends since 2005

When Local Authority figures are aggregated, 2019 emissions are lower than 2005 emissions in all sectors and sub-sectors except for Agriculture, Road Transport (minor roads), Transport Other (including combustion of lubricants, LPG vehicles, inland waterways, coal railways and aircraft support vehicles) and LULUCF net emissions from forestland, wetlands, settlements and harvested wood product.

The 3 largest absolute decreases since 2005 were in the following sub-sectors:

- Domestic electricity (-41.8 million tonnes of CO_2)
- Commercial electricity (-34.3 million tonnes of CO_2)
- Industrial electricity (-30.6 million tonnes of CO_2)

Changes by sector at the Local Authority level

Tables 5 below provides some information on the Local Authorities that have experienced the largest percentage decreases in emissions since 2005, and the sub-sector that made the largest contribution in each case.

The majority of Local Authorities with the largest decreases in CO_2 emissions since 2005 were driven by closures in large industrial installations, except for City of London, where emissions reductions were mainly due to a decrease in emissions from commercial electricity use.

For Northumberland, a LULUCF sink is one factor in the trend in its emissions. A large sink can lead to the net emissions total in a Local Authority being much lower than its non-LULUCF emissions total, meaning that any changes in emissions from other sectors can lead to a large percentage change in total emissions. This is the case for Northumberland, the authority with one of the largest falls in CO_2 emissions since 2005, where non-LULUCF emissions have only fallen by 66% compared to a fall in total emissions of 82% when LULUCF is included.

Table 5: Local Authorities that had the largest decreases in CO_2 emissions since 2005

Percentage

Local Authority	Percentage decrease	Sub-sector most responsible for decrease
Northumberland	82%	Large industrial installations
Redcar and Cleveland	77%	Large industrial installations
Gravesham	73%	Large industrial installations
New Forest	64%	Large industrial installations
City of London	61%	Commercial electricity

Carbon dioxide emissions within the scope of influence of Local Authorities

Alongside the full dataset, we have also published a “subset dataset” which represents carbon dioxide emissions within the scope of influence of Local Authorities. This can be found in the tables accompanying this publication, available on the department’s statistics website. Unlike the full dataset, the dataset of emissions within the scope of Local Authorities excludes emissions that Local Authorities do not have direct influence over. The emissions that are removed from the full dataset are:

- Motorways – all emissions from the “Transport (motorways)” sector have been removed.

- EU Emissions Trading System (EU ETS) sites – these emissions have been removed from the "Large industrial installations" sector, with the exception of energy suppliers (e.g. power stations), whose emissions are indirectly included via the end-user estimates for electricity use. Note that not all the emissions from the "Large industrial installations" sector are produced by EU ETS installations, hence the fact that there are emissions remaining in this sector in the subset.

- Diesel railways – all emissions from the "Diesel Railways" sector have been excluded.

- Land Use, Land Use Change, and Forestry – all emissions belonging to the "LULUCF Net emissions" sector have been excluded.

Removing these emissions has a significant impact on some Local Authorities compared to others, as some Local Authorities have a much bigger proportion of emissions from the above sources than others. Table 6 shows the Local Authorities with the largest decreases in emissions within the scope of influence of the Local Authority between 2005 and 2019. Only one Local Authority (City of London) is among the top five Local Authorities for decreases in overall emissions (which are shown in Table 5 in the previous section). This is because the largest decreases in overall emissions were driven by the large industrial installations sub-sector, large aspects of which are considered to be outside the scope of influence of LAs, or occurred in areas with large LULUCF sinks, which are considered to be entirely outside the scope of influence of LAs.

Table 6: Local Authorities that had the largest decreases in CO_2 emissions within the scope of influence of the Local Authority since 2005

Percentage

Local Authority	Percentage decrease	Sub-sector most responsible for decrease
City of London	61%	Commercial electricity
Exeter	53%	Public gas
Thurrock	53%	Industrial gas
Westminster	50%	Commercial electricity
Reading	49%	Commercial electricity

No Local Authorities had an increase in emissions within the scope of the Local Authority between 2005 and 2019.

Looking at changes in emissions within the scope of influence of Local Authorities between 2018 and 2019, eight Local Authorities had increases in their emissions over this period. Table 7 shows the Local Authorities with the biggest percentage changes to the emissions within their scope of influence between 2018 and 2019. Most of these Local Authorities do not appear in Table 5, as the drivers of some of the largest emissions changes (such as the opening or closing of large industrial installations) may be outside the scope of influence of Local Authorities.

Table 7: Local Authorities that had the largest increases or decreases in emissions within the scope of influence of the Local Authority, 2018-2019

Percentage

Local Authority	Percentage change	Sub-sector most responsible for changes in that area
Ryedale	-17%	Industry 'Other Fuels'
Richmondshire	-13%	Road Transport (A roads)
Flintshire	-13%	Industry 'Other Fuels'
Pembrokeshire	2%	Commercial Electricity
West Lothian	2%	Commercial gas
Burnley	6%	Commercial gas

Reconciliation with the UK inventory

Reconciliation Table

Local Authority estimates are designed to be as consistent as possible with the national inventory for the UK. However, some differences are unavoidable.

A number of emission sources included in the UK inventory are not included in the local authority estimates. Excluded sources are principally linked to aviation and shipping.

A small proportion of the gas and electricity consumption allocated to the domestic sector in these estimates is attributed to business in the UK inventory. This is because it is not possible to distinguish between domestic customers and smaller businesses in the meter point consumption data used in these local estimates.

Table 8 shows a summary of the reconciliation between the UK inventory and the local inventory. The different elements of this reconciliation should be interpreted as follows:

- **"Excluded"** are the sectors that have been deliberately excluded from the local level allocation, as it would not have been appropriate to include them.
- **"Unallocated methodological differences"** are differences which have become apparent due to the different methodological approaches used in deriving the UK Inventory and local level estimates. These include gas and electricity consumption which cannot be allocated to Local Authorities due to confidentiality concerns at high emitting sites or incomplete address information for individual meters, and harvested wood products.

- **"Methodological differences"** are the differences that have caused the discrepancies between the national inventories and the Local Authority carbon dioxide dataset. These are explained after the UK reconciliation table.

Table 8: Reconciliation of 2019 local emission estimates with UK inventory

		$MtCO_2$
	Details	**Totals**
End-user emissions allocated to local areas		**344.8**
Unallocated methodological differences:		
Large electricity users with unknown location	0.7	
Unallocated consumption	-1.0	
Total unallocated		-0.3
Total UK end-user emissions (local method)		**344.5**
Excluded from local allocation:		
Domestic shipping	5.4	
Domestic aviation	1.5	
Military transport	1.9	
Exports	6.3	
International aviation and shipping	4.4	
Total excluded		19.5
Methodological differences:		
Domestic sector	-2.5	
Industrial sector	9.6	
Commercial sector	-4.7	
Public Sector	-1.2	
Transport sector	0.0	
Agriculture sector	0.0	
LULUCF sector	0.0	
Total methodological differences		1.1
UK total CO_2 emissions		**365.1**

Main differences between the Local Authority (LA) dataset and the Devolved Administrations (DA) datasets

This section of the report describes where there are unavoidable differences between the methodologies used in the estimation of emissions for this Local Authority carbon dioxide (CO_2) emissions dataset, and for the Devolved Administration emissions datasets.

The following section sets out where and why these differences occur.

Gas and Electricity Consumption data

The definitions used for domestic and industrial and commercial consumers differ between the two datasets. In the Local Authority CO_2 dataset, the split is as defined by the BEIS sub-national energy consumption dataset which are not fully consistent with the national energy

data presented in Digest of UK Energy Statistics (DUKES)[12]. The Devolved Administration greenhouse gas inventory (DA GHGI), however, is based on DA-wide electricity consumption statistics which are available in the electricity generation and supply section of BEIS's Energy Trends[13] publication and are fully consistent with DUKES data for major power producers. These two underlying datasets are not fully consistent, and therefore result in differences between the Local Authority dataset and the DA inventories for gas and electricity use, as described below.

Unallocated Gas and Electricity Consumption data

In the sub-national energy datasets, some gas data cannot be allocated to LAs, due to reasons of confidentiality. In part, these gaps in the emissions estimates are filled through the point source database (mentioned above). However, in doing so, this introduces some uncertainty. In the DA inventory though, there is no unallocated consumption; point source data is supplemented by employment and other surrogate data to allocate all the national fuel use between the four countries.

In the Local Authority dataset, some electricity consumption data cannot be allocated to LAs. This is due to both commercial confidentiality concerns for high-consuming sites, and where address information is incomplete. In these instances, these data are therefore assigned to the 'unallocated' category. The DA inventory, on the other hand, reports emissions against a wider geographical coverage, effectively negating the data disclosure concerns, and hence there is no need to exclude specific emissions from the DA inventories.

Unallocated LULUCF data

Harvested wood products can be allocated to particular DAs but not to particular Local Authorities. Within the Local Authority carbon dioxide dataset, these emissions/removals are therefore assigned to the 'unallocated' category. These are the differences which can be seen in each of the DA reconciliation tables. All other LULUCF estimates are fully consistent across UK, DA and Local Authority data.

Use of additional gas data for Northern Ireland

Both datasets now include consideration of new gas consumption data supplied by Northern Ireland energy suppliers, which shows a large growth in gas use within Northern Ireland from 2006 onwards. The DA inventory approach includes estimates for the fuel-switching from oil and solid fuels that this growth in gas use has displaced. In the Local Authority carbon dioxide data, these estimates of fuel switching have not been possible, given the greater level of detail required by the data, and the UK emissions distribution grids have been used solely.

Distribution of 'Other Fuels' across DAs

There are some areas where emissions allocation methods differ between the two datasets due to the availability of data.

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[12] For the definitions used in DUKES see the technical notes and definitions section of chapter 1 of DUKES 2018: https://www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2019-main-report

[13] https://www.gov.uk/government/collections/energy-trends

In the iron and steel sector, the methodology used for the Local Authority carbon dioxide emissions assumes that all emissions from the iron and steel sector from industrial processes, process gases and solid fuels occur at large point sources. Emissions from the consumption of oil in the iron and steel sector are mapped using a combination of point sources and area sources (as described in the Technical Report). In the DA inventory, fuel use data supplied by the Iron and Steel Statistics Bureau (ISSB) is used, since it is available on a DA basis.

There is also a difference in the estimation of emissions from peat in the domestic sector. In the Local Authority carbon dioxide emissions methodology, peat use is mapped using the domestic fuel use mapping grids which are produced by Ricardo Energy and Environment as part of the mapping process for the National Atmospheric Emissions Inventory programme. For the DA inventory, this is mapped using a DA specific distribution calculated by Centre for Ecology and Hydrology (CEH).

For domestic oil combustion, the allocation of emissions to Local Authorities uses separate emissions distribution grids for LPG and other oils. The mapping grids are unchanged from last year's publication. For the DA inventory, LPG grids were not available therefore all domestic oil emissions are mapped using the same distribution grid.

For domestic coal combustion, the DA inventory estimates use the energy modelling work based on the 2011 census which also underpins the Local Authority CO_2 estimates. This results in more consistent reporting between Local Authority CO_2 emissions and the DA inventory emissions. However, some differences remain for solid and liquid fuels due to different compilation methods and fuel aggregations; the Local Authority CO_2 dataset takes a more bottom-up approach to disaggregating smokeless solid fuels according to the location of smokeless zones, for example.

Point Sources

There are also some differences between the estimates of emissions at large point sources and those in the national totals. An explanation for these differences is provided in the Technical Report.

UK maps

A range of maps showing 2019 carbon dioxide emissions per capita at Local Authority level are presented on the following pages.

As Figures 8 to 15 show, annual emissions per capita can vary noticeably between regions in the UK. This is particularly evident in the domestic and LULUCF sectors.

As Figure 9 shows, in 2019, for the domestic sector, emissions per capita were higher in Scotland, Northern Ireland, and Wales compared than the rest of the UK. Per capita emissions are high in Northern Ireland predominantly because there is limited availability of natural gas in this areas; this results in the combustion of more carbon intensive fuels instead, such as coal, burning oil and gas oil, which are assigned to the domestic 'other fuels' sector. Wales also has

a higher proportion of emissions from ‘other fuels’ than the rest of the UK, though to a lesser extent than Northern Ireland. Similarly, as seen in figure 10, emissions per capita in the Industrial sector are higher in Wales, Scotland and Northern Ireland, likely due to higher electricity consumption in these regions as compared to the rest of the UK. Additionally, since emissions from this sector are heavily dependent on whether there are large industrial sites situated in that area, higher CO_2 emissions per capita in Wales, Scotland and the north of England compared to London which has a higher population density and a greater proportion of residential areas meaning that industrial sites are less likely to be located here.

There are less clear trends in the commercial, public and transport sectors. As Figures 11, 12 and 13 show, within all regions there is a mixture of areas with high, medium, and low carbon dioxide emissions per capita. For the commercial and public sectors, emissions will vary depending on rural and urban areas and population density. It is more difficult to identify reasons behind the variations observed in the transport sector, since there are numerous factors (such as composition of the vehicle fleet and traffic statistics by vehicle type) which feed into these estimates. Further information on how transport emissions have been estimated is available in the Technical Report.

In the LULUCF sector, there are clear regional trends in per capita emissions (Figure 14). In particular, in large parts of Scotland, Wales and the North East there are large sinks of carbon dioxide. In other parts of the UK, such as in Northern Ireland and parts of the East of England, LULUCF is a large source of carbon dioxide emissions. Northern Ireland has the highest LULUCF emissions per capita, due to the clearing of land for the maintenance and creation of settlements and croplands.

Figure 8: Net emissions of carbon dioxide per capita by Local Authority (tonnes CO_2 per capita) in 2019

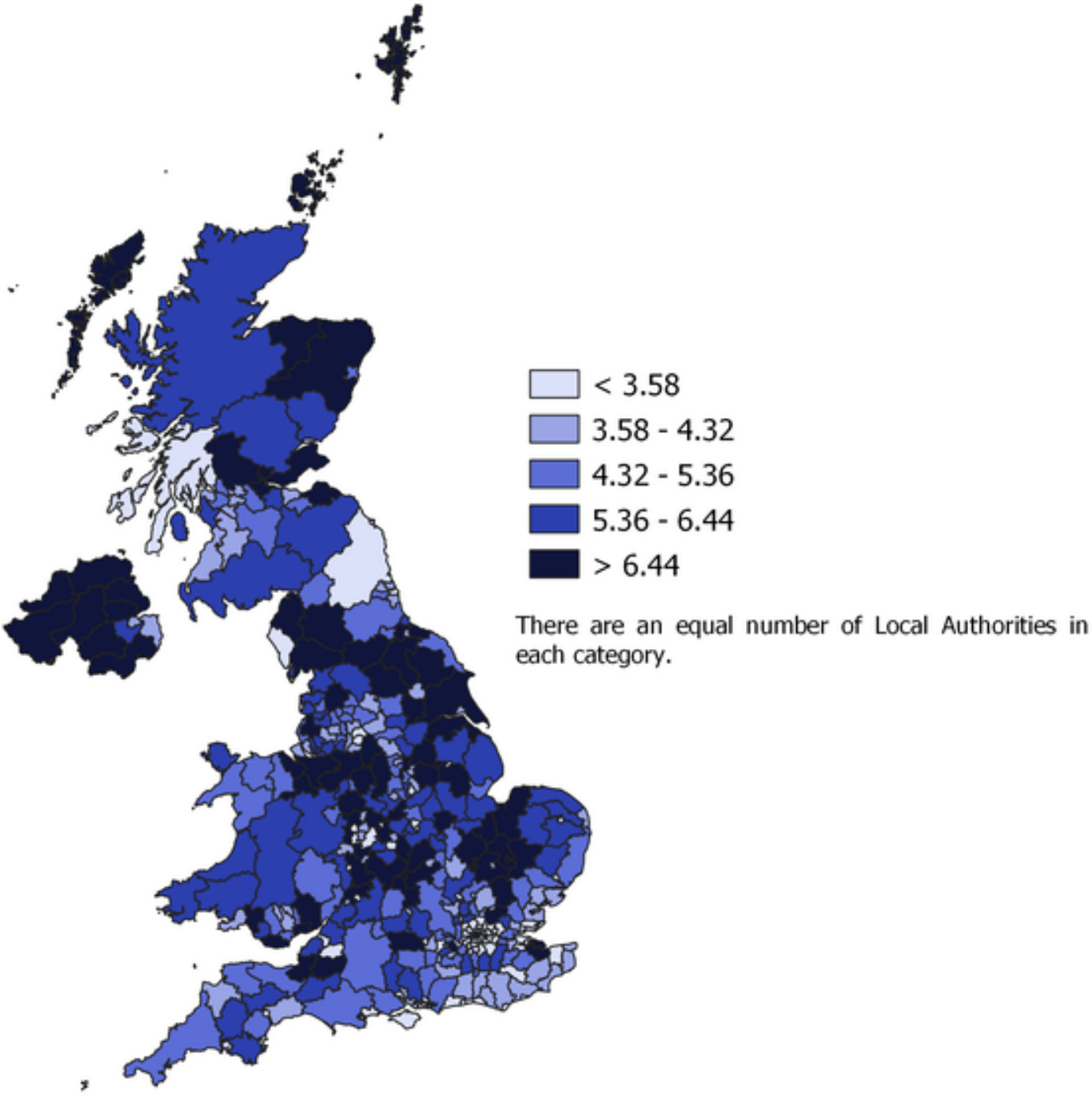


Figure 9: Domestic CO_2 emissions per capita by Local Authority (tonnes CO_2 per capita) in 2019

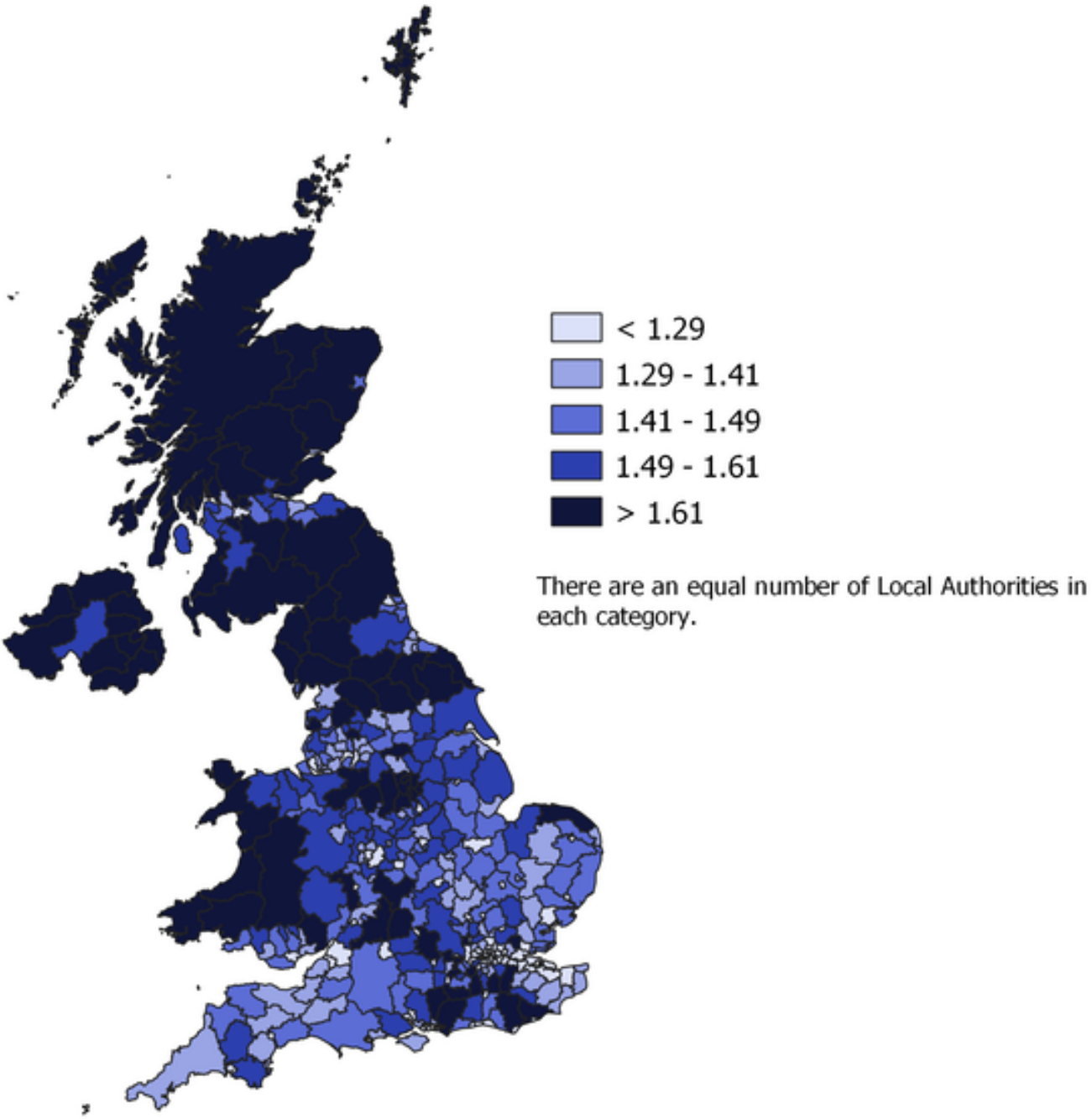


Figure 10: Industrial CO_2 emissions per capita by Local Authority (tonnes CO_2 per capita) in 2019

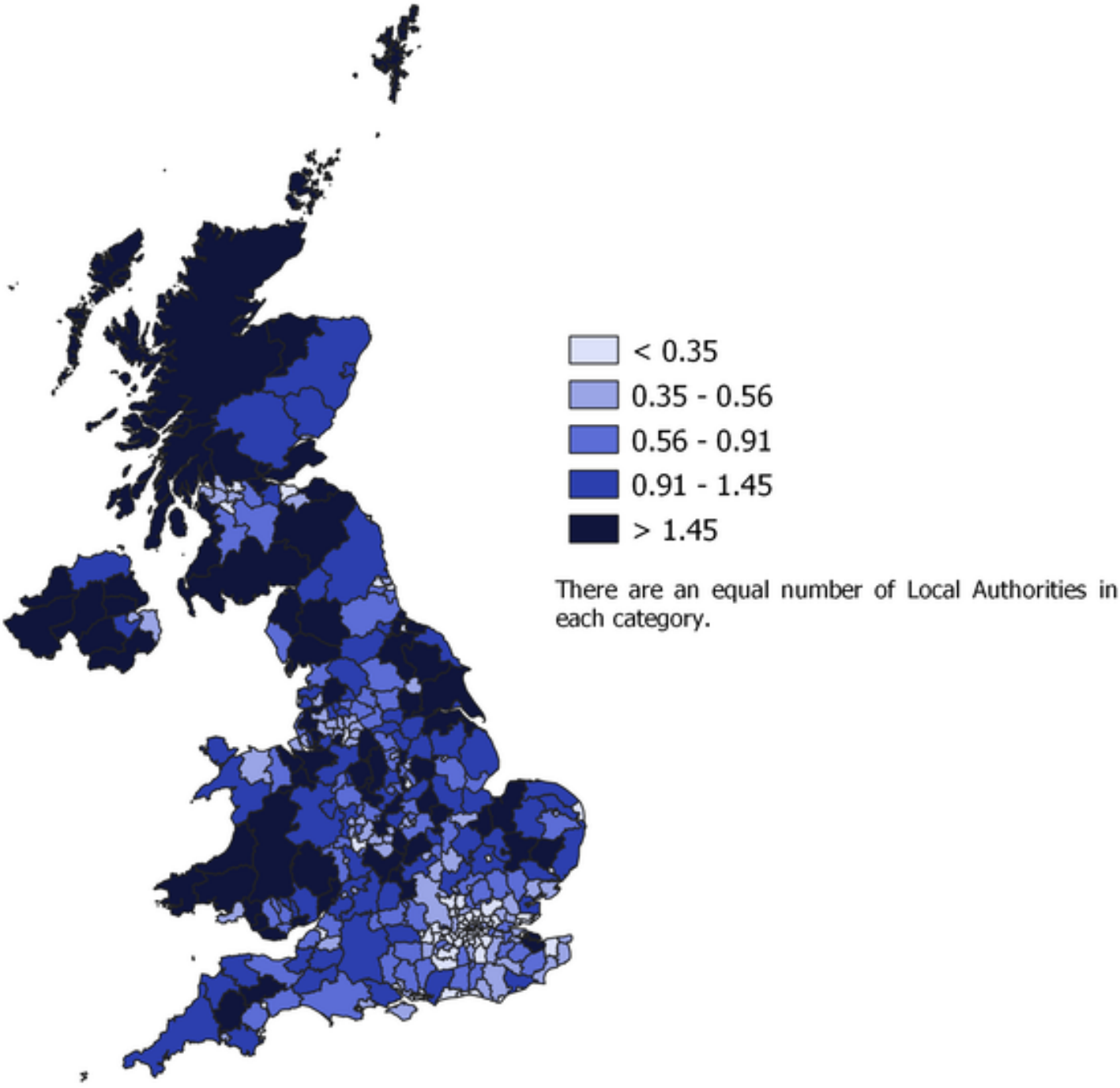


Figure 11: Commercial CO_2 emissions per capita by Local Authority (tonnes CO_2 per capita) in 2019

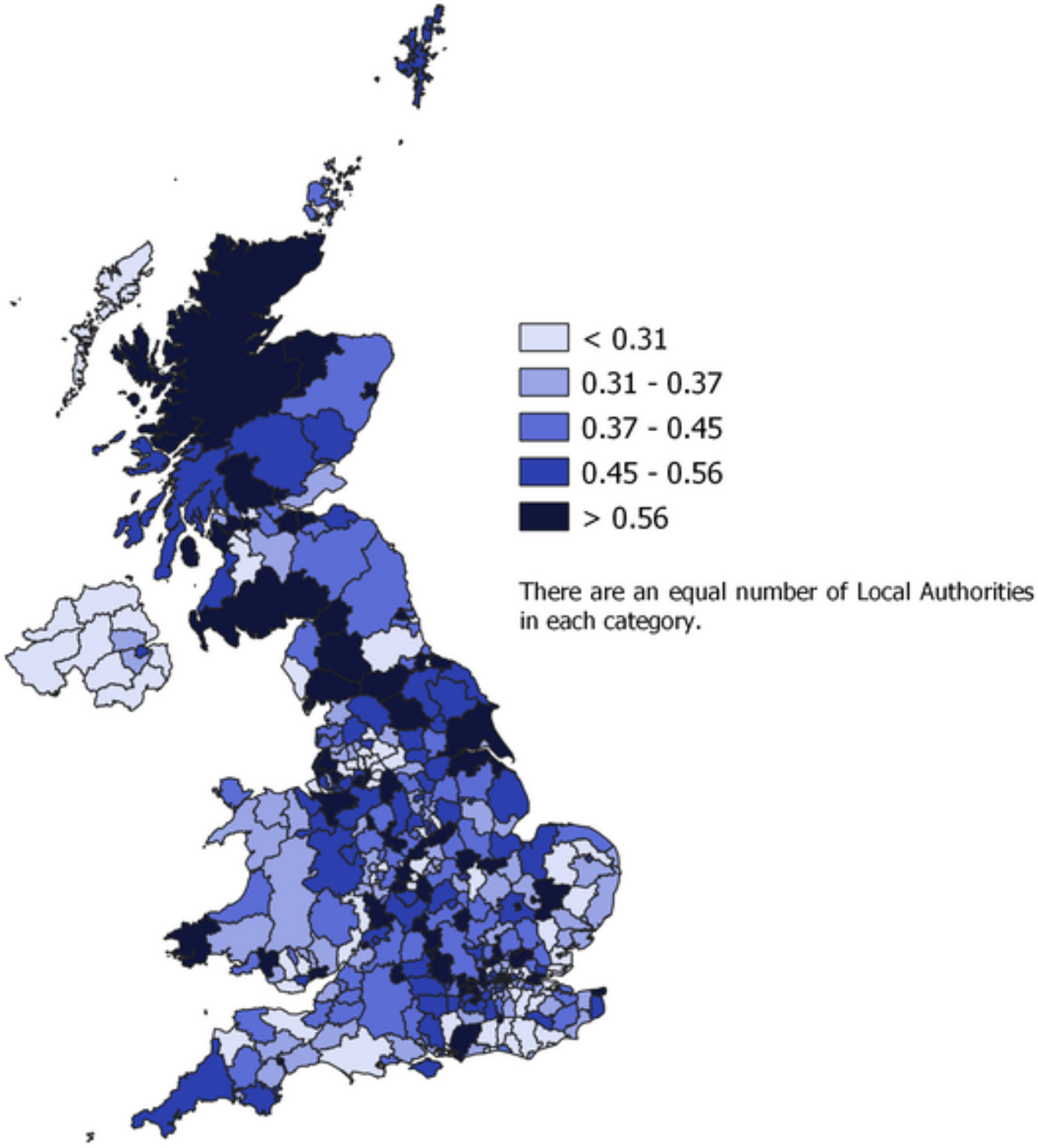


Figure 12: Public CO_2 emissions per capita by Local Authority (tonnes CO_2 per capita) in 2019

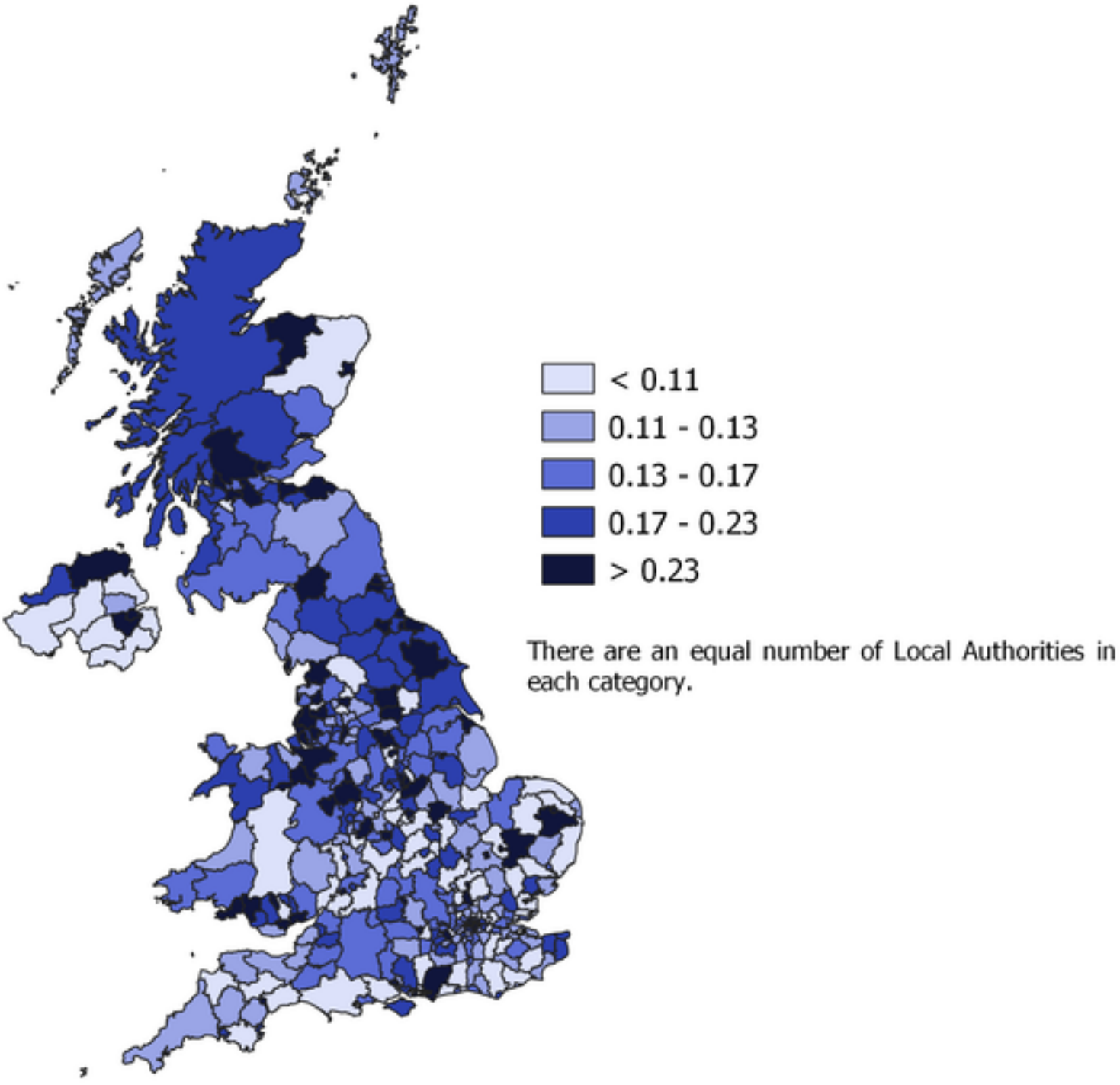


Figure 13: Transport CO_2 emissions per capita by Local Authority (tonnes CO_2 per capita) in 2019

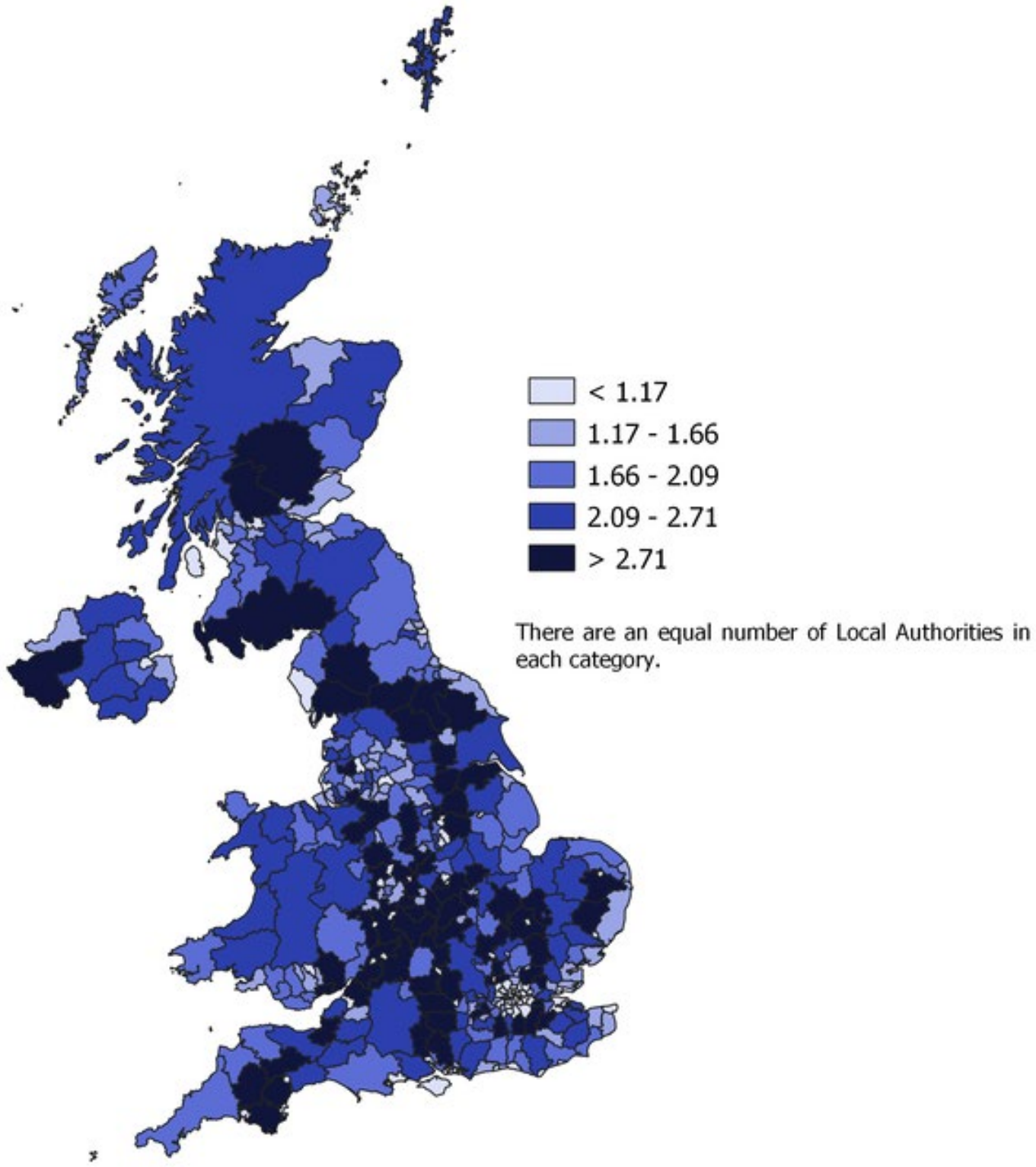
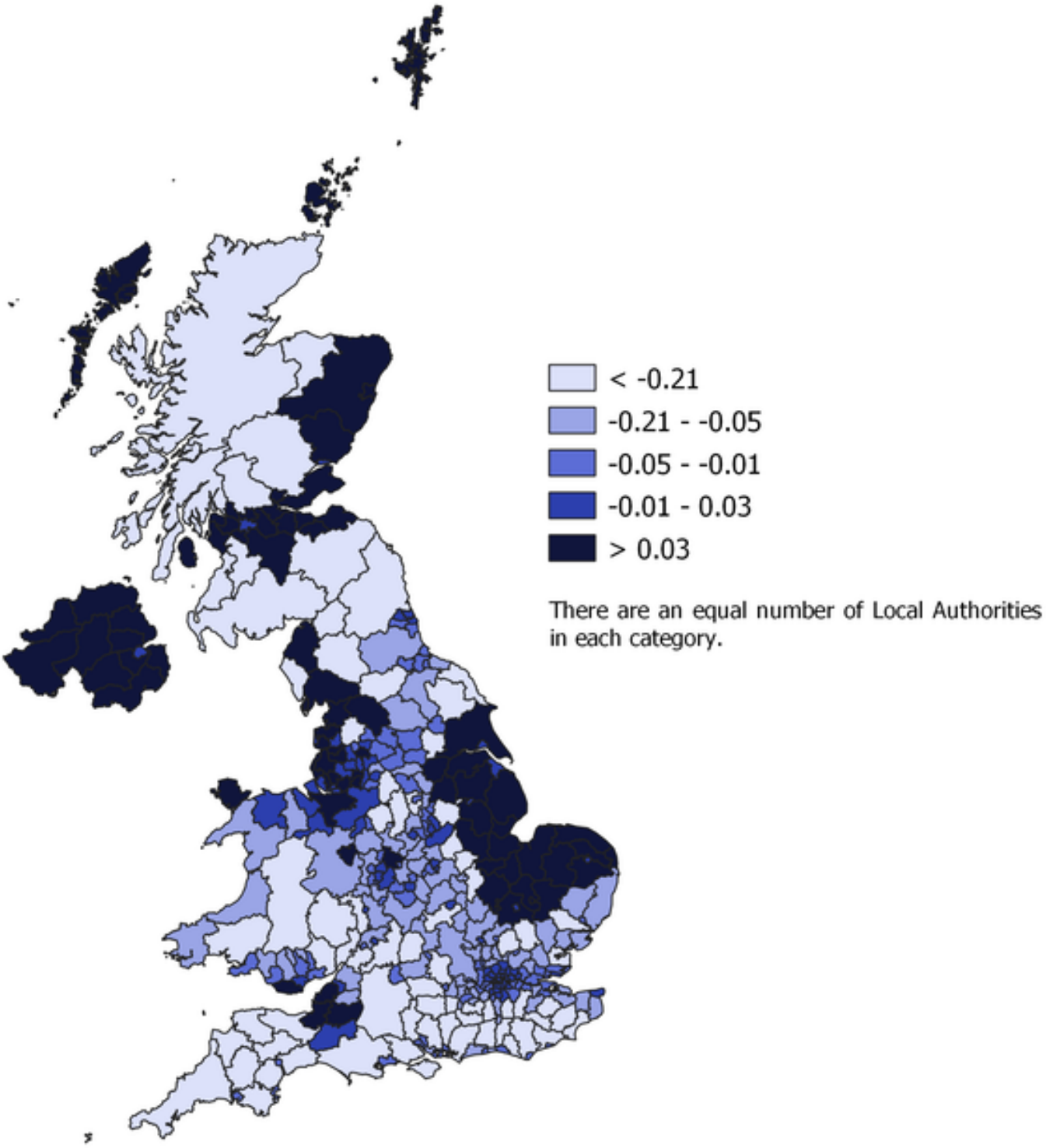


Figure 14: Land Use, Land Use Change and Forestry CO_2 net emissions per capita by Local Authority (tonnes CO_2 per capita) in 2019



Methodological improvements since last year and revisions to the data for 2005 to 2018

In the production of the 2019 estimates, new data were introduced, together with some improvements to the underlying methodology. In order to ensure that the data for 2005 to 2018 are consistent with the data now available for 2019, the estimates for these years have been revised to incorporate both the new data and the improvements in the underlying methodology. For some LAs, these revisions have resulted in noticeable changes to the emissions estimates in the earlier years for some sectors. More information and specific examples are given in the Technical Report.

Industrial, Commercial and Public

There have been minor revisions to total emissions associated with non-domestic electricity and gas consumption, these are now presented split between industrial, commercial, and public sector, based on methodologies outlined in the 'Employment based energy consumption in the UK'[14] report.

Land Use, Land Use Change and Forestry

The most significant improvements made this year were to estimates of emissions from the LULUCF sector. Emissions across this sector were revised mainly due to implementation of emissions from wetland drainage and rewetting using the 2013 Intergovernmental Panel on Climate Change (IPCC) Supplement to the 2006 IPCC guidelines. These revisions affect all LULUCF sectors due to updated estimates for drainage and rewetting of organic soils.

Large Industrial Installations

There is a programme of continuous improvement and revisions have been made to the point source data for 2005-2018 in a few instances where additional data have become available, or where other changes (such as changes to the methodology of the UK GHGI) have an impact on the point source data. Most point source data, however, will be unchanged from the values used in the previous version of the local and regional estimates of CO_2.

[14] assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/719075/Employment_based_energy_consumption_.pdf

Accompanying tables

The following tables are available in Excel and ODS format on the department's statistics website:

Full dataset: Local Authority CO_2 emission estimates 2005-2019 (kt CO_2)
Subset dataset: Local Authority CO_2 emission estimates within the scope of influence of Local Authorities 2005-2019 (kt CO_2)
Sector Scope: Sectors used in LA CO_2 - IPCC or other scope
UK Reconciliation: Reconciliation of 2019 Local Authority CO_2 emissions estimates with full Final End-User UK Inventory
England Reconciliation: Reconciliation of 2019 Local Authority dataset with the end-user inventory for England
Scotland Reconciliation: Reconciliation of 2019 Local Authority dataset with the end-user inventory for Scotland
Wales Reconciliation: Reconciliation of 2019 Local Authority dataset with the end-user inventory for Wales
NI Reconciliation: Reconciliation of 2019 Local Authority dataset with the end-user inventory for Northern Ireland
Pollution Inventory: Data from Pollution Inventory 'by source' emissions, not consistent with Local Authority CO_2 emissions by end-user

Technical information

The full set of data tables and methodology documents that accompany this statistics release can be found at: https://www.gov.uk/government/collections/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics

A number of supplementary reports are also available for local authority emissions. These are for users to refer to if they want more information on the methodology for producing the estimates:

- **Local and Regional Carbon Dioxide Emissions Estimates for 2005-2019 for the UK: technical report**
  - Report on the methodology used to produce the emissions estimates.
- **Employment based energy consumption mapping in the UK**
  - A report which outlines the methodology used to map emissions from smaller industrial and commercial sources.
- **Mapping carbon emissions & removals for the Land Use, Land Use Change & Forestry (LULUCF) sector**

- A report looking at LULUCF emissions and removals at the Local Authority level.

The following user guidance is available for sub-national emissions: Sub-national emissions statistics: Frequently asked questions

Further information on UK greenhouse gas emissions statistics, including Excel tables with additional data on UK emissions, can be found at: https://www.gov.uk/government/collections/uk-greenhouse-gas-emissions-statistics

This statistical release and the related data tables are part of the National Atmospheric Emissions Inventory (NAEI) for 1970-2019, produced for BEIS and the Devolved Administrations by Ricardo Energy and Environment. For further information on the UK Greenhouse Gas Inventory, see the NAEI website: https://naei.beis.gov.uk/

Given the number of local authorities, this statistical release does not provide a detailed explanation of all revisions to the historical data series or the year-on-year changes for each Local Authority. However, explanations of the reasons for any changes are available on request; any such requests should be sent to the following email address: climatechange.statistics@beis.gov.uk

Further information

Future updates to these statistics

The next UK local authority carbon dioxide emissions estimates, covering the period 2005-2020, will be published in June 2022.

Final estimates of UK greenhouse gas emissions in 2020 will be published in February 2022.

In March 2022, the 1990-2020 UK greenhouse gas emissions estimates will be updated to include estimates by end user and by fuel type, and provisional 2021 UK emissions estimates will be published.

In June 2022, the 1990-2020 UK greenhouse gas emissions estimates will be updated to include estimates by Standard Industrial Classification.

Related statistics

Devolved Administration Greenhouse Gas Inventories

Greenhouse gas emissions inventories are available for England, Scotland, Wales and Northern Ireland on the NAEI website: https://naei.beis.gov.uk/reports/reports?report_id=1019

Final UK greenhouse gas emissions statistics

This publication provides the latest estimates of UK greenhouse gas emissions by source sector (published in February each year) and by end user (published in March): https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics

Provisional UK greenhouse gas emissions statistics

Published in March each year, this publication provides initial estimates of the previous year's greenhouse gas emissions: https://www.gov.uk/government/collections/provisional-uk-greenhouse-gas-emissions-national-statistics

Sub-national energy consumption statistics

Several publications are produced by BEIS estimating energy consumption by local authority, which are used in the production of the UK local authority greenhouse gas emissions estimates:

- Electricity consumption statistics for Great Britain and for Northern Ireland: https://www.gov.uk/government/collections/sub-national-electricity-consumption-data
- Gas consumption statistics for Great Britain and for Northern Ireland: https://www.gov.uk/government/collections/sub-national-gas-consumption-data
- Road transport fuel consumption statistics for the United Kingdom: https://www.gov.uk/government/collections/road-transport-consumption-at-regional-and-local-level
- Residual fuel (non-electricity, non-gas, non-road transport fuels) consumption for the United Kingdom: https://www.gov.uk/government/collections/sub-national-consumption-of-other-fuels
- Total final energy consumption statistics for Great Britain: https://www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level

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: climatechange.statistics@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.

National Statistics designation

National Statistics status means that our statistics meet the highest standards of trustworthiness, quality, and public value, and it is our responsibility to maintain compliance with these standards.

The continued designation of these statistics as National Statistics was confirmed in September 2018 following a compliance check by the Office for Statistics Regulation. The statistics last underwent a full assessment against the Code of Practice for Statistics in 2014.

Since the latest review by the Office for Statistics Regulation, we have continued to comply with the Code of Practice for Statistics, and have made the following improvements:

- Improved the accuracy of the historic emissions estimates by continuing to make methodological changes to the UK's Greenhouse Gas Inventory.
- Started using the Ordnance Survey Open Roads (OSOR) dataset to provide a more accurate base map for the road network Great Britain. This is used to allocate DfT road traffic count points to road sections as part of the estimation of road traffic emissions in each local authority.
- Included information about emissions per km^2 of land area in each authority and a more detailed breakdown of industrial, commercial, public sector and LULUCF emissions in the tables.

Pre-release access to statistics

Some ministers and officials receive access to these statistics up to 24 hours before release. Details of the arrangements for doing this and a list of the ministers and officials that receive pre-release access to these statistics can be found in the BEIS statement of compliance with the Pre-Release Access to Official Statistics Order 2008.

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This publication is available from: https://www.gov.uk/government/collections/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics

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