

Local Authority CO₂ emissions estimates 2010

Statistical Summary and UK Maps

23 August 2012

Published by:

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Published by the Department of Energy and Climate Change.

Produced in the UK, August 2012 in electronic format.

This is a National Statistics publication.

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2010 National Statistics on Carbon Dioxide emissions at Local Authority and Regional Level

Statistical Summary

National Statistics of carbon dioxide emissions for local authority (LA) areas for 2010, and revised figures for the years 2005-2009, have been produced on behalf of DECC by AEA.

This report explains the background to the estimates, summarises some of the results and conclusions, 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 Technical Report and accompanying spreadsheets, which can be found at the following web-link:

http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/laco2/laco2.aspx.

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1. Introduction

The UK compiles an annual inventory of its greenhouse gas emissions in order 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, as well as maps estimating the geographical distribution of the sources of emissions.

Carbon dioxide (CO₂) is the main greenhouse gas, accounting for about 85 per cent of the UK total in 2010, and the vast majority of CO₂ emissions come from the burning of fossil fuels. In recent years, increasing emphasis has been placed on the role of regional and local government in contributing to energy efficiency improvements, and hence reductions in CO₂ emissions. The level of interest in local estimates has therefore increased accordingly.

This project combines data from the National Atmospheric Emissions Inventory (NAEI) with data from a number of other sources, including local energy consumption data from DECC, to produce a nationally consistent set of CO₂ emissions estimates down to local authority level.

The statistics show emissions allocated on an “end-user” basis - the general principle here is that 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 – thus as with the national inventories, 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 local authority (LA) statistics now include consistent figures for six years - 2005 to 2010 - which are classified as National Statistics under the terms of the National Statistics Code of Practice¹. A consistent time series has been produced by re-calculating the 2005 to 2009 estimates to reflect the methodological changes used in calculating the 2010 estimates. This is important as it allows changes to be monitored over time. Furthermore, there is a commitment to back-cast any future improvements to methodology where appropriate so that a comparable series starting in 2005 is always maintained.

The base year for the dataset time series is 2005. Data for earlier years will not be made available because data for gas and electricity at local level are not available on a consistent basis for these years.

Full details of the results and methodology are available in the Technical Report and accompanying spreadsheets, which can be found at the following web-link:

http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/laco2/la_co2.aspx.

¹ <http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html>

2. Use of the estimates

The purpose of these estimates is to assist those using local emissions accounting as a tool in developing emissions reduction strategies, and also for raising awareness generally of the issue of greenhouse gas emissions. The estimates and methodological report should be useful to those who are already working on local inventories, and might encourage others to do more by providing a useful starting point for further work.

Despite the important improvements made each year, these estimates are not perfect. They stretch the information available to the limit in order to provide estimates for each authority. Some of the limitations of the 2010 estimates include:

- confidentiality constraints on data for some large electricity and gas customers which either prevents their allocation to local authority boundaries, or introduces some additional uncertainty into the allocation, which may have a significant impact on results for a few authorities
- road transport emission estimates rely on national traffic statistics, 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 road transport (these residual sources are about 20 per cent of total emissions) 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 *Technical Report*.

It is also very important to bear in mind that circumstances vary enormously between authorities, and also that local authorities have relatively little influence over some types of emissions. In some cases more accurate data may be obtainable from locally available information, on which DECC would welcome feedback.

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 to monitor action on climate change at a local level.

It should be noted that the results at regional level 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 road transport taking place across boundaries, still exist but are less acute at the regional level than at the local level.

3. Improvements since last year and revisions to the data for 2005 to 2009

In the production of this year's estimates, new data was introduced, together with some improvements in the underlying methodology.

In order to ensure that the data for 2005 to 2009 are consistent with the data now available for 2010, 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.

Emissions from Northern Ireland electricity use: Confidentiality restrictions have been reduced in Northern Ireland. As a result, data on domestic electricity consumption in 2008-2009 and non-domestic electricity consumption in 2009-2010 at District Council level in Northern Ireland are now available. Therefore this year the methodology has been improved to allocate CO₂ emissions from industrial and commercial electricity consumption in Northern Ireland using these new datasets.

In the domestic sector, the distribution of electricity consumption between LAs for 2008 from this new dataset has been used for the years 2005-2008; the distribution for 2009 has been used for 2009 onwards. In previous years, emissions were modelled using household counts in each LA.

Similarly in the non-domestic sector, the new methodology has been applied to the whole time series, so that in all earlier years the distribution of emissions is in proportion to the electricity consumption in 2009. In previous years, emissions were modelled using total employment by LA from the Inter-Departmental Business Register (IDBR) database.

Mapping distribution grids for industrial and commercial use of solid and liquid fuels: the maps have been updated making use of the latest Energy Consumption UK data; Display Energy Certificate data; and employment distributions from the IDBR.

Road transport: The use of new evidence from the Department for Transport's (DfT's) Automatic Number Plate Recognition (ANPR) data has led to revisions in the emission factors for road transport. The fleet composition (e.g. the age of the vehicles, Euro standard mix and the petrol-diesel split in each of the DAs) on different road types for the whole of Great Britain has been developed. Previously the four Devolved Administrations (DAs) used the same emission factors.

Land Use, Land Use Change and Forestry: This year, for the first time, mapped LULUCF emissions and removals have been estimated for all years from 2005 to 2010 to provide a fully consistent time series of data from the CEH model. Previously it was only possible to estimate the latest year and apply that distribution to earlier years. This is a more accurate method because it reflects activity data for the appropriate area and time.

4. Results

4.1 Main findings

Some of the main findings are as follows:

- Overall in 2010, 43 per cent of end-user emissions assigned to local authority areas were attributed to the industry and commercial sector, 31 per cent to the domestic sector, and 26 per cent to road transport. There are wide local variations on this mainly because of the economy and geography of different local areas. These figures do not take emissions from the LULUCF sector into account, since the sector has both emissions and removals of CO₂, which introduce computational uncertainties.
- Since 2009, emissions have increased in 394 out of the 406 LAs. There have been decreases in emissions in only 12 authorities. However between 2008 and 2009, emissions decreased in almost all LAs, with increases in emissions in only 4 authorities.
- By sector, the results display a similar pattern. In 366 LAs (90 per cent of all authorities), there was an increase in emissions from the industrial and commercial sector between 2009 and 2010. In the road transport sector, 232 LAs experienced a decrease in emissions between 2009 and 2010. For the domestic sector, every single local authority has experienced an increase in emissions between 2009 and 2010. This is the reverse of the result observed between 2008 and 2009, when emissions decreased in the domestic sector in every LA.
- The industry and commercial sector had the highest share of end-user emissions in 43 per cent of authorities. The domestic sector the highest share in 36 per cent, and the road transport sector had the highest share in 22 per cent of authorities. The road transport sector had the lowest share in 58 per cent of authorities.
- In 2010, about 49 per cent of domestic end-user emissions came from gas use and 40 per cent were due to electricity consumption.
- In 2010, domestic end-user emissions were less than 2 tonnes per person in 7 per cent of LAs, between 2 and 2.5 tonnes per person in 62 per cent, between 2.5 and 3 tonnes per person in 22 per cent and above 3 tonnes per person in 10 per cent.

4.2 Full dataset – National Statistics

Estimates of CO₂ emissions have been produced for each local authority in the UK from the following broad source categories:

- industry, commercial & public sector (including electricity-related emissions)
- domestic (including electricity-related emissions)
- road transport
- land use, land use change and forestry (including removals of CO₂ from the atmosphere, so that net emissions from this sector can sometimes be negative)

The level of sectoral detail is constrained by that available in the DECC statistics on local electricity and gas use. To estimate a further breakdown would have involved 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.

4.2.1 Emissions in 2010

Table 1 shows a summary of the end-user results by region. Estimates are also shown per resident, based on the Office of National Statistics (ONS) mid-year population estimates for 2010, in order to make some allowance for the different size of regions. However, it should be noted that while emissions per resident may be a useful measure for domestic emissions, emissions from industry and road transport are driven by many factors other than resident population. Therefore industrial and commercial, and road transport emissions per resident should be interpreted with caution.

Results for individual LAs can be found in the spreadsheet supplied with the *Technical Report*.

There is a great deal of variation between LAs. In particular a significant amount of industrial emissions are concentrated in a few areas, so for most LAs the contribution of industrial and commercial emissions in 2010 may have been very different from the overall averages in **Table 1**.

Table 1: End-user carbon dioxide emissions 2010: Regional summary

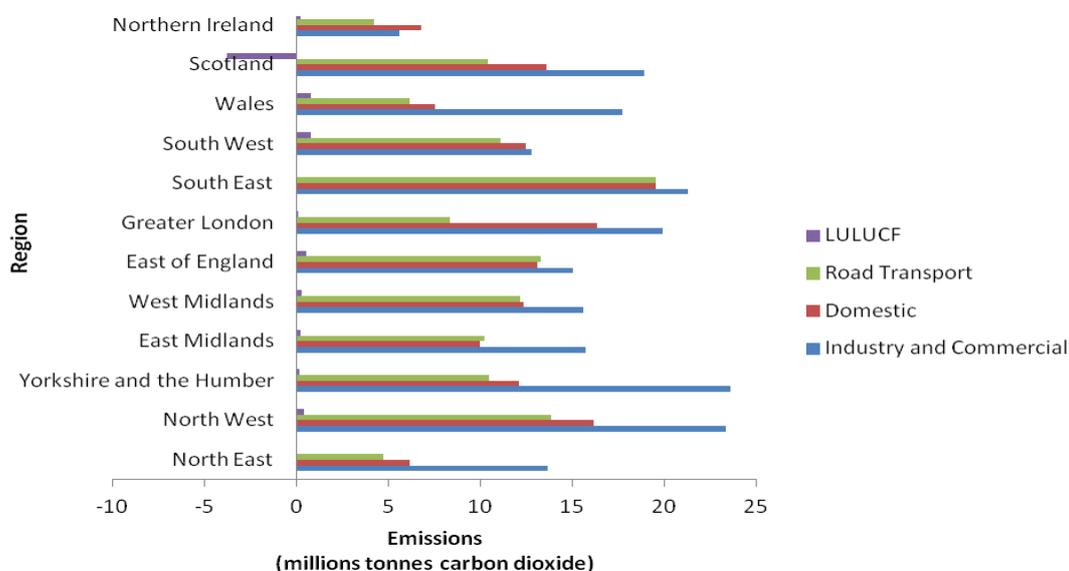
Government Office Region	Total emissions (million tonnes carbon dioxide)					Per capita emissions (tonnes carbon dioxide per resident)						
	Industrial, commercial & public		Domestic	Road transport	LULUCF	Total	Industrial, commercial & public		Domestic	Road transport	LULUCF	Total
	North East	13.7	6.1	4.7	0.0	24.5	5.2	2.4	1.8	0.0	9.4	
North West	23.4	16.2	13.9	0.4	53.8	3.4	2.3	2.0	0.1	7.8		
Yorkshire and the Humber	23.6	12.1	10.5	0.2	46	4.5	2.3	2.0	0.0	8.7		
East Midlands	15.8	10.0	10.2	0.2	36	3.5	2.2	2.3	0.0	8.1		
West Midlands	15.6	12.4	12.1	0.3	40	2.9	2.3	2.2	0.0	7.4		
East of England	15.1	13.1	13.3	0.5	42	2.6	2.2	2.3	0.1	7.2		
Greater London	19.9	16.3	8.4	0.0	45	2.5	2.1	1.1	0.0	5.7		
South East	21.3	19.6	19.6	0.0	60	2.5	2.3	2.3	0.0	7.1		
South West	12.8	12.5	11.1	0.8	37	2.4	2.4	2.1	0.1	7.0		
England ⁽¹⁾	161.0	118.3	103.7	2.3	385.3	3.1	2.3	2.0	0.0	7.4		
Wales ⁽¹⁾	17.7	7.5	6.2	0.8	32	5.9	2.5	2.0	0.3	10.7		
Scotland ⁽¹⁾	18.9	13.6	10.4	-3.8	39	3.6	2.6	2.0	-0.7	7.5		
N. Ireland ⁽¹⁾	5.6	6.8	4.2	0.2	17	3.1	3.8	2.4	0.1	9.4		
UK ⁽²⁾	207.8	146.5	124.5	-4.4	474	3.3	2.4	2.0	-0.1	7.6		
% of UK total	43.8%	30.9%	26.2%	-0.9%	100%							

(1) These data are not fully consistent with the equivalent data for the Devolved Administrations. A reconciliation of these two sets of figure can be found in the *Data tables*².

(2) Sum of local authority emission estimates differ from the official inventory for the UK (see Reconciliation section below).

Figure 1 below shows how emissions in each sector vary between each of the regions for 2010.

Figure 1: 2010 end-user carbon dioxide emissions by region and sector



² http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/laco2/laco2.aspx

Figure 2 below shows how emissions per capita in each sector vary between each of the regions for 2010.

Figure 2: 2010 per capita end-user carbon dioxide emissions by region and sector

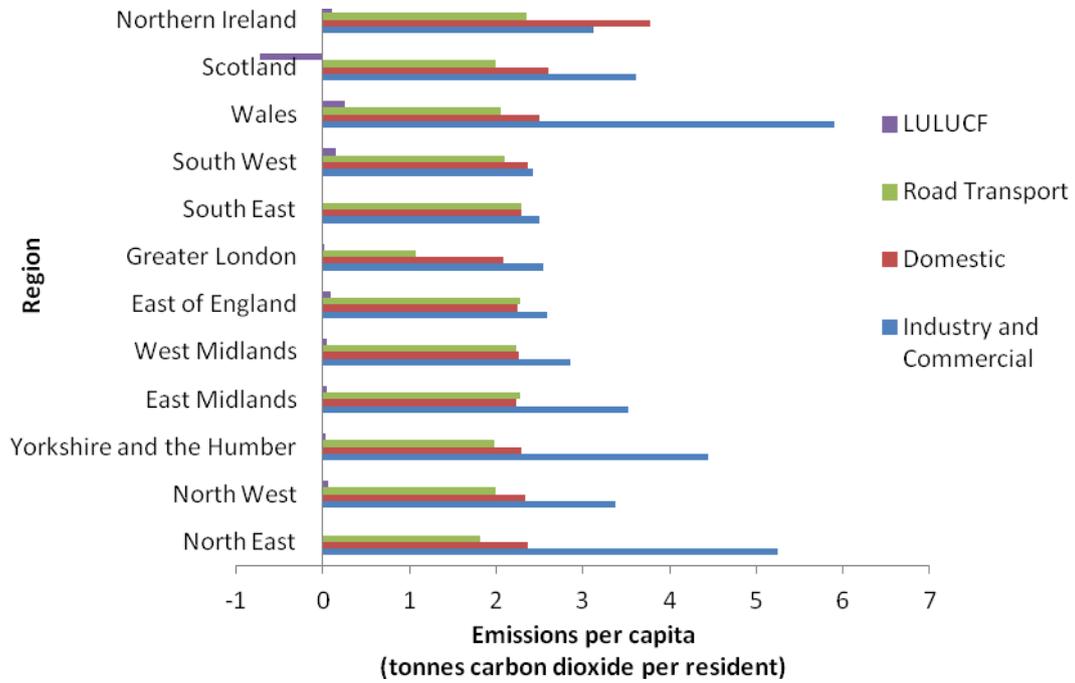


Table 2 and **Figure 3** below show the number of LAs with different proportions of emissions coming from the different sectors. They show that:

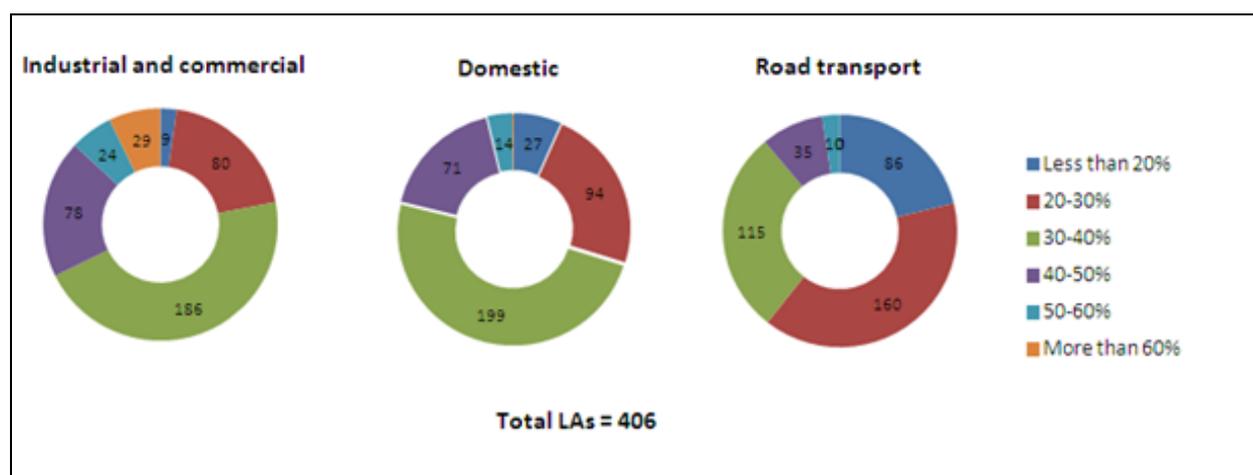
- the industrial and commercial sector accounted for over half of emissions in 53 LAs;
- domestic emissions accounted for over half in 15 LAs; and
- road transport made up half of emissions in 10 LAs.

In the majority of cases, the domestic, and the industry and commercial sectors made up 30-50% of emissions, while road transport was usually the source of 20-40% of emissions.

Table 2: Sectoral breakdown of emissions: Number of LAs with a given proportion of emissions in 2010 (excluding LULUCF)

Proportion of emissions	Sector (number of LAs where sector accounts for corresponding proportion of emissions)		
	<u>Industrial and commercial</u>	<u>Domestic</u>	<u>Road transport</u>
Less than 20%	9	27	86
20-30%	80	94	160
30-40%	186	199	115
40-50%	78	71	35
50-60%	24	14	10
More than 60%	29	1	0
Total	406	406	406

Figure 3: Sectoral breakdown of emissions: Number of LAs with a given proportion of emissions in 2010 (excluding LULUCF)



4.2.2 Emissions by sector in 2010

Domestic sector

Emissions per resident vary least between areas for the domestic sector, and are dominated by gas and electricity consumption, for which real local data are available. DECC publishes domestic energy consumption data to regional and local authority level³. These data have been used to estimate emissions for the domestic sector for all LAs, related to gas and electricity consumption. Domestic emissions here represent emissions from energy consumption in and around the home, including emissions attributable to the use of electricity, but not activities by private individuals elsewhere, such as personal travel.

In 2010, out of the 406 LAs, domestic end-user emissions were greater than industrial and commercial end-user emissions in 191 (or 47% of all) LAs.

Table 3 below shows the proportion of LAs which fall into different emissions per capita sectors.

Table 3: Percentage of LAs by CO₂ emissions per capita in the domestic sector

Tonnes per person	Number of LAs	Percentage of LAs
Less than 2	29	7%
2 - 2.5	250	62%
2.5 - 3	88	22%
More than 3	39	10%

This 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.

Since 2009, there has been an increase in emissions from the domestic sector for all LAs. This has resulted almost entirely from an increase in the use of natural gas. Domestic emissions are heavily influenced by external temperatures, and 2010 was, on average, the coldest year since 1987. This caused an increase in demand for space heating in 2010, which resulted in a significant increase in emissions from domestic gas use.

In 2010, about 49 per cent of domestic end-user emissions arose from gas use, 40 per cent from electricity, and 11 per cent from consumption of other fuels. Between 2005 and 2010, there was a decrease in emissions from domestic gas consumption of 7%.

In the domestic sector, 368 (or 91 per cent) LAs have seen a decrease in emissions since 2005. The largest decreases were in Gateshead, Knowsley and Torfaen (all 17%).

³ <http://www.decc.gov.uk/en/content/cms/statistics/regional/regional.aspx>

Road transport

Road transport emissions include both freight and passenger transport, both private and for business purposes. The estimates are made on the basis of 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 the issue has to be borne in mind when looking at either totals or per capita estimates. The *Technical Report* shows how the estimates break down between major and minor roads, to help with consideration of this point. On the end-user basis, road transport emissions include a share of emissions from oil refineries.

More than half (232 out of 406) of all LAs in the UK have experienced a decrease in road transport emissions between 2009 and 2010. This follows on from the 2008 to 2009 change where 309 LAs saw decreases in emissions from road transport .

4.2.3 Changes between 2005 and 2010

When the LA emissions are aggregated estimated total emissions decreased by around 10% – falling from 523.3 million tonnes to 473.5 million tonnes between 2005 and 2010.

Some of the key changes over this period can be summarised as follows:

- Out of 406 LAs, 361 have shown a decrease in total emissions between 2005 and 2010.
- The average percentage change for all LAs between 2005 and 2010 was:
 - -5.1% in the domestic sector;
 - -11.8% in the industrial and commercial sector;
 - -6.6% in the road transport sector; and
 - total emissions decreased on average by 7.9%.The percentage change was not calculated for the LULUCF sector because the sector has both emissions and removals of CO₂, which introduce computational uncertainties.
- Since 2005, the largest percentage decrease:
 - in total emissions was in Redcar and Cleveland (down 67.7%);
 - in the industrial and commercial sector was in Gravesham (down 84.3%). This is primarily due to the closure of a cement works during 2009;
 - in the domestic sector was in both Gateshead and Knowsley (both down 12.3%); and
 - in road transport was in Selby (down 16.1%).
- The largest percentage increase since 2005:
 - in total emissions was in Highland (up 54.1%);
 - in the industrial and commercial sector was in Slough (up 47.7%);
 - in the domestic sector was in Belfast (up 10.8%); and
 - in the road transport sector was Eilean Siar (up 8.6%);

- In 2010, per capita emissions across the UK range from:
 - -1.9 tonnes in Argyll and Bute in Scotland (where LULUCF removals outweigh all emissions); and
 - up to 138.5 tonnes in the City of London (which has a large amount of commercial activity but a low population).

Emissions for many LAs are heavily influenced by activities at industrial sites. It is important to note that, as with Gravesham, changes in emissions estimates over time can be heavily influenced by single sites.

Table 4 and **Figure 4** below compares 2010 with 2005 at the regional level. All regions have seen emissions decreasing between 2005 and 2010, with some variation between regions – the largest decrease in per capita terms of 3.7 tonnes per person was seen in the North East and the smallest decrease, of 0.6 tonnes per person, was seen in Greater London.

Table 4: End-user carbon dioxide emissions 2005 and 2010: Region comparison

Region / country	2005		2010	
	Total emissions (Mt)	Per capita (t)	Total emissions (Mt)	Per capita (t)
North East	33	13.1	25	9.4
North West	60	8.8	54	7.8
Yorkshire and the Humber	53	10.4	46	8.7
East Midlands	40	9.3	36	8.1
West Midlands	45	8.3	40	7.4
East of England	46	8.2	42	7.2
Greater London	47	6.3	45	5.7
South East	67	8.2	60	7.1
South West	42	8.2	37	7.0
England ⁽¹⁾	432	8.6	385	7.4
Wales ⁽¹⁾	33	11.3	32	10.7
Scotland ⁽¹⁾	41	8.1	39	7.5
N. Ireland ⁽¹⁾	17	9.8	17	9.4
UK ⁽²⁾	530	8.8	474	7.6

(1) These data are not fully consistent with the equivalent data for the Devolved Administrations. A reconciliation of these two sets of figure can be found in the *Data tables*⁴.

(2) Sum of local authority emission estimates differ from the official inventory for the UK (see Reconciliation section below).

⁴http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/laco2/laco2.aspx

Figure 4 below shows the change in total carbon dioxide emissions between 2005 and 2010, for each region.

Figure 4: Regional emissions in 2005 and 2010



At the Local Authority level, there was a larger variation by LA with some areas estimated emissions increasing considerably, and some decreasing considerably:

- 14 LAs have experienced a decrease of more than 20 per cent during the period 2005-2010 - largest decrease of 68 per cent was seen in Redcar and Cleveland.
- An additional 25 LAs experienced a decrease of at least 15 per cent during the period 2005-2010.
- In another 99 LAs, total emissions decreased between 10 and 15 per cent.
- In 44 LAs, total emissions increased since 2005.
- In absolute terms 150 LAs have seen a decrease of more than 100 thousand tonnes, with the biggest decrease in Redcar and Cleveland (6,280 thousand tonnes).

Changes by sector overall

In all sectors – apart from railways and domestic ‘other fuels’ – there have been reductions in emissions in 2010 compared with 2005 estimates.

The 3 largest absolute decreases were in the following sectors:

- Large industrial installations (-15.0 million tonnes)
- Industry and commercial electricity (-11.1 million tonnes)
- Road transport (-6.1 million tonnes)

Changes by sector at the Local Authority level

As discussed above, several LAs have seen large decreases between 2005 and 2010. Taking the ten LAs that have seen the biggest reductions, an assessment

below was made to identify the specific sub-sectors that were driving the reductions so they could be individually verified.

Argyll and Bute in Scotland is the only local authority where LULUCF removals outweigh all emissions from the other sectors. More information on LULUCF emissions can be found in the *Mapping carbon emissions & removals for the Land Use, Land Use Change & Forestry*⁵ report.

Table 5 below shows the LAs that have seen the 5 biggest decreases in total emissions since 2005, alongside the sub-sectors driving the changes (excluding emissions from the LULUCF sector).

Table 5: LAs that saw large decreases between 2005 and 2010 – full dataset

Local Authority	Percentage decrease	Sector(s) responsible (proportion of all decreases in that area)
Redcar and Cleveland	-68	Large industrial installations (95%)
Gravesham	-65	Large industrial installations (92%)
Ribble Valley	-34	Large industrial installations (91%)
Fermanagh	-30	Large industrial installations (94%)
Isle of Anglesey	-29	Large industrial installations (76%)

Table 6 below shows the LAs that have seen the 5 biggest increases in emissions since 2005, alongside the sub-sectors driving the changes (excluding emissions from the LULUCF sector).

Table 6: LAs that saw the largest increases between 2005 and 2010 – full dataset

Local Authority	Percentage increase	Sector(s) responsible (proportion of all increases in that area)
Slough	-18	Industry and commercial electricity (98%)
King's Lynn and West Norfolk	-18	Industry and commercial gas (59%),
Swale	-15	Industry and commercial gas (78%),
St. Edmundsbury	-15	Industry and commercial gas (74%)
Clackmannanshire	-12	Industry and commercial gas (95%)

⁵ http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/laco2/laco2.aspx

4.2.4 Largest increases and decreases between 2009 and 2010

There have been some large reductions in emissions from 2009 to 2010. **Table 7** below looks at the five LAs that have seen the biggest reductions, alongside the specific sub-sectors that were mainly responsible for these reductions.

Table 7: LAs that saw large decreases between 2009 and 2010 – full dataset

Local Authority	Percentage decrease	Sector(s) responsible (proportion of all decreases in that area)
Redcar and Cleveland	-57	Large industrial installations (99%)
Isle of Anglesey	-13	Large industrial installations (100%)
West Somerset	-8	Industry and commercial gas (100%)
Tonbridge and Malling	-4	Large industrial installations (100%)
Rossendale	-4	Industry and commercial electricity (99%)

Between 2009 and 2010, there were increases in emissions in 394 LAs. **Table 8** below shows the five LAs which experienced the largest increases in emissions, along with the sectors which contributed to this change.

Table 8: LAs that saw large increases between 2009 and 2010 – full dataset

Local Authority	Percentage increase	Sector(s) responsible (proportion of all increases in that area)
Neath Port Talbot	38	Large industrial installations (95%)
Swale	31	Industry and commercial gas (77%)
Ribble Valley	22	Large industrial installations (72%)
Barrow-in-Furness	22	Industry and commercial electricity (82%)
North Lincolnshire	20	Large industrial installations (88%)

4.3 CO₂ emissions within the scope of influence of LAs

Alongside the full dataset, we have also published a subset which represents carbon dioxide emissions within the scope of influence of LAs. This dataset was previously used to report progress against National Indicator 186. The full dataset includes all the emissions that occur within the boundaries of each local authority; however, the dataset of emissions within the scope of LAs excludes certain emissions, which it has been considered LAs are unable to directly influence. The emissions that are removed from the National Statistics are:

- Motorways – all emissions from the “Road transport (motorways)” sector have been removed;
- EU Emissions trading system 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.

Using this dataset, an assessment was made for the LAs that have seen the five biggest decreases and increases in total emissions since 2005, alongside the sub-sectors driving the changes. This is summarised in **Table 9 and 10** below:

Table 9: LAs that saw large decreases between 2005 and 2010 – CO₂ emissions within the scope of influence of LAs

Local Authority	Percentage decrease	Sector(s) responsible (proportion of all increases in that area)
Exeter	-29	Industry and commercial gas (87%)
Isle of Anglesey	-29	Large industrial installations (76%)
Thurrock	-26	Industry and commercial gas (79%)
Dover	-24	Industry and commercial gas (67%)
Rotherham	-24	Industry and commercial gas (56%)

For other LAs not mentioned in **Table 9** that have seen a large decrease, the major contributors are similarly industry and commercial emissions from gas and electricity. In the period 2005-2010, 127 LAs experienced a decrease of more than 10 per cent and a further 190 have experienced a decrease of more than 5 per cent for the same period. In total, 373 of 406 LAs have experienced a decrease in carbon dioxide emissions over the period 2005-2010.

Table 10 below lists the five LAs which have increased most in emissions since 2005, together with the magnitude of the change in each case:

Table 10: LAs that saw large increases between 2005 and 2010 – CO₂ emissions within the scope of influence of LAs

Local Authority	Percentage increase	Sector(s) responsible (proportion of all increases in that area)
Swale	37	Industry and commercial gas (78%)
Slough	27	Industry and commercial electricity (97%)
Clackmannanshire	18	Industry and commercial gas (95%)
King's Lynn and West Norfolk	18	Industry and commercial gas (59%)
Craigavon	13	Industry and commercial gas (61%)

A similar analysis was carried out on this subset of data, to compare the LAs which have changed most in emissions since 2009. This is summarised in **Tables 11 and 12** below:

Table 11: LAs that saw large decreases between 2009 and 2010 – CO₂ emissions within the scope of influence of LAs

Local Authority	Percentage decrease	Sector(s) responsible (proportion of all decreases in that area)
Isle of Anglesey	-13	Large industrial installations (100%)
West Somerset	-8	Industry and commercial gas (100%)
Rosendale	-4	Industry and commercial electricity (99%)
Derby	-0.4	Industry and commercial gas (93%)
Pembrokeshire	-0.4	Industry and commercial electricity (96%)

Table 12: LAs that saw large increases between 2009 and 2010 – CO₂ emissions within the scope of influence of LAs

Local Authority	Percentage increase	Sector(s) responsible (proportion of all increases in that area)
Swale	42	Industry and commercial gas (86%)
Barrow-in-Furness	27	Industry and commercial electricity (82%)
Clackmannanshire	22	Industry and commercial gas (83%)
Fife	19	Industry and commercial gas (84%)
Slough	17	Industry and commercial electricity (62%), industry and commercial gas (19%)

4.4 Results by region and sector

Table 13 below shows regional totals for the detailed sectors and fuels while **Table 14** shows the percentage change in emissions between 2005 and 2010 for each sector and each region.

Given the number of LAs, it would not be practical to provide a detailed explanation of all revisions to the historical data series or the year on year changes, within this Statistical Release. 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@decc.gsi.gov.uk.

Table 13: Emissions in 2010 (kt CO₂) by region and (detailed) sector

Sector	North East	North West	Yorkshire and the Humber	East Midlands	West Midlands	East of England	Greater London	South East	South West	Wales	Scotland	Northern Ireland	Unallocated	Total
A. Industry and Commercial Electricity	4,032	10,614	8,008	6,679	7,665	8,152	14,429	11,984	7,322	5,342	8,183	2,462	4,504	99,375
B. Industry and Commercial Gas	1,956	5,506	4,653	3,058	3,456	3,583	4,690	4,388	2,346	2,132	4,718	652	36	41,174
C. Large Industrial Installations	6,606	4,653	8,352	3,244	1,878	752	109	1,993	108	8,211	3,461	538	0	39,906
D. Industrial and Commercial Other Fuels	867	2,059	2,116	2,303	2,076	2,210	583	2,251	2,035	1,406	1,563	1,492	0	20,961
E. Agricultural Combustion	144	326	239	255	306	212	9	337	655	508	744	457	0	4,192
F. Diesel Railways	78	206	229	221	214	144	94	323	339	137	233	12	0	2,231
G. Domestic Electricity	2,171	6,414	4,597	4,143	5,064	5,803	6,880	8,448	5,450	2,739	5,809	1,516	257	59,292
H. Domestic Gas	3,431	8,908	6,705	5,459	6,432	6,347	9,227	9,940	4,937	3,332	6,260	332	91	71,402
I. Domestic 'Other Fuels'	545	877	818	377	861	966	243	1,172	2,067	1,450	1,511	4,945	0	15,832
J. Road Transport (A roads)	2,315	4,569	4,159	5,136	4,192	6,338	4,633	7,581	4,943	3,105	5,206	2,012	0	54,188
K. Road Transport (Motorways)	301	4,854	2,853	2,018	3,633	2,358	582	5,754	2,338	831	1,779	341	0	27,642
L. Road Transport (Minor roads)	2,099	4,381	3,430	3,008	4,266	4,518	3,123	6,148	3,750	2,199	3,404	1,861	0	42,188
M. Road Transport Other	20	55	40	39	48	53	35	82	46	24	38	17	0	497
N. LULUCF Net Emissions	-31	418	170	193	254	506	35	-19	757	772	-3,761	194	-3,894	-4,409
Total	24,533	53,840	46,368	36,133	40,344	41,943	44,672	60,382	37,094	32,187	39,150	16,830	995	474,470

Table 14: Percentage change in emissions from 2005 to 2010 (kt CO₂) by region and (detailed) sector

Sector	North East	North West	Yorkshire and the Humber	East Midlands	West Midlands	East of England	Greater London	South East	South West	Wales	Scotland	Northern Ireland	Total
A. Industry and Commercial Electricity	-17%	-12%	-10%	-16%	-13%	-9%	0%	-6%	-11%	-14%	-8%	9%	-10%
B. Industry and Commercial Gas	-22%	-13%	-17%	-13%	-19%	-8%	-8%	-10%	-22%	-19%	0%	74%	-12%
C. Large Industrial Installations	-50%	-17%	-23%	-20%	-7%	-28%	-16%	-46%	-90%	5%	-20%	-54%	-27%
D. Industrial and Commercial Other Fuels	-18%	-15%	-9%	-5%	-17%	-18%	-25%	-23%	-23%	-19%	-25%	-9%	-17%
E. Agricultural Combustion	-9%	-9%	-9%	-9%	-8%	-9%	-6%	-9%	-9%	-9%	-11%	-12%	-10%
F. Diesel Railways	4%	7%	6%	7%	7%	7%	8%	8%	6%	2%	5%	11%	6%
G. Domestic Electricity	-8%	-7%	-10%	-8%	-6%	-8%	-5%	-7%	-9%	-7%	-10%	-6%	-7%
H. Domestic Gas	-11%	-10%	-8%	-7%	-9%	-5%	-6%	-5%	-7%	-10%	-5%	62%	-7%
I. Domestic 'Other Fuels'	10%	7%	9%	9%	11%	9%	4%	8%	10%	10%	8%	8%	9%
J. Road Transport (A roads)	-10%	-11%	-12%	-9%	-11%	-9%	-11%	-12%	-10%	-8%	-8%	-8%	-10%
K. Road Transport (Motorways)	-6%	-5%	-8%	-11%	-8%	-10%	-1%	-8%	-8%	-10%	-5%	-8%	-8%
L. Road Transport (Minor roads)	-2%	-3%	-2%	-1%	-2%	-1%	-5%	-2%	-1%	0%	1%	2%	-2%
M. Road Transport Other	-15%	-15%	-15%	-15%	-15%	-15%	-15%	-15%	-15%	-16%	-16%	-16%	-15%
N. LULUCF Net Emissions	-82%	-9%	-48%	-22%	8%	-5%	-7%	-91%	15%	-365%	-30%	110%	23%
Total	-27%	-10%	-12%	-11%	-10%	-8%	-5%	-9%	-11%	-3%	-5%	0%	-10%

Note: Values have been greyed out where they represent less than 3% of the region's total emissions in 2010

5. Reconciliation with the UK inventory

5.1 Reconciliation Table

These local 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 estimates, as there is no obvious basis for doing so. 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 would be attributed to business in the UK inventory. This is because it is impossible to distinguish between domestic customers and smaller businesses in the meter point consumption data used in these local estimates.

Table 15 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.
- **"Methodological differences"** are the differences that have caused the discrepancies between the national inventories and the LA CO₂ dataset. These are explained after the UK reconciliation table, in Section 7.1.

Table 15: Reconciliation of 2010 local emission estimates with UK inventory

	(million tonnes CO ₂)	
	Details	Totals
1. End-user emissions allocated to local areas		473.5
<i>Unallocated methodological differences:</i>		
unallocated consumption (largely industrial and commercial electricity)	-1.3	
large electricity users with unknown location	2.3	
Total unallocated		1.0
2. Total UK end-user emissions (local method)		474.5
<i>Excluded from local allocation:</i>		
domestic shipping	2.6	
domestic aviation	1.8	
military transport	3.3	
exports	15.8	
Total excluded		23.5
<i>Methodological differences:</i>		
higher domestic in local method	3.5	
lower industry & commercial in local method	-7.0	
Total methodological differences		-3.5
3. UK total CO₂ emissions		494.5
Emissions from Crown Dependencies		1.3
4. UK Greenhouse Gas Inventory total		495.8

5.2 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 LA carbon dioxide (CO₂) emissions dataset, and for the Devolved Administration-level 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 CO₂ dataset, the split is as defined by the DECC sub-national energy consumption dataset. 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 DECC's *Energy Trends* publication. These two underlying datasets are not fully consistent, and therefore result in differences between the LA dataset and the DA inventories for gas and electricity use, as described below.

Looking first at gas consumption, the sub-national energy dataset underlying the LA CO₂ emissions data uses the gas industry standard cut-off point of 73,200kWh (2,500 therms) and classifies consumers using under that annual consumption as domestic consumers. The data are also weather-corrected using a 17-year average. In addition, the data cover the gas year – the period covering 1 October through to the following 30 September – as opposed to the calendar year, as used in the LA CO₂ dataset. Finally, gas consumption in the Local Authority CO₂ dataset is mapped using the sub-national energy consumption data, along with excluded large gas users for GB, and gas consumption data from the energy suppliers for Northern Ireland.

In respect of the DA inventory however, the underlying *Energy Trends* dataset does not have the abovementioned complications. Firstly, there is no cut-off point used to differentiate between domestic and industry and commercial users, and secondly, the *Energy Trends* data are not weather corrected, and are also collected annually on a calendar year basis. Finally, *Energy Trends* uses all gas consumption data from the point source database with the remaining consumption mapped using a combination of sub-national gas consumption and NAEI mapping grids.

Turning to electricity, in compiling the LA CO₂ dataset, each meter in the sub-national energy dataset is allocated a profile class, which enables consumption by domestic customers to be identified separately from consumption by industrial and commercial customers. However as part of the data validation process, all users initially identified as domestic customers with either a recorded consumption greater than 100,000kWh, or with both recorded consumption greater than 50,000kWh and address information indicating non-domestic use, are reclassified as industrial and commercial customers.

In respect of the DA inventory however, the nature of the *Energy Trends* dataset means that this does not require any reclassification between domestic and industrial and commercial users. It should, however, be noted that the *Energy Trends* dataset

used in the DA inventory (with the exception of half-hourly data) covers the year 31 January 2010 to 30 January 2011. This therefore differs from the sub-national dataset used in the LA CO₂ estimates, which is based on a calendar year.

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 of the national fuel use between the four DAs.

In the LA dataset, some electricity consumption data cannot be allocated to LAs. This is due to both commercial confidentiality concerns for high-consuming sites, and also where it is not possible to map these data. 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

LULUCF data is supplied by CEH who are able to assign emissions from harvested wood products to particular DAs but not to particular LAs. 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-LA data.

Use of additional gas data for Northern Ireland

Both datasets now include consideration of new gas consumption data supplied by Firmus Energy, which shows a large growth in gas use within Northern Ireland from 2006 onwards. The DA GHGI 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 more greater level of detail required by the data, and the UK emissions distribution grids have been used solely. Note that due to the more limited energy market in Northern Ireland, energy data (for metered fuels) is not available in as much detail as for GB and the much greater sensitivities apply to the data.

Distribution of 'Other Fuels' across DAs

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

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 process, 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 Section 4 of the Technical Report). In the DA GHGI, 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 AEA as part of the mapping process for the National Atmospheric Emissions Inventory programme. For the DA GHGI, this is mapped using a DA specific distribution calculated by CEH.

For domestic oil combustion, the allocation of emissions to LAs is based on housing and energy supply data. The mapping grids are unchanged from last year's publication. For the DA inventory, some assumptions are made based on oil delivered from GB to Northern Ireland and GB emissions are then distributed using these same distribution grids.

For domestic coal combustion, the LA emissions use domestic mapping grids as above. There are unique mapping grids for each fuel. The DA inventory uses an earlier version of these mapping grids to ensure a more consistent time series over a longer period.

Railways

Local Authority carbon dioxide emissions from railways are distributed using NAEI mapping grids which were developed using vehicle km data as described in Section 7 of the Technical Report. For the DA GHGI, emissions from railway locomotives in Great Britain are disaggregated based on diesel oil consumption data supplied by ATOC (2010) for passenger services and NAEI estimates for freight services.

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.

Road Transport

Since the introduction of the Department for Transport's (DfT's) Automatic Number Plate Recognition (ANPR) data into the national and mapped emissions inventories, there is now a better match between DA and LA inventories. This means that DA specific fleet composition and vkm can be used and applied directly to specific road links. The small differences still observed (~1%) are due to the method used for splitting vkm between DAs. The DA inventories use data supplied by DfT and NI DRD whereas the LA mapping uses road link data attributed to certain LAs.

6. UK maps

The results of the work on 2010 carbon dioxide emissions at local authority level has been presented in a variety of detail and formats in the following pages.

Figure 5 shows total CO₂ emissions per capita by LA, while **Figures 6 to 9** show per capita emissions for each sector (Domestic; Industrial and Commercial; Road Transport and LULUCF) by LA.

Figure 10 presents CO₂ as carbon emissions by source on a 1 km² resolution map. Data at this spatial resolution are generated as part of the NAEI programme on behalf of Defra and are published on the NAEI website (http://www.naei.org.uk/mapping/mapping_2009.php).

Carbon dioxide maps at the same spatial resolution on an end-user basis including the distribution of electricity emissions will also be published on the NAEI website shortly.

6.1 Regional sectoral variations

As **Figures 6 to 9** show, emissions per capita can vary noticeably between regions in the UK. This is particularly evident in the domestic and LULUCF sectors.

As **Figure 6** shows, in 2010, for the domestic sector, emissions per capita were visibly higher in Northern Ireland, Scotland, Wales and South West England compared with the rest of the UK. Per capita emissions were highest in Northern Ireland (3.8 tonnes per person). This is predominantly because there is limited availability of natural gas in these 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. However, as gas becomes increasingly more widely available here, it is expected that emissions from the domestic sector will decrease accordingly. In Scotland, Wales and South West England, there is greater availability of gas; however it is still evident that the proportion which domestic 'other fuels' contributes to total domestic emissions is roughly twice as high as is seen other parts of the UK.

There are no clear trends in the industrial and commercial, and road transport sectors. As **Figures 7 and 8** show, within all regions there are areas which have a mixture of (i.e. low, medium and high) carbon dioxide emissions per capita. With respect to the industrial and commercial sector, this is expected, since emissions from this sector are heavily dependent on whether there are large industrial sites situated in that area. It is more difficult to identify reasons behind the variations observed in the road transport sector, since there are numerous factors (such as composition of the vehicle fleet and average annual daily statistics by vehicle type) which feed into these estimates. Further information on how road transport emissions have been estimated is available in section 11 of the Technical Report.

In the LULUCF sector, there are clear regional trends in per capita emissions (**Figure 9**). In large parts of Scotland (and also in parts of the East of England), there are large sinks of carbon dioxide. Since 1990, these sinks have increased due to less land conversion to cropland, less conversion of grassland and forests to cropland,

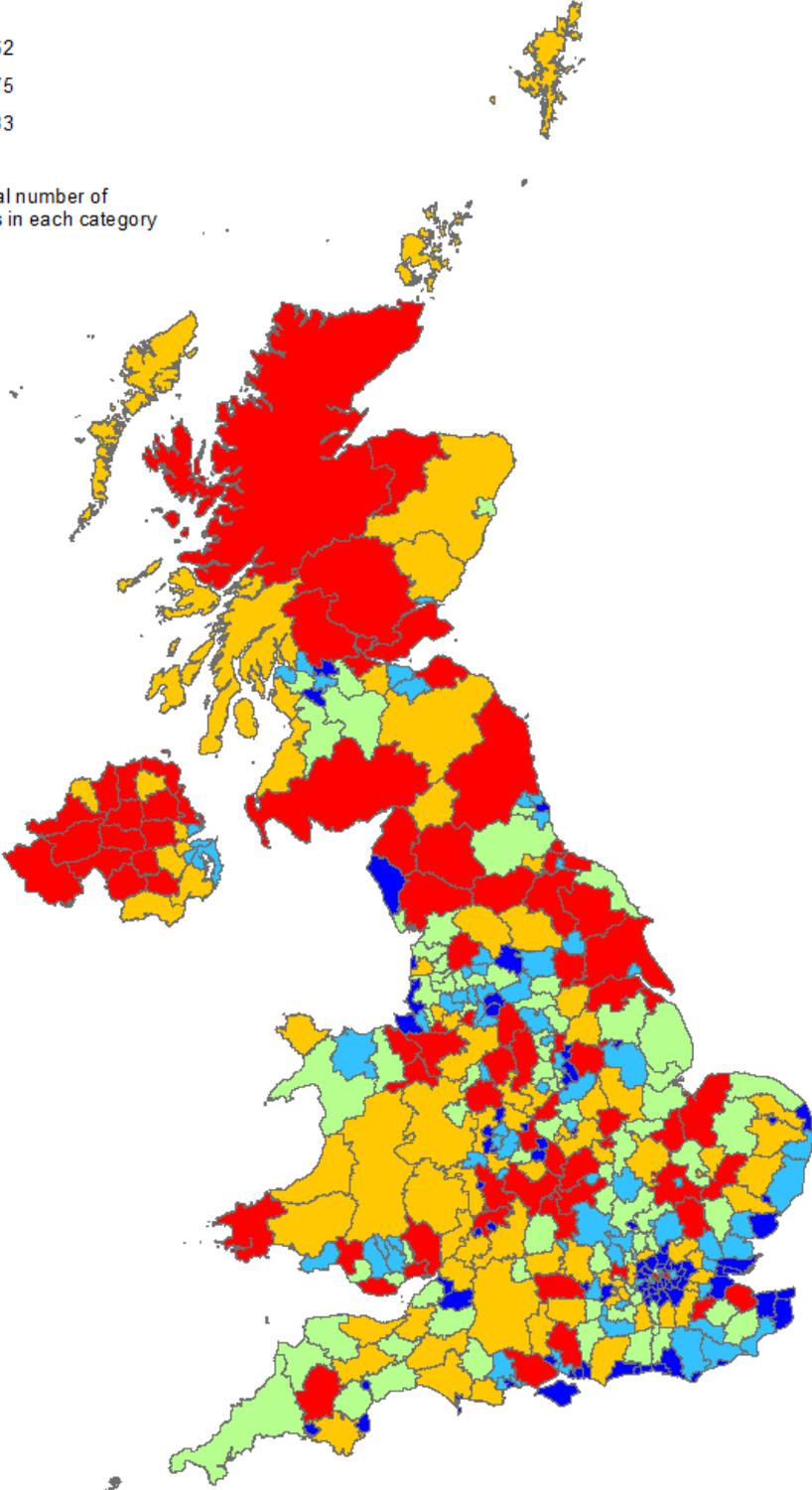
and the increased maintenance of, and conversion to, forestland. In other parts of the UK, such as in Northern Ireland and Wales, LULUCF is a large source of carbon dioxide emissions. In the former, emissions have arisen from the clearing of land for the maintenance and creation of settlements and croplands. In Wales, forest stocks have been maturing, and there has also been an increase in harvesting for wood products.

Figure 5: Emissions of CO₂ per capita by Local Authority (t), excluding LULUCF

2010 Total Emissions excluding LULUCF (tonnes Carbon Dioxide per capita)

- < 5.63
- 5.63 - 6.62
- 6.63 - 7.75
- 7.76 - 9.33
- > 9.33

There is an equal number of Local Authorities in each category



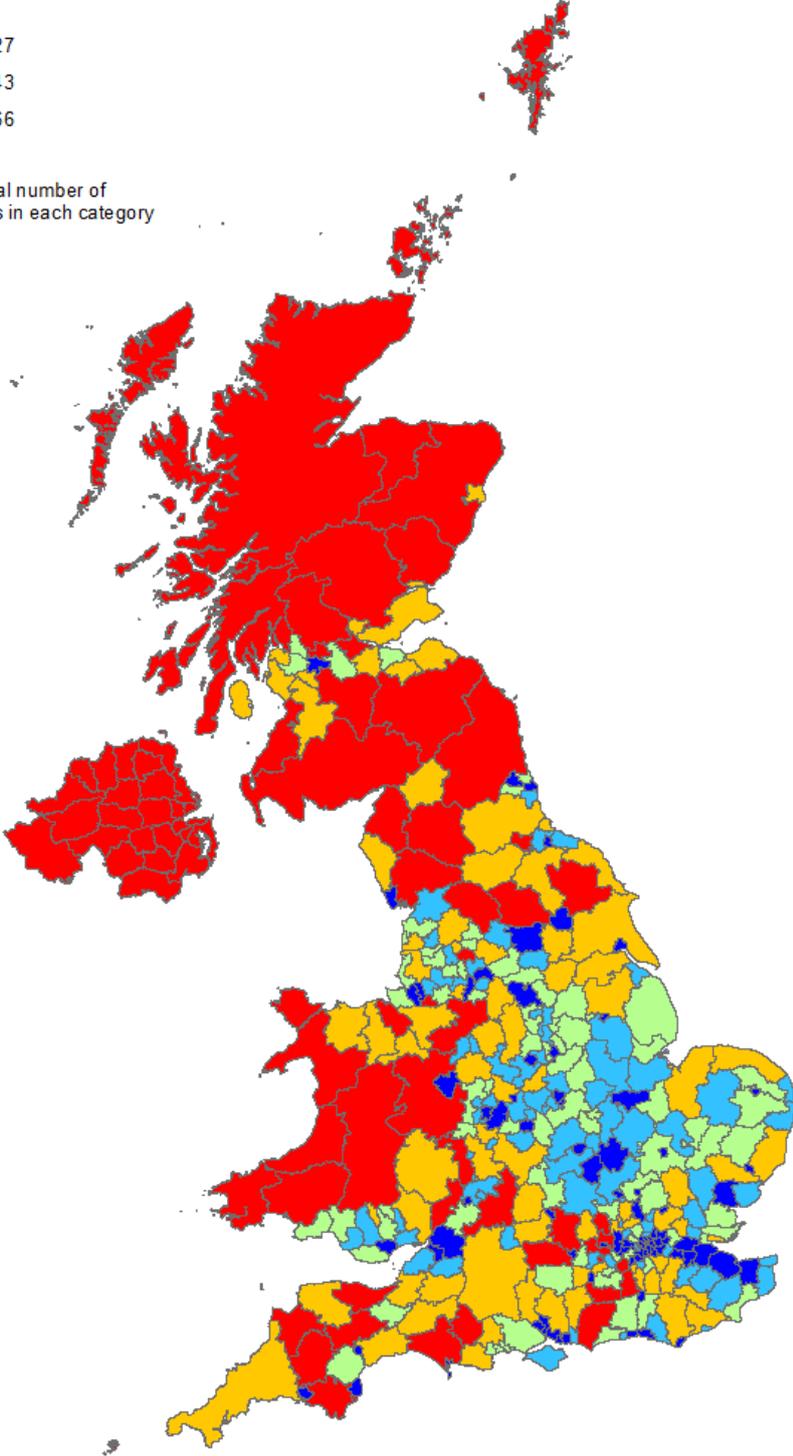
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Figure 6: Domestic CO₂ per capita emissions by Local Authority (t) for 2010

2010 Domestic Emissions (tonnes Carbon Dioxide per capita)

- < 2.14
- 2.14 - 2.27
- 2.28 - 2.43
- 2.44 - 2.66
- > 2.67

There is an equal number of Local Authorities in each category



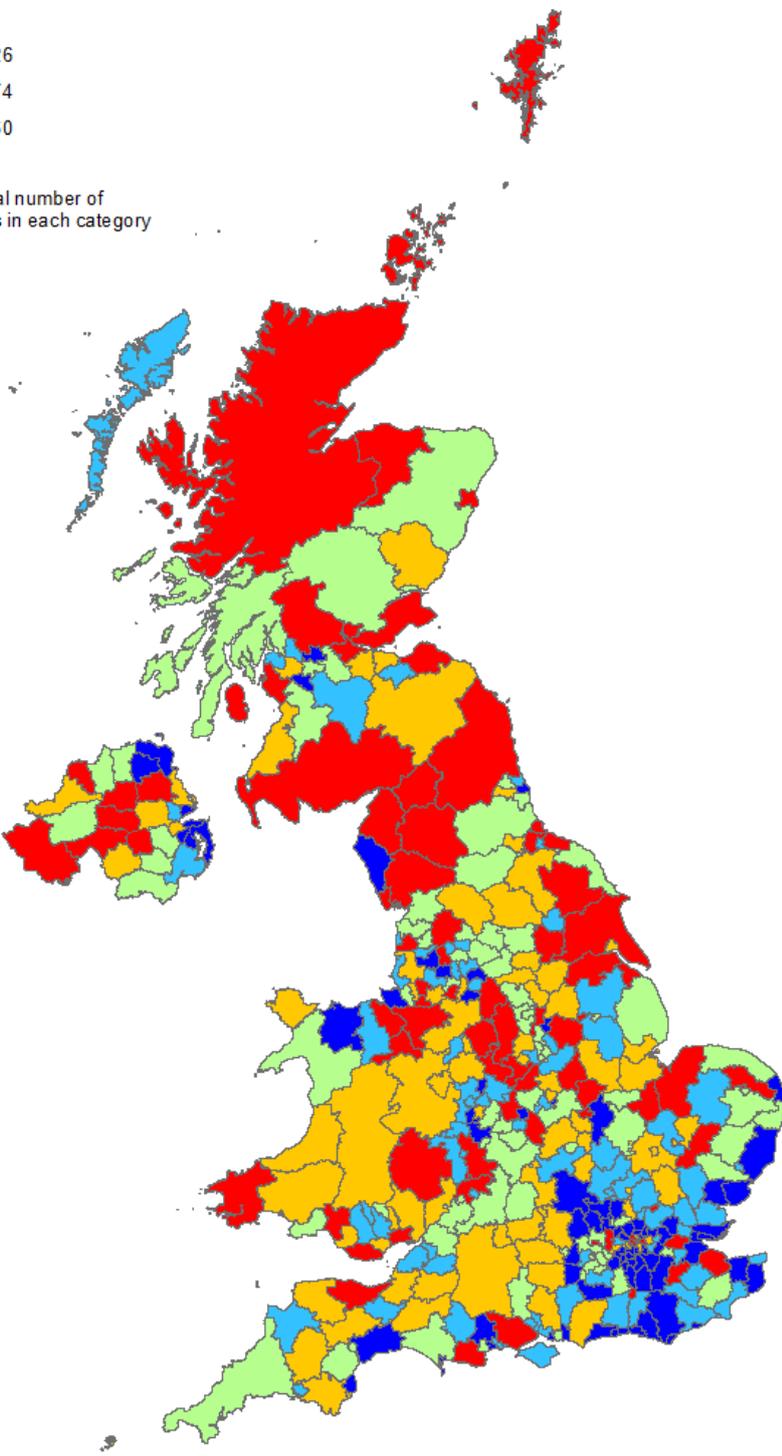
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Figure 7: Industrial and commercial per capita CO₂ emissions by Local Authority (t) for 2010

2010 Industrial and Commercial Emissions (tonnes Carbon Dioxide per capita)

- < 1.85
- 1.85 - 2.26
- 2.27 - 2.74
- 2.75 - 3.60
- > 3.60

There is an equal number of Local Authorities in each category



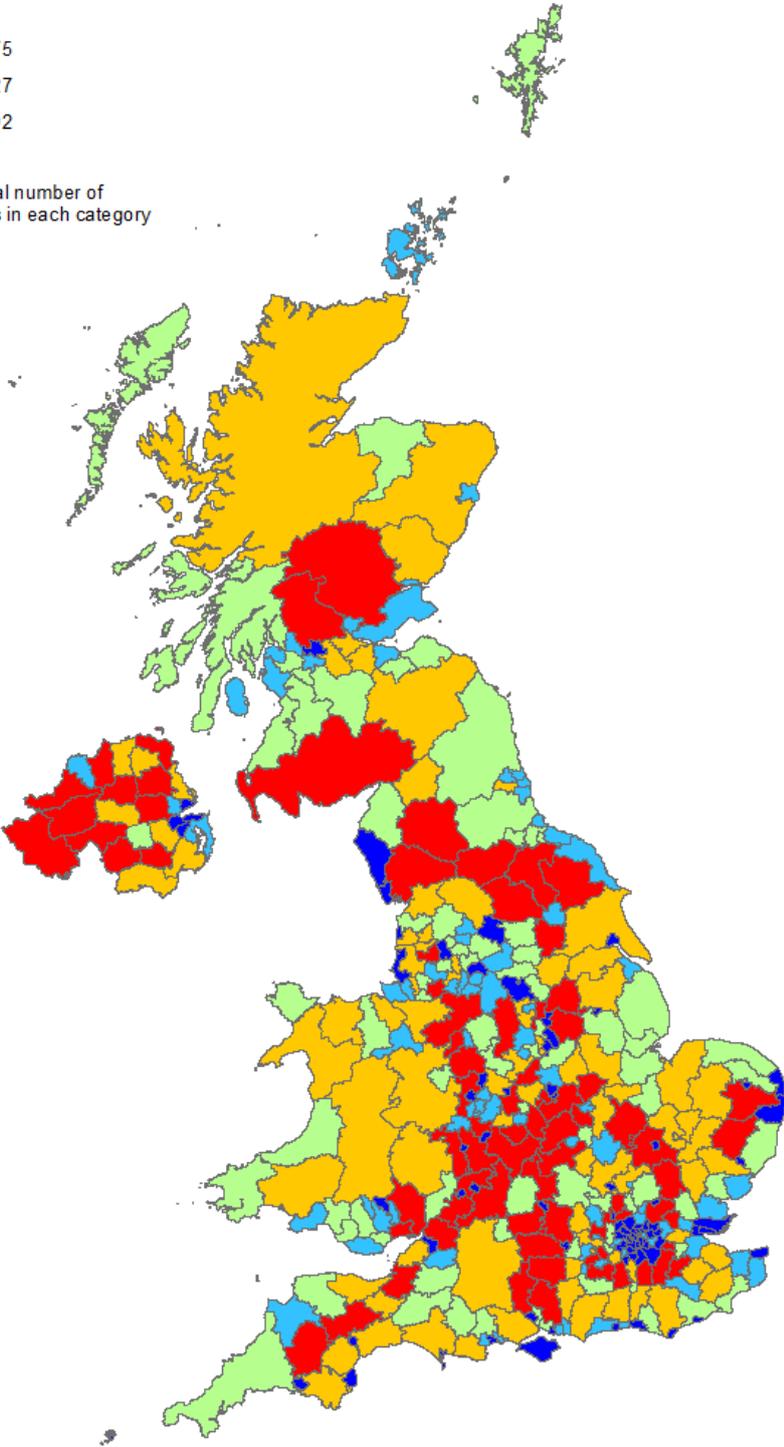
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Figure 8: Road Transport CO₂ emissions per capita by Local Authority (t) for 2010

2010 Road Transport Emissions (tonnes Carbon Dioxide per capita)

- < 1.24
- 1.24 - 1.75
- 1.76 - 2.27
- 2.28 - 3.02
- > 3.02

There is an equal number of Local Authorities in each category



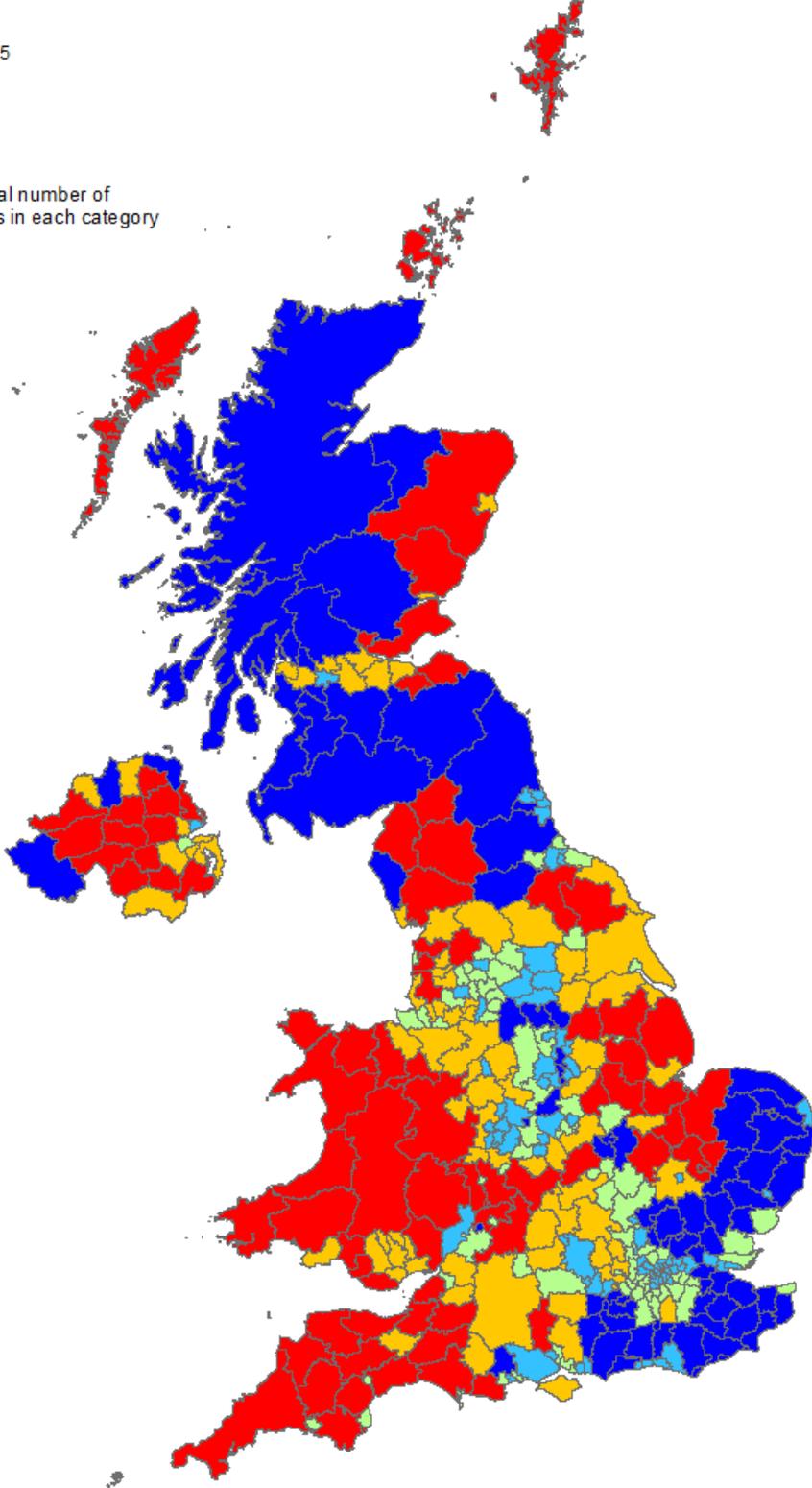
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Figure 9: Land use change CO₂ emissions per capita by Local Authority (t) for 2010

2010 LULUCF Emissions (tonnes Carbon Dioxide per capita)

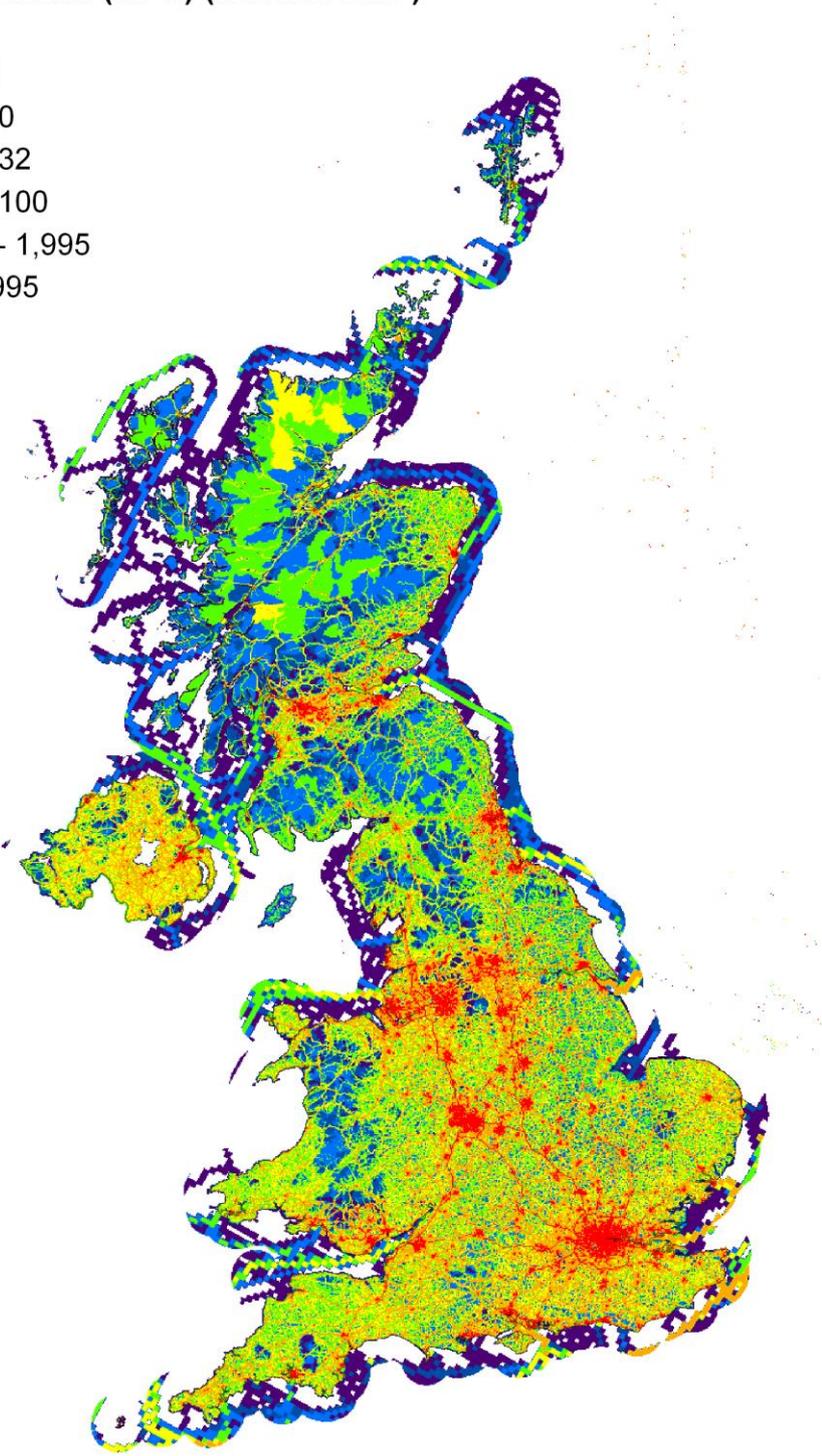
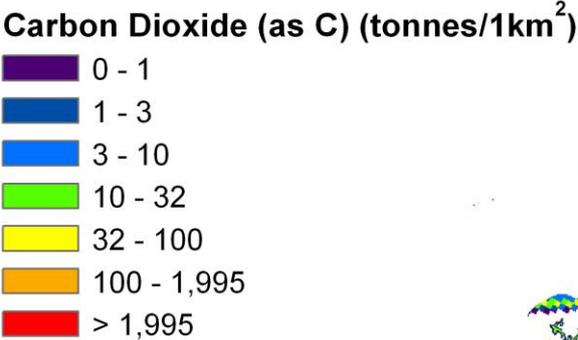
- < - 0.002
- - 0.002 - 0.005
- 0.006 - 0.023
- 0.024 - 0.115
- > 0.115

There is an equal number of Local Authorities in each category



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Figure 10: 1km² resolution emissions map of CO₂ for 2010⁶



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⁶ Land use and Land Use Change emissions are not included in this map because 1km resolution data are not available for this sector

7. The future

Further sets of these National Statistics will be produced annually. There is also a commitment to maintain a comparable time series starting in 2005 into the future, so the series for all years back to 2005 will be reviewed each year to ensure consistency. There are currently no planned improvements to the LA CO₂ emissions dataset.

Comments

We would welcome comments on these statistics. These should be sent to:

UK Greenhouse Gas Emissions Statistics and Inventory Team
Department of Energy and Climate Change
Area 6A
3 Whitehall Place
London
SW1A 2AW

e-mail: ClimateChange.Statistics@decc.gsi.gov.uk

Useful links

Details of DECC's estimates of local and regional energy statistics are available here:

http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/regional.aspx

The home pages of the UK National Atmospheric Emissions Inventory are here:

<http://www.naei.org.uk>