

Local Authority CO₂ emissions estimates 2011

Statistical Summary and UK Maps

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2011 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 2011, and revised figures for the years 2005-2010, 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:

www.gov.uk/government/publications/local-authority-emissions-estimates

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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 83 per cent of the UK total in 2011, and the vast majority of these 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 2011 - 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 2010 estimates to reflect the methodological changes used in calculating the 2011 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:

www.gov.uk/government/publications/local-authority-emissions-estimates

¹ 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 2011 estimates include:

- Unallocated electricity where electricity sales within the sub-national dataset cannot be successfully allocated to specific LAs, due to lack of information.
- 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 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 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 2010

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 2010 are consistent with the data now available for 2011, 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 gas use:

There has been a change to the methodology to ensure that Northern Ireland gas consumption is treated differently to the GB gas consumption data, due to the nature of the respective datasets. Northern Ireland gas consumption data is not weather corrected, whereas the GB gas data is. Previously, total UK gas consumption data which is used in the UK GHG inventory – and is not weather corrected – was allocated to the rest of the UK using both weather corrected GB gas data and non-weather corrected Northern Ireland gas consumption data, in a single step. However, in order to make better use of the data available on Northern Ireland, the process now removes Northern Ireland data from the UK total before emissions are allocated to GB using sub-national data. This methodology change applies to both the industrial and domestic sector, however the industrial sector also has incorporated revised gas consumption data from energy suppliers further adding to the changes.

Large Industrial Installations:

There are significant changes to some sites arising from gaps that were identified during the annual UNFCCC review of the UK's National GHG inventory. These changes have been applied consistently across the time series.

Industrial and Commercial Other Fuels:

There have been some small revisions in national emissions estimates for sources that fall within this sector. Changes have also occurred due to the re-allocation of aircraft support vehicles from this sector to "Transport – Other"

Road Transport (A roads)

Previous annual average daily flows for road traffic in Northern Ireland were taken from 2009 data as this was the latest data available when these statistics were compiled in last year's dataset. Emissions for this sector are now estimated based on 2010 annual average daily flows.

Road Transport (Minor roads)

A new methodology has been used in the UK GHG inventory this year to account for emissions from minor roads. This reflects changes on the road network and updates to the Department for Transport's minor road traffic counts.

Diesel Railways

There is also an updated methodology which uses data from the Department for Transport's Rail Emissions Model. This provides emissions estimates from each strategic route in GB for passenger and freight trains. The emissions along each rail link are assumed to be uniform along the length of the rail link as no information on load variations is available.

Transport Other

This sector was previously called "Road Transport Other" and included just LPG and lubricants used in road vehicles. This sector has now been redefined, and now includes a new source, inland waterways and aircraft support vehicles which have been re-allocated from Sector D (Industrial and Commercial Other Fuels).

This category now also includes coal combustion which is thought to mainly be in use on heritage railways. However, there is not enough information on heritage railways to map these accurately and they have therefore been mapped using the same method as applied for regional rail emissions.

Land Use, Land Use Change and Forestry

There have been a number of changes in this sector such as: changes to the mapping methodologies; adjustment on split of forest planting on mineral and organic soil; new data on wildfires; new estimates of biomass and dead organic matter losses based on country specific densities; and new activity data for peat extraction.

4. Results

4.1 Main findings

Some of the main findings are as follows:

- Overall in 2011, 42 per cent of end-user emissions assigned to local authority areas were attributed to the industry and commercial sector, 29 per cent to the domestic sector, and 28 per cent to 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 2010, emissions have decreased in 403 out of the 406 LAs. There have been increases in emissions in only 3 authorities.
- By sector, the results display a similar pattern. In 389 LAs (96 per cent of all authorities), there was a decrease in emissions from the industrial and commercial sector between 2010 and 2011. In the transport sector, 349 LAs experienced a decrease in emissions between 2010 and 2011. For the domestic sector, every single local authority has experienced a decrease in emissions between 2010 and 2011. This is the reverse of the result observed between 2009 and 2010, when emissions increased in the domestic sector in every LA.
- The industry and commercial sector had the highest share of end-user emissions in 41 per cent of authorities. The domestic sector the highest share in 31 per cent, and the transport sector had the highest share in 29 per cent of authorities. The transport sector had the lowest share in 45 per cent of authorities.
- In 2011, about 46 per cent of domestic end-user emissions came from gas use and 44 per cent were due to electricity consumption.
- In 2011, domestic end-user emissions were less than 2 tonnes per person in 45 per cent of LAs, between 2 and 2.5 tonnes per person in 43 per cent, between 2.5 and 3 tonnes per person in 8 per cent and above 3 tonnes per person in 4 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)
- 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 2011

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 2011, 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 transport are driven by many factors other than resident population. Therefore industrial and commercial, and 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 2011 may have been very different from the overall averages in **Table 1**.

Table 1: End-user carbon dioxide emissions 2011: Regional summary

Government Office Region	Total emissions (million tonnes carbon dioxide)					Per capita emissions (tonnes carbon dioxide per resident)						
	Industrial, commercial & public		Domestic	Transport	LULUCF	Total	Industrial, commercial & public		Domestic	Transport	LULUCF	Total
North East	13.4	5.4	4.4	-0.1	23.1	5.2	2.1	1.7	0.0	8.9		
North West	20.8	14.2	13.6	0.4	49.0	2.9	2.0	1.9	0.1	7.0		
Yorkshire and the Humber	21.8	10.7	10.6	0.3	43.4	4.1	2.0	2.0	0.0	8.2		
East Midlands	14.2	8.8	10.4	0.2	33.7	3.1	1.9	2.3	0.0	7.4		
West Midlands	14.2	10.9	12.2	0.3	37.6	2.5	1.9	2.2	0.0	6.7		
East of England	13.0	11.5	13.4	0.5	38.4	2.2	2.0	2.3	0.1	6.6		
Greater London	17.6	14.5	7.8	0.0	39.9	2.1	1.8	1.0	0.0	4.9		
South East	18.2	17.3	19.3	-0.2	54.6	2.1	2.0	2.2	0.0	6.3		
South West	11.1	10.9	11.5	0.8	34.3	2.1	2.1	2.2	0.1	6.5		
England ⁽¹⁾	144.3	104.2	103.3	2.1	354.0	2.7	2.0	1.9	0.0	6.7		
Wales ⁽¹⁾	15.6	6.5	6.1	0.9	29.1	5.1	2.1	2.0	0.3	9.5		
Scotland ⁽¹⁾	17.2	12.0	10.5	-3.7	36.0	3.3	2.3	2.0	-0.7	6.8		
N. Ireland ⁽¹⁾	5.1	5.6	4.2	0.3	15.2	2.8	3.1	2.3	0.1	8.4		
UK ⁽²⁾	182.2	128.5	124.1	-0.4	434.3	5.2	2.1	1.7	0.0	8.9		
% of UK total	42.0%	29.6%	28.6%	-0.1%	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 2011.

² www.gov.uk/government/publications/local-authority-emissions-estimates

Figure 1: 2011 end-user carbon dioxide emissions by region and sector

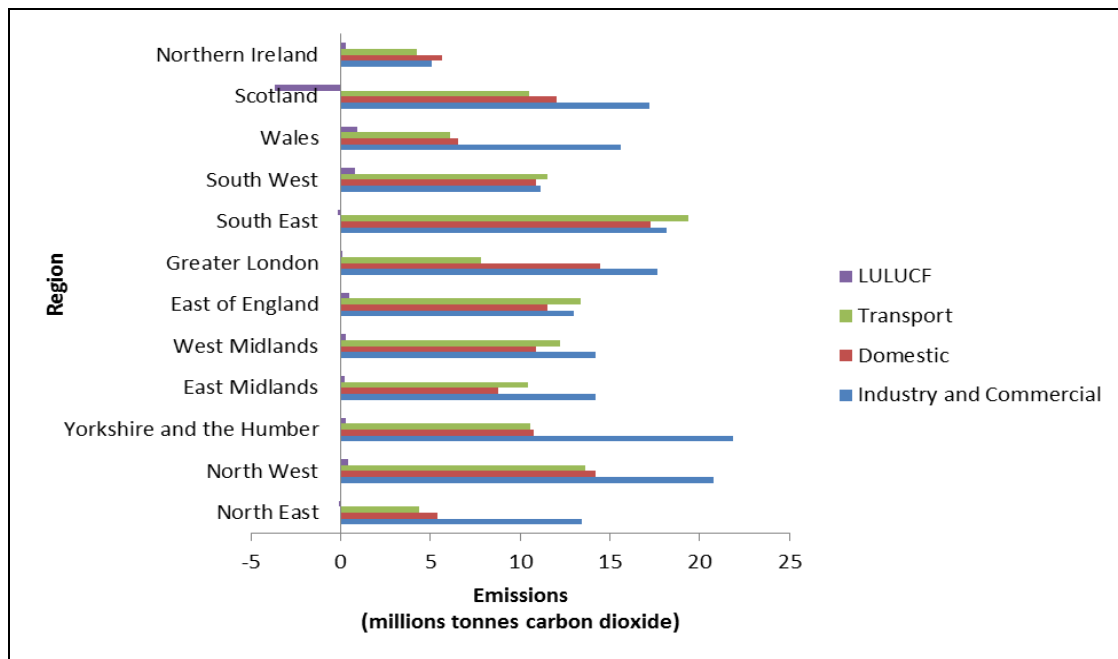


Figure 2 below shows how emissions per capita in each sector vary between each of the regions for 2011.

Figure 2: 2011 per capita end-user carbon dioxide emissions by region and sector

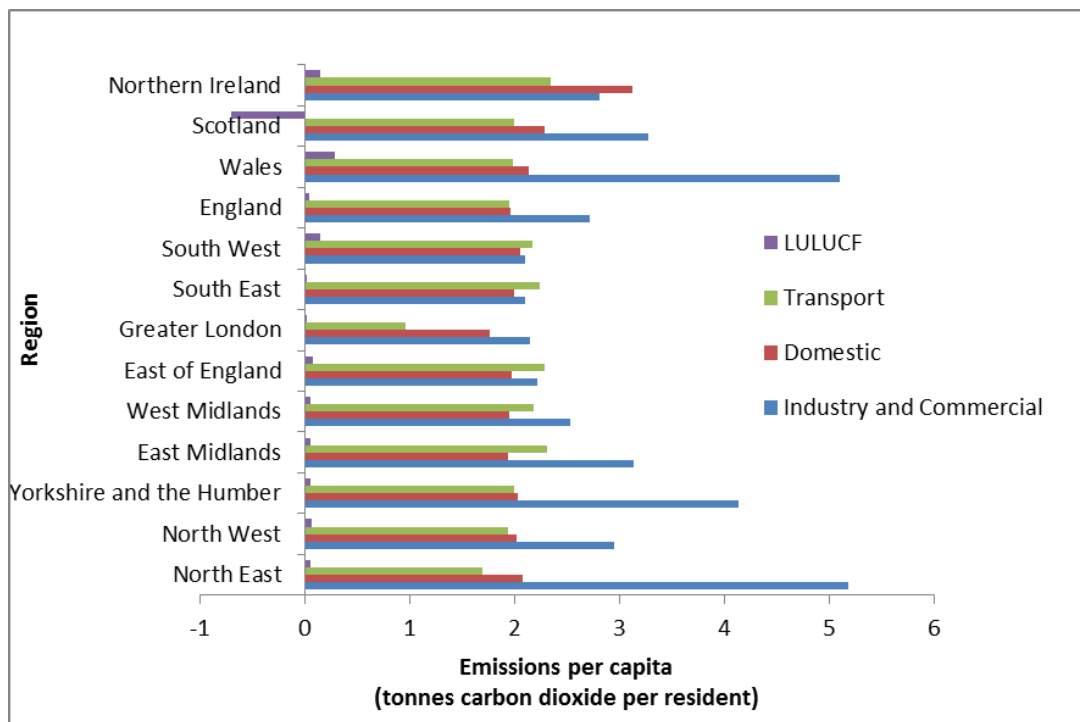


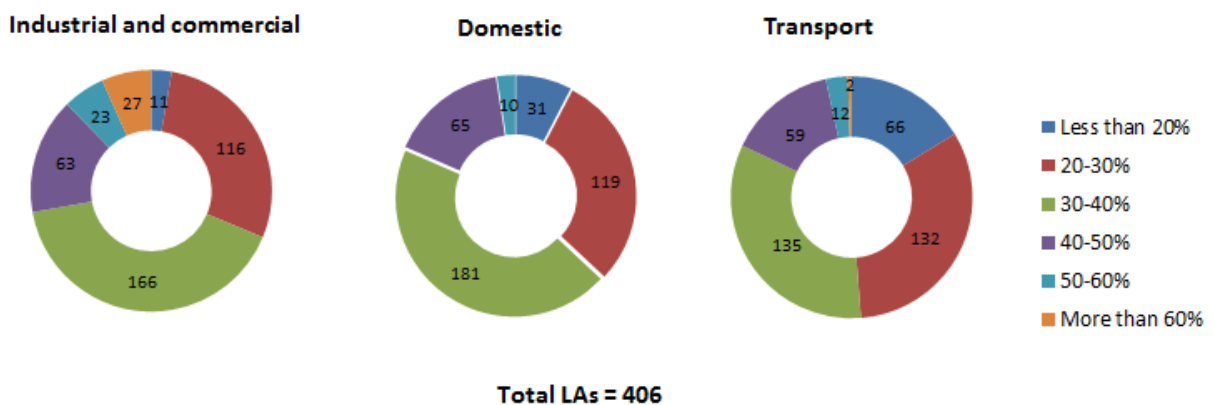
Table 2 and **Figure 3** below show the number of LAs with different proportions of emissions coming from the different sectors. They show that:

- the industrial and commercial sector accounted for over half of emissions in 50 LAs;
- domestic emissions accounted for over half in 10 LAs; and
- transport made up half of emissions in 14 LAs.
- in the majority of cases, all sectors made up 20-40% of emissions.

Table 2: Sectoral breakdown of emissions: Number of LAs with a given proportion of emissions in 2011 (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>Transport</u>
Less than 20%	11	31	66
20-30%	116	119	132
30-40%	166	181	135
40-50%	63	65	59
50-60%	23	10	12
More than 60%	27	0	2
Total	406	406	406

Figure 3: Sectoral breakdown of emissions: Number of LAs with a given proportion of emissions in 2011 (excluding LULUCF)



4.2.2 Emissions by sector in 2011

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 2011, out of the 406 LAs, domestic end-user emissions were greater than industrial and commercial end-user emissions in 189 (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 2010	Percentage of LAs 2010	Number of LAs 2011	Percentage of LAs 2011
Less than 2	29	7%	181	45%
2 - 2.5	250	62%	176	43%
2.5 - 3	88	22%	33	8%
More than 3	39	10%	16	4%

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.

Since 2010, there has been a decrease in emissions from the domestic sector for all LAs. This has resulted almost entirely from a reduction in the use of natural gas. Domestic emissions are heavily influenced by external temperatures, and 2011 was, on average, warmer than 2010. This caused a decrease in demand for space heating in 2011, which resulted in a decrease in emissions from domestic gas use.

In 2011, about 46 per cent of domestic end-user emissions arose from gas use, 44 per cent from electricity, and 10 per cent from consumption of other fuels. Between 2005 and 2011, there was a decrease in emissions from domestic gas consumption of 23%.

In the domestic sector, every LA has seen a decrease in emissions of at least 5 per cent since 2005. The largest decrease was in Torfaen (24%) with other noticeable decreases in Gateshead, South Tyneside, Knowsley and Newcastle upon Tyne (all 23%).

³ www.gov.uk/government/organisations/department-of-energy-climate-change/series/sub-national-energy-consumption

Transport sector

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, transport emissions include a share of emissions from oil refineries.

More than three-quarters (349 out of 406) of all LAs in the UK have experienced a decrease in transport emissions between 2010 and 2011, with an overall average decrease of 1.4 per cent. Since 2005, all but three LAs have seen decreases in emission from this sector.

Industrial, commercial and public sector

These emissions are dominated by industrial and commercial electricity consumption. The estimates are based on sub-national electricity consumption data published by DECC, which have been used to map CO₂ emissions from electricity generation to the point of consumption. For some LAs, emissions from large industrial installations will be the dominant factor, and these have been mapped using the NAEI database of point sources.

Nearly all LAs (389 out of 406) in the UK have experienced a decrease in industry emissions between 2010 and 2011, with an overall average decrease of 8.5 per cent. Since 2005, all but 27 LAs have seen decreases in emission from this sector.

4.2.3 Changes between 2005 and 2011

When the LA emissions are aggregated, estimated total emissions decreased by around 16% – falling from 519.6 million tonnes to 434.3 million tonnes between 2005 and 2011.

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

- Out of 406 LAs, 389 have shown a decrease in total emissions between 2005 and 2011.
- The average percentage change for all LAs between 2005 and 2011 was:
 - -17.1% in the domestic sector;
 - -21.7% in the industrial and commercial sector;
 - -8.9% in the transport sector; and
 - total emissions decreased on average by 17.3%.

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 Gravesham (down 68.0%);
 - in the industrial and commercial sector was in Gravesham (down 85.8%). This is primarily due to the closure of a cement works during 2010;
 - in the domestic sector was in Torfaen (down 23.7%); and
 - in transport was in Wandsworth (down 19.4%).
- The largest percentage increase since 2005:
 - in total emissions was in Highland (up 20.5%);
 - in the industrial and commercial sector was in Slough (up 42.5%);
 - in the transport sector was Eilean Siar (up 5.3%);
- In all LAs, emissions in the domestic sector are now at lower levels compared with 2005.
- In 2011, per capita emissions across the UK range from:
 - -2.7 tonnes in Argyll and Bute in Scotland (where LULUCF removals outweigh all emissions); and
 - up to 187.7 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 2011 with 2005 at the regional level. All but 4 regions have seen emissions increasing between 2005 and 2011, with some variation between regions – the largest decrease in per capita terms of 4.1 tonnes per person was seen in the North East and the largest increase, of 2.7 tonnes per person, was seen in Greater London.

Table 4: End-user carbon dioxide emissions 2005 and 2011: Region comparison

Region / country	2005		2011	
	Total emissions (Mt)	Per capita (t)	Total emissions (Mt)	Per capita (t)
North East	33	13.0	23	8.9
North West	60	8.7	49	7.0
Yorkshire and the Humber	53	10.3	43	8.2
East Midlands	40	9.3	34	7.4
West Midlands	44	8.2	38	6.7
East of England	45	8.1	38	6.6
Greater London	47	6.2	40	4.9
South East	66	8.0	55	6.3
South West	41	8.2	34	6.5
England ⁽¹⁾	429	8.5	354	6.7
Wales ⁽¹⁾	33	11.0	29	9.5
Scotland ⁽¹⁾	41		36	6.8
N. Ireland ⁽¹⁾	16		15	8.4
UK ⁽²⁾	526		435	6.9

(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).

At the time of publication, population data for local authorities in Scotland and Northern Ireland was not available as a consistent time-series going back to 2005. Since the population data for 2005 is not consistent with the latest 2011 population data, it has therefore not been possible to compare the latest per capita figures for 2011 with equivalent figures for 2005.

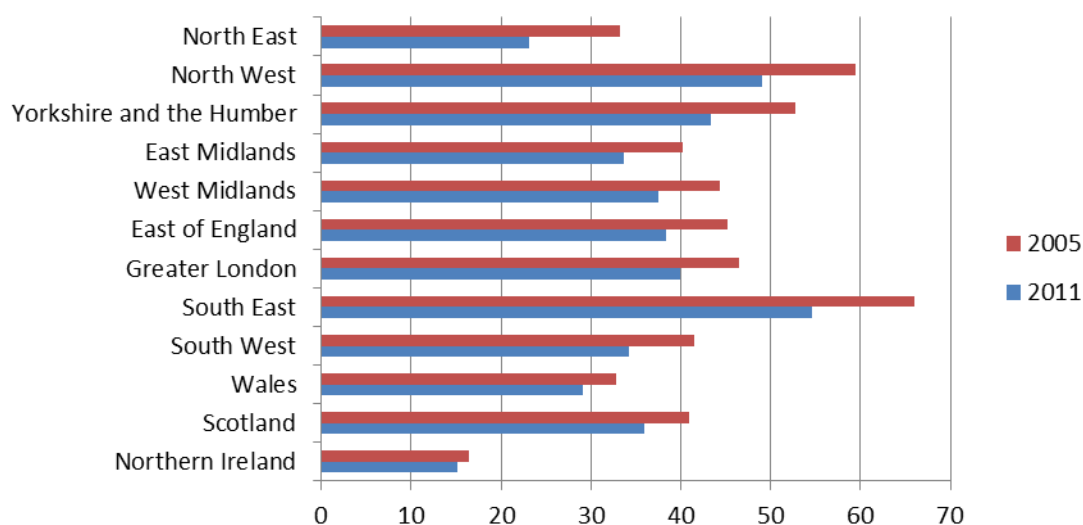
It should be noted that there have been a number of significant changes in per capita emissions for some local authorities in England and Wales due to revisions in the ONS population data series. Further details of these revisions can be found on the ONS website at the following link:

<http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2002-to-mid-2010-revised--subnational-/stb---mid-2002-to-mid-2010-subnational-population-estimates-revised.html#tab-How-much-have-the-estimates-changed->

Figure 4 below shows the change in total carbon dioxide emissions between 2005 and 2011, for each region.

⁴ www.gov.uk/government/publications/uk-greenhouse-gas-emissions-explanatory-notes

Figure 4: Regional emissions in 2005 and 2011



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

- 79 LAs have experienced a decrease of more than 20 per cent during the period 2005-2011 - largest decrease of 68 per cent was seen in Gravesham.
- An additional 137 LAs experienced a decrease of at least 15 per cent during the period 2005-2011.
- In another 123 LAs, total emissions decreased between 10 and 15 per cent.
- In 16 LAs, total emissions increased since 2005.
- In absolute terms 289 LAs have seen a decrease of more than 100 thousand tonnes, with the biggest decrease in Redcar and Cleveland (5,774 thousand tonnes).

Changes by sector overall

In all sectors – apart from Diesel Railways and Transport Other– there have been reductions in emissions in 2011 compared with 2005 estimates.

The 3 largest absolute decreases were in the following sectors:

- Industry and commercial electricity (-19.5 million tonnes)
- Domestic gas (-18.0 million tonnes)
- Large industrial installations (-15.8 million tonnes)

Changes by sector at the Local Authority level

As discussed above, several LAs have seen large decreases between 2005 and 2011. Taking the five 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 2011 – full dataset

Local Authority	Percentage decrease	Sector(s) responsible (proportion of all decreases in that area)
Gravesham	-68	Large industrial installations (88%)
Redcar and Cleveland	-61	Large industrial installations (93%)
New Forest	-46	Large industrial installations (79%)
Thurrock	-37	Industrial and commercial gas (53%), Industrial and commercial electricity (24%)
Isle of Anglesey	-37	Large industrial installations (70%)

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 2011 – full dataset

Local Authority	Percentage increase	Sector(s) responsible (proportion of all increases in that area)
Slough	11	Industry and commercial electricity (99%)
King's Lynn and West Norfolk	8	Industry and commercial gas (56%), Industry and commercial electricity (43%)
Swale	5	Industry and commercial gas (83%)
Clackmannanshire	5	Industry and commercial gas (99%)
Ballymena	2	Industry and commercial gas (79%)

⁵ www.gov.uk/government/publications/uk-greenhouse-gas-emissions-explanatory-notes

4.2.4 Largest increases and decreases between 2010 and 2011

There have been some large reductions in emissions from 2010 to 2011. **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 2010 and 2011 – full dataset

Local Authority	Percentage decrease	Sector(s) responsible (proportion of all decreases in that area)
New Forest	-37	Large industrial installations (91%)
Barrow-in-Furness	-20	Industry and commercial electricity (71%)
Stockton-on-Tees	-16	Large industrial installations (56%), Industry and commercial electricity (22%)
Redcar and Cleveland	-16	Large industrial installations (88%)
Blackburn and Darwen	-15	Large industrial installations (33%), Industry and commercial gas (21%), Industry and commercial electricity (20%), Domestic gas (18%)

Between 2010 and 2011, there were only three LAs which experienced increases in emissions. These increases, however, are all less than 2.5 per cent.

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 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.

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 **Tables 8 and 9** below:

Table 8: LAs that saw large decreases between 2005 and 2011 – CO₂ emissions within the scope of influence of LAs

Local Authority	Percentage decrease	Sector(s) responsible (proportion of all increases in that area)
Isle of Anglesey	-37	Large industrial installations (70%)
Thurrock	-37	Industry and commercial gas (60%), Industry and commercial electricity (27%)
Exeter	-36	Industry and commercial gas (76%)
Redcar and Cleveland	-33	Industry and commercial electricity (37%), Industry and commercial gas (28%)
Stockton-on-Tees	-33	Large industrial installations (49%), Industry and commercial gas (23%)

For other LAs not mentioned in **Table 8** that have seen a large decrease, the major contributors are similarly industry and commercial emissions from gas and electricity. In the period 2005-2011, 77 LAs experienced a decrease of more than 20 per cent and a further 277 have experienced a decrease of more than 10 per cent for the same period. In total, 398 of 406 LAs have experienced a decrease in carbon dioxide emissions over the period 2005-2011.

Table 9 below lists the five LAs which have increased most in emissions since 2005, together with the magnitude of the change in each case:

Table 9: LAs that saw large increases between 2005 and 2011 – CO₂ emissions within the scope of influence of LAs

Local Authority	Percentage increase	Sector(s) responsible (proportion of all increases in that area)
Swale	22	Industry and commercial gas (83%)
Slough	19	Industry and commercial electricity (98%)
King's Lynn and West Norfolk	9	Industry and commercial gas (56%), Industry and commercial electricity (43%)
Clackmannanshire	9	Industry and commercial gas (100%)
Ballymena	4	Industry and commercial gas (79%)

A similar analysis was carried out on this subset of data, to compare the LAs which have changed most in emissions since 2010. This is summarised in **Table 10** below:

Table 10: LAs that saw large decreases between 2010 and 2011 – CO₂ emissions within the scope of influence of LAs

Local Authority	Percentage decrease	Sector(s) responsible (proportion of all decreases in that area)
Barrow-in-Furness	-21	Industry and commercial electricity (71%)
Stockton-on-Tees	-18	Large industrial installations (55%), Industry and commercial gas (22%)
St. Edmundsbury	-18	Industry and commercial gas (71%)
Hartlepool	-16	Industry and commercial electricity (62%)
Trafford	-16	Industry and commercial electricity (49%), Industry and commercial gas (26%), Domestic Gas (20%)

Between 2010 and 2011, there were no LAs which experienced increases in emissions.

4.4 Results by region and sector

Table 11 below shows regional totals for the detailed sectors and fuels while **Table 12** shows the percentage change in emissions between 2005 and 2011 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 11: Emissions in 2011 (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	3,699	9,212	7,543	6,236	7,357	7,402	13,153	11,217	6,844	4,920	7,676	2,327	3,536	91,120
B. Industry and Commercial Gas	1,583	4,742	3,951	2,584	2,936	2,957	3,944	3,624	1,963	1,750	4,005	587	45	34,672
C. Large Industrial Installations	7,353	4,858	8,485	3,317	1,902	707	93	1,190	65	7,382	3,525	535	0	39,411
D. Industrial and Commercial Other Fuels	660	1,611	1,614	1,835	1,667	1,721	425	1,783	1,593	1,046	1,222	1,160	0	16,336
E. Agricultural Combustion	145	331	243	260	311	216	9	342	666	515	754	464	0	4,257
F. Diesel Railways	2,084	6,141	4,397	3,952	4,825	5,541	6,620	8,099	5,192	2,617	5,519	1,433	235	56,654
G. Domestic Electricity	2,820	7,309	5,577	4,516	5,336	5,211	7,599	8,189	4,013	2,708	5,230	309	81	58,899
H. Domestic Gas	497	781	753	333	746	793	242	1,005	1,678	1,216	1,278	3,907	0	13,228
I. Domestic 'Other Fuels'	2,299	4,490	4,113	5,100	4,174	6,266	4,462	7,498	4,875	3,051	5,128	1,961	0	53,416
J. Transport (A roads)	303	4,751	2,845	1,958	3,602	2,390	555	5,685	2,318	817	1,765	336	0	27,325
K. Transport (Motorways)	1,644	3,871	3,249	2,981	3,846	4,273	2,613	5,545	3,894	2,015	3,273	1,842	0	39,045
L. Transport (Minor roads)	104	238	233	257	247	171	63	340	280	105	190	40	0	2,267
M. Transport Other	38	278	121	153	360	289	130	279	129	71	113	45	0	2,005
N. LULUCF Net Emissions	-119	430	260	202	262	462	34	-162	759	882	-3,711	266	-3,400	-3,836
Total	23,108	49,043	43,382	33,684	37,571	38,399	39,940	54,634	34,267	29,096	35,967	15,212	496	434,799

Table 12: Percentage change in emissions from 2005 to 2011 (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	-24%	-24%	-15%	-22%	-17%	-18%	-9%	-12%	-17%	-21%	-14%	3%	-18%
B. Industry and Commercial Gas	-37%	-25%	-30%	-27%	-31%	-24%	-22%	-26%	-35%	-34%	-15%	51%	-26%
C. Large Industrial Installations	-45%	-14%	-23%	-18%	-5%	-33%	-28%	-68%	-94%	-5%	-18%	-54%	-29%
D. Industrial and Commercial Other Fuels	-23%	-18%	-13%	-6%	-17%	-18%	-31%	-24%	-23%	-21%	-23%	-5%	-18%
E. Agricultural Combustion	-7%	-7%	-7%	-6%	-6%	-6%	-3%	-7%	-7%	-8%	-9%	-10%	-8%
F. Diesel Railways	-12%	-11%	-14%	-12%	-10%	-12%	-9%	-11%	-13%	-11%	-15%	-11%	-12%
G. Domestic Electricity	-27%	-27%	-23%	-23%	-24%	-22%	-23%	-22%	-24%	-27%	-21%	46%	-23%
H. Domestic Gas	0%	-4%	1%	-3%	-3%	-10%	4%	-7%	-10%	-7%	-8%	-14%	-8%
I. Domestic 'Other Fuels'	-11%	-13%	-13%	-10%	-12%	-10%	-14%	-14%	-12%	-10%	-9%	-10%	-12%
J. Transport (A roads)	-6%	-7%	-9%	-13%	-9%	-8%	-6%	-10%	-9%	-12%	-7%	-9%	-9%
K. Transport (Motorways)	-12%	-9%	-6%	-4%	-8%	-6%	-12%	-8%	-2%	-6%	-3%	1%	-6%
L. Transport (Minor roads)	5%	10%	8%	5%	8%	7%	12%	9%	8%	13%	12%	22%	9%
M. Transport Other	-14%	4%	2%	3%	9%	3%	-8%	0%	-5%	-1%	-11%	-11%	1%
N. LULUCF Net Emissions	-39%	-12%	-29%	-29%	-3%	-16%	-13%	-29%	3%	-355%	-27%	122%	17%
Total	-30%	-18%	-18%	-16%	-15%	-15%	-14%	-17%	-17%	-11%	-12%	-8%	-17%

Note: Values have been greyed out where they represent less than 3% of the region's total emissions in 2011

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 13 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 13: Reconciliation of 2011 local emission estimates with UK inventory

	(Industry and Commercial Gas sector have tonnes CO ₂)	
	Details	Totals
1. End-user emissions allocated to local areas		434.3
<i>Unallocated methodological differences:</i>		
unallocated consumption	-1.6	
large electricity users with unknown location	2.1	
Total unallocated		0.5
2. Total UK end-user emissions (local method)		434.8
<i>Excluded from local allocation:</i>		
domestic shipping	1.7	
domestic aviation	1.7	
military transport	3.1	
exports	15.2	
Total excluded		21.6
<i>Methodological differences:</i>		
lower domestic in local method	-5.2	
higher industry & commercial in local method	6.0	
Total methodological differences		0.8
3. UK total CO₂ emissions		457.2
Emissions from Crown Dependencies		1.4
4. UK Greenhouse Gas Inventory total		458.6

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 17year 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. 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 2011 to 30 January 2012. 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 LA 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.

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 spatially disaggregated using data from the Department of Transport's Rail Emissions Model. as described in Section 11 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 (2011) 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.

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 2011 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; 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://naei.defra.gov.uk/data/map-uk-das>).

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 2011, 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. 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 three times as high as is seen other parts of the UK.

There are no clear trends in the industrial and commercial, and 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 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 transport emissions have been estimated is available in section 10 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

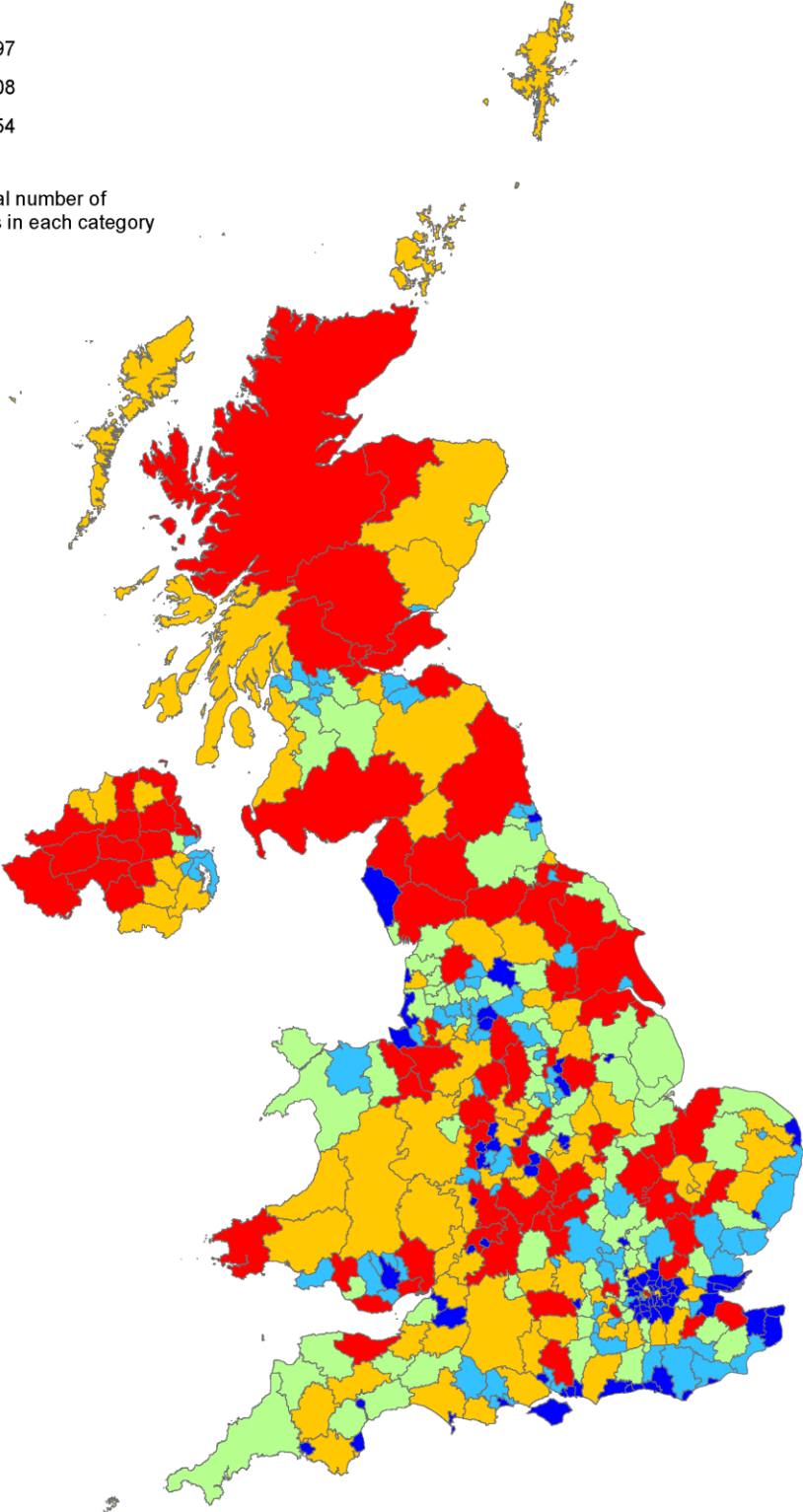
land conversion to cropland, less conversion of grassland and forests to cropland, and the increased maintenance of, and conversion to, forestland. In other parts of the UK, such as in Northern Ireland and Wales, LULUCF is a large source of carbon dioxide emissions. In the former, emissions have arisen 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

2011 Total Emissions excluding LULUCF (tonnes Carbon Dioxide per capita)

- < 5.10
- 5.10 - 5.97
- 5.98 - 7.08
- 7.09 - 8.54
- > 8.54

There is an equal number of Local Authorities in each category



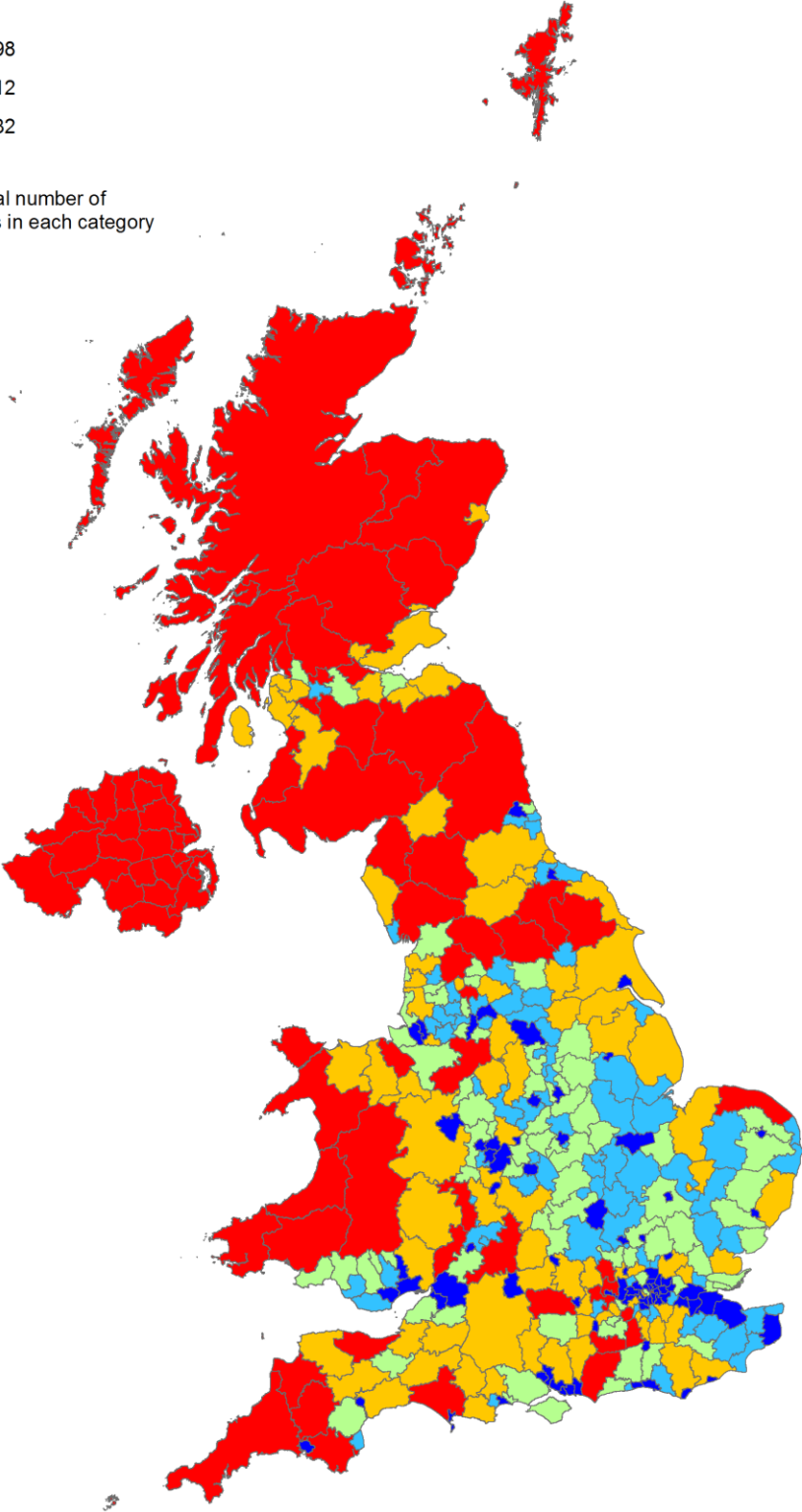
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Figure 6: Domestic CO₂ per capita emissions by Local Authority (t) for 2011

2011 Domestic Emissions (tonnes Carbon Dioxide per capita)

- < 1.86
- 1.86 - 1.98
- 1.99 - 2.12
- 2.13 - 2.32
- > 2.33

There is an equal number of Local Authorities in each category



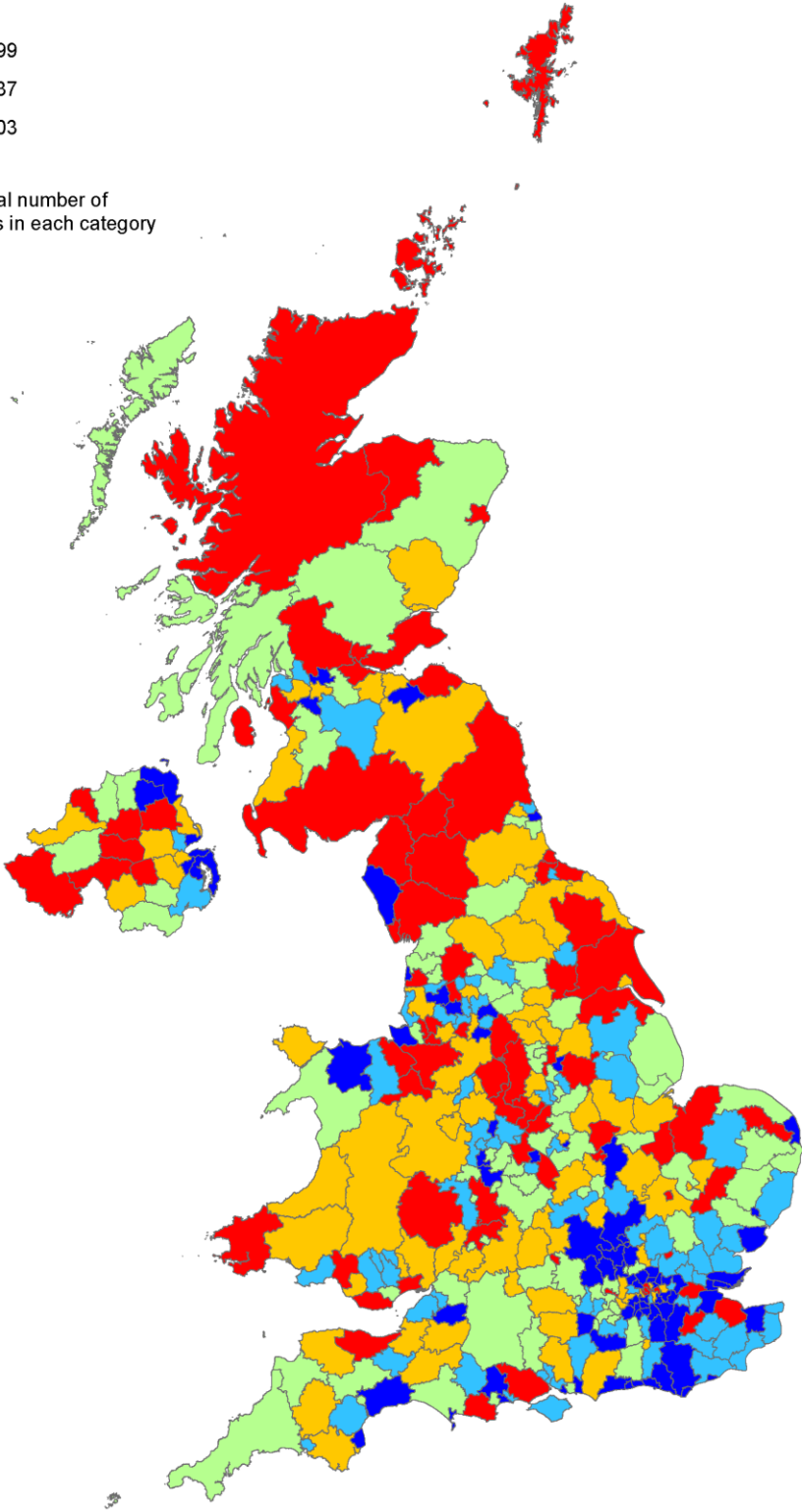
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Figure 7: Industrial and commercial per capita CO₂ emissions by Local Authority (t) for 2011

2011 Industrial and Commercial Emissions (tonnes Carbon Dioxide per capita)

- < 1.61
- 1.61 - 1.99
- 2.00 - 2.37
- 2.38 - 3.03
- > 3.03

There is an equal number of Local Authorities in each category



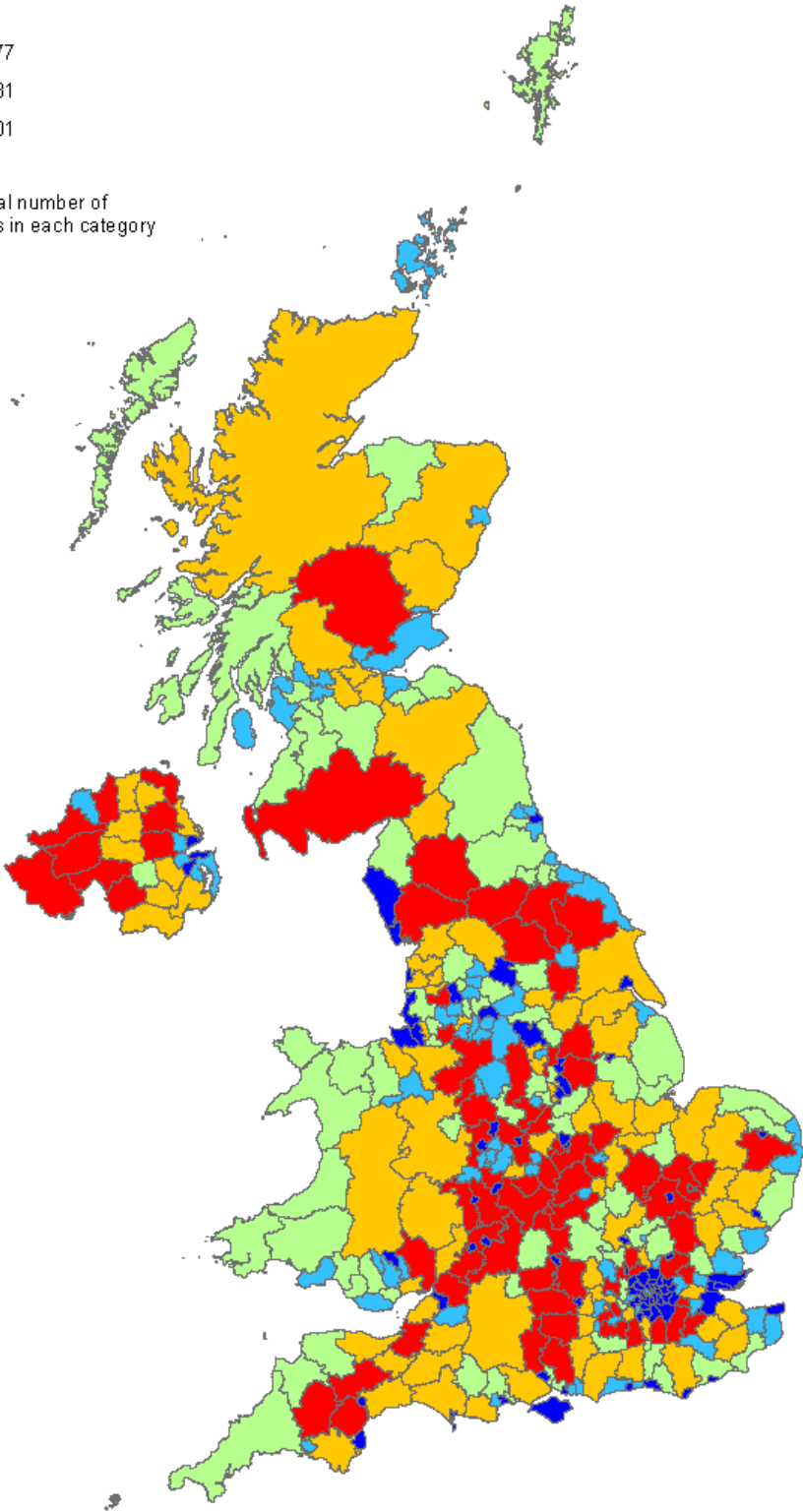
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Figure 8: Transport CO₂ emissions per capita by Local Authority (t) for 2011

2011 Transport Emissions (tonnes Carbon Dioxide per capita)

- < 1.23
- 1.23 - 1.77
- 1.78 - 2.31
- 2.32 - 3.01
- > 3.01

There is an equal number of Local Authorities in each category



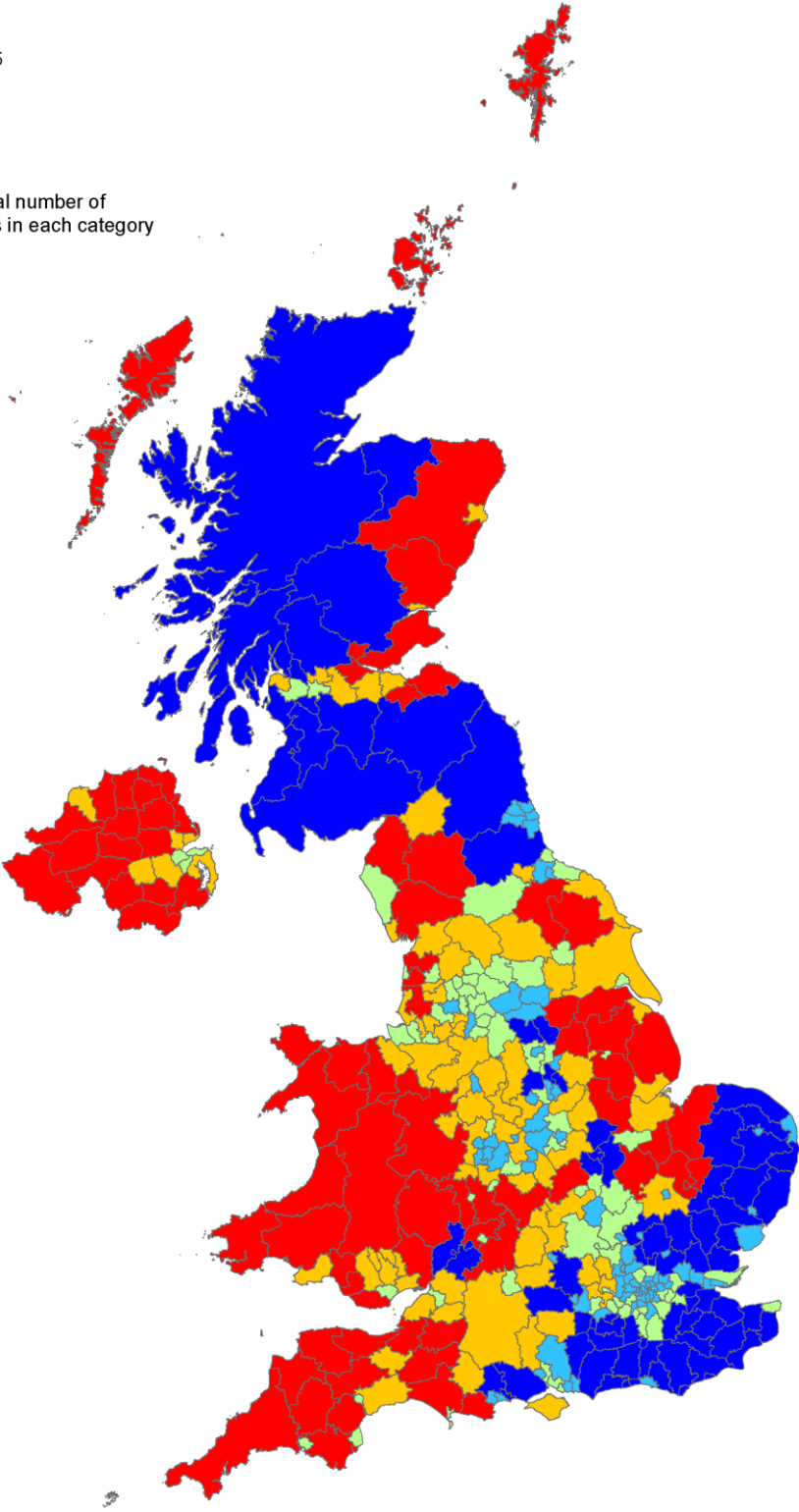
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Figure 9: Land use change CO₂ emissions per capita by Local Authority (t) for 2011

2011 LULUCF Emissions (tonnes Carbon Dioxide per capita)

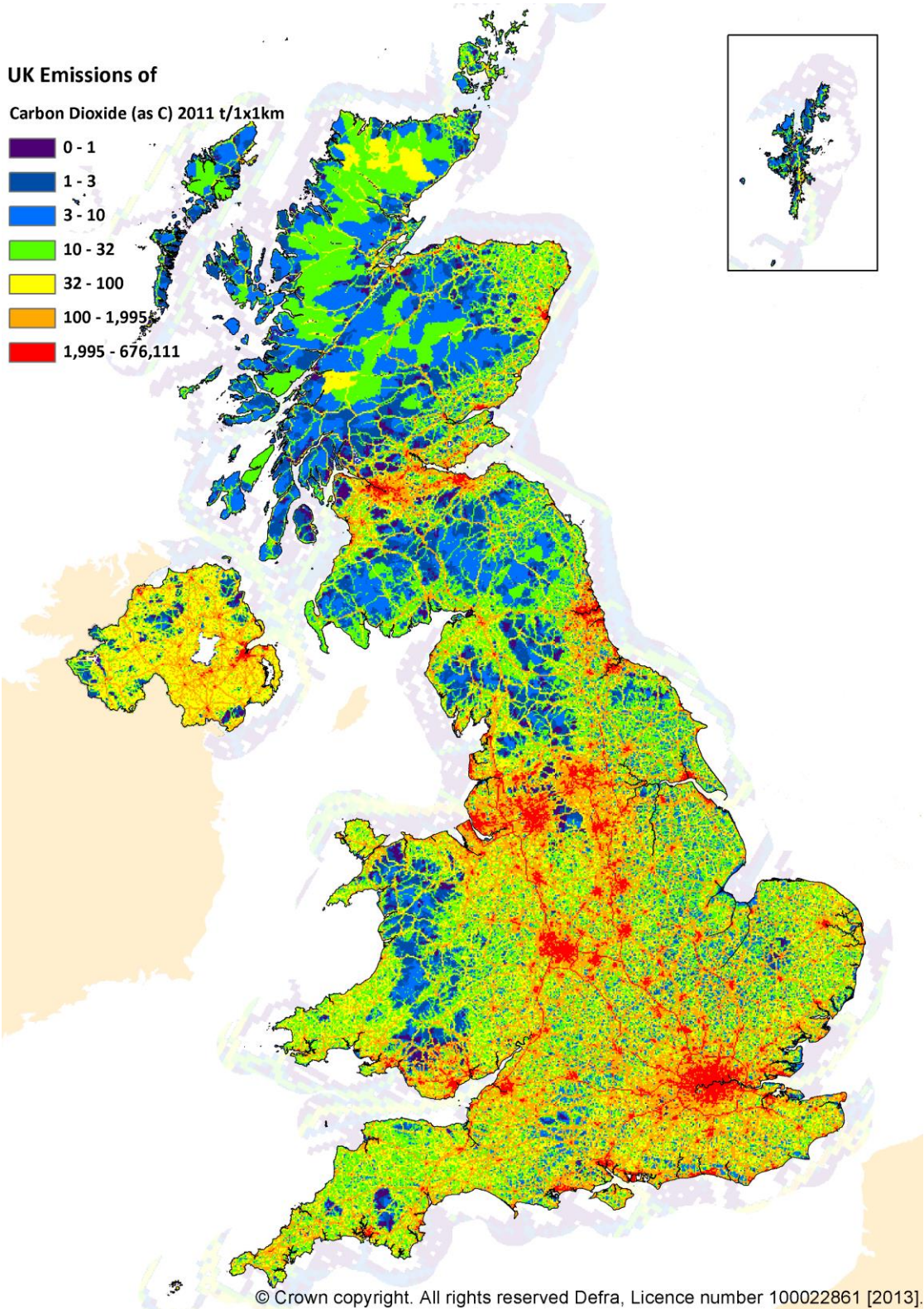
- < -0.003
- -0.003 - 0.005
- 0.006 - 0.026
- 0.027 - 0.133
- > 0.133

There is an equal number of Local Authorities in each category



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Figure 10: 1km² resolution emissions map of CO₂ for 2011⁶



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. Planned Improvements

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. However the local authority estimates are consistent with the national emissions estimates and any future updates to the local authority dataset will therefore need to reflect any changes made at the national level, including those made in response to revisions to underlying data.

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:

www.gov.uk/government/organisations/department-of-energy-climate-change/series/sub-national-energy-consumption

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

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