Best Foot Forward

Bringing sustainability down to earth

Domestic Carbon Dioxide Emissions for Selected Cities

Research conducted for

British Gas

by

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Best Foot Forward

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Cover Picture: The annual carbon dioxide emissions from the average dwelling are sufficient to fill about three hot air balloons.

THE QUEEN'S AWARDS FOR ENTERPRISE: SUSTAINABLE DEVELOPMENT 2005

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Introduction

British Gas commissioned Best Foot Forward to estimate the domestic carbon dioxide (CO_2) emissions for a selection of 23 UK cities.

Aberdeen City	Leeds
Birmingham	Leicester
Bradford	Liverpool
Brighton & Hove	Manchester
Bristol, City of	Newcastle upon Tyne
Cardiff	Nottingham
Coventry	Plymouth
Derby	Reading
Edinburgh, City of	Sheffield
Glasgow City	Southampton
Greater London	Sunderland
Kingston upon Hull, City of	

Carbon dioxide (CO_2) is the main gas responsible for damaging climate change. Emissions occur when fossil fuels (primarily oil, gas and coal) are burned to generate energy. This is used to heat, cool and illuminate our homes as well as providing the power to run dishwashers, washing machines, stereos, TV's and other appliances.

Here we present results based on an analysis of official energy consumption data for 2003 (the latest year for which information is available) produced by the Department of Trade and Industry.

Included in this analysis are all the main forms of energy used in the home; gas, heating oil, coal and grid electricity.

Methodology

Calculating domestic carbon dioxide emissions requires several assumptions about the emissions per unit of energy used. These vary by fuel type. Here we have used factors published by Government sources (see Table A.1 in Appendix 1).

It should also be recognized that the consumption data provided by the DTI, which in turn originates from a variety of sources, is imperfect.

A similar study undertaken by DEFRA, which we have taken into account in our analysis, points to the 'experimental' nature of much of the source data used.

Some of the data limitations identified by DEFRA which are relevant to this study include:

1. Some inaccuracies in the locational information available in the raw electricity and gas consumption data, and in its allocation to local authority boundaries. This is likely to be most significant for smaller towns and cities.

2. The local distribution of emissions from oil and coal largely have to be estimated from proxy information such as population.

Further detail on data quality is available in the main DEFRA report. The method we use here closely follows the DEFRA study with several important differences:

1. No attempt has been made to reconcile the local authority data with national emissions. Such adjustments were one of those aspects of the DEFRA analysis which were considered to be the most 'experimental' and any scaling of domestic emissions is likely to impact on all local authorities equally so should not affect the relative ranking.

2. The data used for oil and coal is more up-to-date than that available at the time of the DEFRA study. Given the initial doubts expressed over the accuracy of this data it was felt important to use the most accurate estimates available.

3. The DEFRA study does not report the consumption of different fuel types (usually expressed in kilowatt hours) alongside the related emissions. We feel that it is important to include such information in a report such as this, as part of a project seeking to engage and educate the public.

4. The DEFRA results are not presented on a per dwelling basis. To calculate this it was necessary to combine emissions data with information on the number of households in each city. Data on dwelling numbers was obtained from the Office of National Statistics and the equivalent Welsh and Scottish bodies.

Having highlighted the differences in methodology, it is worth stating that the final results were very similar to the DEFRA study reflecting the relatively minor differences in approach and the newer data. The rank ordering of the selected cities was the same.

Note that neither study takes into account any geographical variations in the purchasing or supply of 'green' grid electricity or energy 'offsets'. However, the small part these currently play in the energy supply mix is unlikely to vary the results significantly.

Detailed methodology notes are contained in Appendix 1.

Summary results

Consumption data for electricity, gas, oil and coal for the selected cities are shown below in Table 1. Data is in average kilowatt-hours per dwelling per year.

Oil and coal consumption are low, reflecting the fact that gas is the fuel most frequently chosen to provide space heating in urban areas.

Table 1: kilowatt-hours per dwelling per year for the selected Cities by fuel type

City	Gas	Electricity	Oil	Coal
Aberdeen City	14,805	5,066	496	146
Birmingham	17,938	4,576	193	11
Bradford	18,763	4,366	372	37
Brighton & Hove	15,431	4,322	381	57
Bristol, City of	15,464	4,411	740	58
Cardiff	17,451	3,728	273	181
Coventry	15,551	4,361	270	36
Derby	14,763	4,473	264	46
Edinburgh, City of	15,552	4,872	303	30
Glasgow City	12,872	4,903	155	11
Greater London	17,834	4,385	181	15
Kingston upon Hull, City of	13,275	4,122	328	40
Leeds	17,277	4,555	301	56
Leicester	20,016	3,898	374	28
Liverpool	16,678	4,259	280	21
Manchester	16,714	3,796	231	14
Newcastle upon Tyne	17,707	4,054	176	23
Nottingham	18,704	4,132	270	97
Plymouth	12,679	4,407	315	164
Reading	20,998	4,768	590	36
Sheffield	18,617	3,848	211	50
Southampton	12,272	4,848	452	54
Sunderland	20,164	3,717	276	76

Total carbon dioxide emissions (calculated from the data in Table 1) are given in Table 2. Cities are ordered from highest to lowest. Emissions are reported in average kilogrammes of carbon dioxide per dwelling per year[1].

Reading has the highest emissions per dwelling, followed by **Leicester** and **Bradford**. This is due to a variety of factors including the age and type of housing stock, quality of heating system, ownership of appliances, occupancy levels, fuel mix and habits of the occupants.

Table 2: Carbon dioxide emissions for selected Cities (electricity, gas, oil & coal)

City	Average $kgCO_2$ per dwelling per year
Reading	6,189
Leicester	5,565
Bradford	5,539
Sunderland	5,504
Birmingham	5,424
Nottingham	5,419
Leeds	5,333
Greater London	5,318
Sheffield	5,247
Aberdeen City	5,175
Newcastle upon Tyne	5,150
Edinburgh, City of	5,142
Liverpool	5,073
Bristol, City of	5,041
Cardiff	5,035
Coventry	4,911
Brighton & Hove	4,905
Manchester	4,862
Derby	4,814
Glasgow City	4,611
Southampton	4,563
Plymouth	4,447
Kingston upon Hull, City of	4,395

[1] Note: 1,000 kilogrammes is equal to 1 tonne.

Making CO_2 more meaningful

Our economy runs on fossil fuels. Yet, for many, it is difficult to visualize carbon dioxide or understand the relative 'carbon footprint' associated with different activities.

To make it easier to imagine what a kilogramme of carbon dioxide (CO_2) looks like, consider a party balloon. This would hold about 10g of CO_2. A hundred such balloons would hold a kilogramme of CO_2. A hot air balloon holds the equivalent of 1,800kg (or 1.8 tonnes) of CO_2.

Each year,

- the average dwelling in Reading emits enough CO_2 to fill 3.4 hot air balloons or about 619,000 party balloons.
- the average dwelling in Hull would only fill 2.4 hot air balloons or about 440,000 party balloons.

An average petrol car (1.4-2.1 litre) emits about 0.23 kg CO_2 per kilometre (0.36 kg CO_2 per mile), so driving 240 kilometres (150 miles) results in 54 kg of CO_2 emissions. So, each year,

- the average dwelling in Reading emits CO_2 equivalent to driving 27,500 kilometres (about 17,200 miles).
- the figure for the average dwelling in Hull would be around 19,500 kilometres (about 12,200 miles).

An average dwelling in Liverpool, around the middle of the list of selected cities, produces emissions equivalent to:

- filling 2.8 hot air balloons
- driving 22,500 kilometres by car (14,000 miles)
- 101,465 hours use of a personal computer (604 weeks or 11.6 years).
- Running a domestic refrigerator for 126,831 hours, (755 weeks or 14.5 years).
- Manufacturing of 2,316 plastic toys weighing 200g.
- Manufacturing of 6,763 aluminium cans from virgin ores, or 169,108 from recycled metals.

References

Energy Trends, December 2005; Department of Trade and Industry
http://www.dti.gov.uk/energy/inform/energy_trends/dec_05.pdf

Goodwin, J. et al, August 2005, Local and Regional CO_2 Emissions Estimates for 2003, NETCEN, AEA Technology Environment, for DEFRA.

Appendix 1: Detailed Methodology

Appendix 1 presents the methodology followed during the determination of CO_2 emissions due to domestic consumption of gas, electricity, oil and coal.

Energy consumption data by Local Authority was extracted from Department of Trade and Industry, referring to year 2003. This database contains specific values for each of the four categories mentioned above.

Original figures are presented in different units for each category. Thus, while gas and electricity figures are expressed in GWh, oil and coal data come in thousand tonnes of oil equivalent (toe).

These original values were all converted into a common unit, kWh, and then CO_2 emissions were determined by applying the corresponding conversion factor (see table A.1 below) for each category.

Table A.1 shows the conversion factors used in the analysis.

Table A.1. Conversion Factors

	Gas	Electricity	Oil	Coal
kg CO_2/kWh	0.187	0.441	0.2508	0.33
kWh/toe			11630	11630

The source of these conversion factors is the Digest of UK Energy Statistics.

Commented Example

Next, a complete step-by-step process is presented for Manchester, as an example of the methodology.

As original units differ from one category to another and as different conversion factors are used, the calculation sequence is done individually for each category: gas, electricity, oil and coal.

Starting with gas, the first step is obtaining the original values, compiled and published by DTI. In the case of Manchester, this figure is 3,240.54 and it is measured in GWh. In order to leave things easier when applying the conversion factor, the original figure is immediately converted to kWh, by simply multiplying by 1,000,000.

Then, using a conversion factor (0.187) which relates kg of CO_2 per kWh, we obtain the total CO_2 emissions -in kg- of the city of Manchester, due to gas consumption.

Table A.2 show the values of the sequence explained above.

Table A.2. Gas Study Example

GAS	GWh (original value)	kWh	CO_2 Emissions - kg
Manchester	3,240.54	3,240,536,159.06	605,980,261.74

In the electricity category, original values also come in GWh and the figure for Manchester is 735.97. Here again, we convert it to KWh and to continue, we apply the conversion factor which allows the determination of CO_2 emissions – in kg –. In the case of electricity, this factor is 0.441 kg CO_2/KWh.

Table A.3 present the total figures of Manchester, due to the use of electricity.

Table A.3. Electricity Study Example

ELECTRICITY	GWh (original value)	kWh	CO_2 Emissions - kg
Manchester	735.97	735,969,029.50	324,468,463.49

Oil and coal categories differ slightly from the sequences explained above, mainly because original values published by DTI are presented in a different unit: thousands of tonnes of oil equivalent (toe). Because of this, we need an additional factor which allows converting toe. to kWh, as CO_2 emissions are calculated from kWh.

Original values for Manchester city are 3.84 thousands of toe in the case of oil, and 0.24 in the case of coal.

As it is presented in table A.1, the factor relating toe with kWh is 11,630. Once the kWhs are determined after multiplying the original value by that figure, we then apply the specific conversion factor for each category that permits the calculation of kg of CO_2 emitted due to oil and coal consumption. In the case of oil, this factor is 0.2508 kg CO_2/kWh and for coal, is 0.33 kg CO_2/kWh.

Tables A.4 and A.5 show the figures of the sequences in the study of emissions of CO_2, due to oil and coal, respectively.

Table A.4. Oil Study Example

OIL	Thousands toe (Original value)	kWh	CO_2 Emissions - kg
Manchester	3.84	44,715,415.17	11,214,626.13

Table A.5 Coal Study Example

COAL	Thousands toe (Original value)	kWh	CO_2 Emissions - kg
Manchester	0.24	2,806,933.33	926,288.00

As we have seen, global CO_2 emissions have been calculated for the city of Manchester, differentiating the source: gas, electricity, oil and coal.

The objective of the project is to present that figures per dwelling for each Local Authority. Data of dwellings is obtained in the Office of National Statistics. Continuing with our Manchester example, the number of dwellings for this city is 193,885.

Dividing the results of the four studies commented above by the number of dwellings, we reach to our objective.

Table A.6 present these final results per source category and total.

Table A.6: Manchester Study. Final Results

Manchester	kg CO_2	kg CO_2/Dwelling
Gas	605,980,261.74	3,125.46
Electricity	324,468,463.49	1,673.51
Oil	11,214,626.13	57.84
Coal	926,288.00	4.78
TOTAL	**942,589,639.36**	**4,861.59**

Appendix 2: Emissions for all GB Local Authorities

This appendix includes data for CO_2 emissions per dwelling for all GB Local Authorities ordered alphabetically within region.

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE GREAT BRITAIN	***5,595***

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE WALES	***5,568***
Blaenau Gwent	(see note 1)
Bridgend	5,554
Caerphilly	(see note 1)
Cardiff	5,035
Carmarthenshire	5,724
Ceredigion	5,685
Conwy	5,496
Denbighshire	6,391
Flintshire	6,168
Gwynedd	5,613
Isle of Anglesey	5,574
Merthyr Tydfil	(see note 1)
Monmouthshire	6,148
Neath Port Talbot	5,101
Newport	5,710
Pembrokeshire	5,503
Powys	5,945
Rhondda, Cynon, Taff	(see note 1)
Swansea	5,578
The Vale of Glamorgan	4,622
Torfaen	6,396
Wrexham	5,387

Note 1: *Data from these local authorities is not considered accurate enough to include here.*

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE SCOTLAND	***5,505***
Aberdeen City	5,175
Aberdeenshire	6,318
Angus	5,503
Argyll and Bute	5,756
Clackmannan	5,240
Dumfries and Galloway	5,801
Dundee City	4,915
East Ayrshire	5,773
East Dunbartonshire	6,547
East Lothian	5,722
East Renfrewshire	6,330
Edinburgh, City of	5,142
Eilean Siar	5,482
Falkirk	5,446
Fife	5,663
Glasgow City	4,611
Highland	5,933
Inverclyde	5,366
Midlothian	5,713
Moray	5,808
North Ayrshire	5,447
North Lanarkshire	5,583
Orkney Islands	5,798
Perth and Kinross	6,261
Renfrewshire	5,296
Scottish Borders	5,597
Shetland Islands	6,778
South Ayrshire	6,004
South Lanarkshire	5,792
Stirling	6,524
West Dunbartonshire	5,083
West Lothian	5,362

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE NORTH EAST	***5,414***
Alnwick	5,111
Berwick-Upon-Tweed	5,772
Blyth Valley	6,133
Castle Morpeth	6,909
Chester-le-Street	5,322
Darlington	5,137
Derwentside	4,964
Durham	(see note 1)
Easington	4,691
Gateshead	5,422
Hartlepool	5,322
Middlesbrough	5,092
Newcastle upon Tyne	5,150
North Tyneside	5,184
Redcar and Cleveland	5,197
Sedgefield	5,683
South Tyneside	5,320
Stockton-on-Tees	4,953
Sunderland	5,504
Teesdale	7,731
Tynedale	6,654
Wansbeck	5,176
Wear Valley	5,386

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE YORKSHIRE AND THE HUMBER	***5,527***
Barnsley	5,010
Bradford	5,539
Calderdale	5,995
Craven	5,838
Doncaster	5,540
East Riding of Yorkshire	6,114
Hambleton	7,242
Harrogate	6,494
Kingston upon Hull, City of	4,395
Kirklees	5,498
Leeds	5,333
North East Lincolnshire	5,205
North Lincolnshire	5,491
Richmondshire	6,671
Rotherham	5,369
Ryedale	7,065
Scarborough	5,296
Selby	6,674
Sheffield	5,247
Wakefield	5,533
York	5,570

Note 1: *Data from these local authorities is not considered accurate enough to include here.*

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE NORTH WEST	***5,483***
Allerdale	5,407
Barrow-in-Furness	4,803
Blackburn with Darwen	5,756
Blackpool	5,391
Bolton	5,524
Burnley	5,049
Bury	5,330
Carlisle	5,016
Chester	5,858
Chorley	6,044
Congleton	5,288
Copeland	5,800
Crewe and Nantwich	6,102
Eden	6,433
Ellesmere Port and Neston	5,653
Fylde	6,531
Halton	4,897
Hyndburn	5,007
Knowsley	5,080
Lancaster	5,182
Liverpool	5,073
Macclesfield	6,751
Manchester	4,862
Oldham	5,907
Pendle	5,406
Preston	5,535
Ribble Valley	6,451
Rochdale	5,376
Rossendale	(see note 1)
Salford	4,991
Sefton	5,331
South Lakeland	6,220
South Ribble	4,745
St. Helens	5,701
Stockport	6,132
Tameside	5,023
Trafford	5,702
Vale Royal	6,257
Warrington	5,217
West Lancashire	6,866
Wigan	4,910
Wirral	5,645
Wyre	5,304

Note 1: *Data from these local authorities is not considered accurate enough to include here.*

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE EAST MIDLANDS	***5,743***
Amber Valley	6,798
Ashfield	5,589
Bassetlaw	6,120
Blaby	5,087
Bolsover	5,177
Boston	5,729
Broxtowe	6,137
Charnwood	5,377
Chesterfield	4,875
Corby	5,559
Daventry	7,276
Derby	4,814
Derbyshire Dales	6,452
East Lindsey	5,960
East Northamptonshire	4,905
Erewash	(see note 1)
Gedling	5,721
Harborough	6,105
High Peak	5,600
Hinckley and Bosworth	7,209
Kettering	6,067
Leicester	5,565
Lincoln	5,437
Mansfield	5,268
Melton	6,646
Newark and Sherwood	5,779
North East Derbyshire	(see note 1)
North Kesteven	5,203
North West Leicestershire	6,946
Northampton	5,096
Nottingham	5,419
Oadby and Wigston	4,265
Rushcliffe	5,531
Rutland	6,278
South Derbyshire	6,929
South Holland	6,357
South Kesteven	6,114
South Northamptonshire	6,514
Wellingborough	5,290
West Lindsey	5,840

Note 1: *Data from these local authorities is not considered accurate enough to include here.*

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE WEST MIDLANDS	***5,666***
Birmingham	5,424
Bridgnorth	7,176
Bromsgrove	7,133
Cannock Chase	5,261
Coventry	4,911
Dudley	5,560
East Staffordshire	5,310
Herefordshire, County of	6,017
Lichfield	7,118
Malvern Hills	7,329
Newcastle-under-Lyme	5,321
North Shropshire	6,716
North Warwickshire	(see note 1)
Nuneaton and Bedworth	4,608
Oswestry	6,050
Redditch	5,841
Rugby	5,486
Sandwell	5,180
Shrewsbury and Atcham	6,067
Solihull	6,239
South Shropshire	7,156
South Staffordshire	(see note 1)
Stafford	6,588
Staffordshire Moorlands	7,192
Stoke-on-Trent	5,192
Stratford-on-Avon	6,745
Tamworth	4,865
Telford and Wrekin	5,091
Walsall	4,953
Warwick	5,625
Wolverhampton	5,124
Worcester	4,390
Wychavon	6,356
Wyre Forest	5,046

Note 1: *Data from these local authorities is not considered accurate enough to include here.*

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE EAST OF ENGLAND	***5,968***
Babergh	6,705
Basildon	5,100
Bedford	4,715
Braintree	5,969
Breckland	6,456
Brentwood	6,235
Broadland	(see note 1)
Broxbourne	5,198
Cambridge	6,013
Castle Point	6,563
Chelmsford	5,612
Colchester	5,744
Dacorum	5,507
East Cambridgeshire	6,139
East Hertfordshire	6,229
Epping Forest	6,905
Fenland	5,754
Forest Heath	6,227
Great Yarmouth	5,364
Harlow	5,034
Hertsmere	6,448
Huntingdonshire	5,846
Ipswich	5,418
King's Lynn and West Norfolk	6,629
Luton	4,961
Maldon	6,566
Mid Bedfordshire	5,459
Mid Suffolk	7,130
North Hertfordshire	6,141
North Norfolk	6,223
Norwich	3,802
Peterborough	5,489
Rochford	7,219
South Bedfordshire	(see note 1)
South Cambridgeshire	6,447
South Norfolk	6,303
Southend-on-Sea	5,124
St. Albans	6,525
St. Edmundsbury	6,602
Stevenage	4,822
Suffolk Coastal	5,556
Tendring	5,983
Three Rivers	6,545
Thurrock	5,614
Uttlesford	8,092
Watford	5,644
Waveney	5,519
Welwyn Hatfield	6,004

Note 1: *Data from these local authorities is not considered accurate enough to include here.*

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE GREATER LONDON	***5,318***
Barking And Dagenham	4,224
Barnet	6,369
Bexley	5,635
Brent	5,607
Bromley	6,233
Camden	3,255
City of London	(see note 1)
Croydon	5,831
Ealing	5,292
Enfield	5,771
Greenwich	4,703
Hackney	4,036
Hammersmith and Fulham	4,817
Haringey	5,588
Harrow	5,824
Havering	5,922
Hillingdon	6,215
Hounslow	5,310
Islington	4,679
Kensington and Chelsea	4,404
Kingston upon Thames	5,906
Lambeth	5,134
Lewisham	4,649
Merton	5,500
Newham	5,628
Redbridge	6,057
Richmond upon Thames	6,723
Southwark	4,432
Sutton	5,988
Tower Hamlets	4,507
Waltham Forest	5,381
Wandsworth	4,680
Westminster	4,033

Note 1: *Data from these local authorities is not considered accurate enough to include here.*

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE SOUTH EAST	***5,808***
Adur	4,385
Arun	5,282
Ashford	5,892
Aylesbury Vale	6,406
Basingstoke and Deane	5,720
Bracknell Forest	5,745
Brighton & Hove	4,905
Canterbury	5,388
Cherwell	6,012
Chichester	5,919
Chiltern	7,421
Crawley	5,850
Dartford	5,430
Dover	5,266
East Hampshire	6,892
Eastbourne	3,296
Eastleigh	5,824
Elmbridge	6,560
Epsom and Ewell	5,358
Fareham	6,026
Gosport	4,247
Gravesham	5,406
Guildford	6,282
Hart	6,277
Hastings	4,469
Havant	5,444
Horsham	6,438
Isle of Wight	5,214
Lewes	(see note 1)
Maidstone	6,066
Medway	4,996
Mid Sussex	5,546
Milton Keynes	5,414
Mole Valley	6,928
New Forest	5,997
Oxford	5,024
Portsmouth	4,675
Reading	6,189
Reigate and Banstead	6,360
Rother	5,637
Runnymede	6,894
Rushmoor	(see note 1)
Sevenoaks	6,463
Shepway	5,671
Slough	4,946
South Bucks	(see note 1)

Note 1: *Data from these local authorities is not considered accurate enough to include here.*

South Oxfordshire	7,356
Southampton	4,563
Spelthorne	(see note 1)
Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
Surrey Heath	7,477
Swale	5,405
Tandridge	6,454
Test Valley	(see note 1)
Thanet	5,020
Tonbridge and Malling	6,666
Tunbridge Wells	6,054
Vale of White Horse	5,688
Waverley	6,471
Wealden	6,881
West Berkshire	6,311
West Oxfordshire	6,083
Winchester	(see note 1)
Windsor and Maidenhead	6,307
Woking	6,296
Wokingham	6,179
Worthing	5,275
Wycombe	(see note 1)

Note 1: *Data from these local authorities is not considered accurate enough to include here.*

Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
AVERAGE SOUTH WEST	***5,396***
Bath and North East Somerset	5,788
Bournemouth	5,066
Bristol, City of	5,041
Caradon	4,717
Carrick	5,182
Cheltenham	5,084
Christchurch	(see note 1)
Cotswold	6,736
East Devon	5,788
East Dorset	5,876
Exeter	4,567
Forest of Dean	6,370
Gloucester	5,088
Isles of Scilly	(see note 1)
Kennet	6,902
Kerrier	5,860
Mendip	5,313
Mid Devon	5,565
North Cornwall	5,486
North Devon	5,059
North Dorset	5,611
North Somerset	5,476
North Wiltshire	5,932
Penwith	4,670
Plymouth	4,447
Poole	5,688
Purbeck	6,143
Restormel	5,129
Salisbury	5,879
Sedgemoor	5,852
South Gloucestershire	5,309
South Hams	6,346
South Somerset	6,056
Stroud	6,043
Swindon	4,846
Taunton Deane	5,090
Teignbridge	5,131
Tewkesbury	4,893
Torbay	4,463
Torridge	5,329
West Devon	6,184
West Dorset	6,002
West Somerset	5,334
West Wiltshire	6,075
Weymouth and Portland	4,138

Note 1: *Data from these local authorities is not considered accurate enough to include here.*

Appendix 3: Emissions for all GB Local Authorities (Ranked)

This appendix includes data for average annual CO_2 emissions per dwelling for all GB Local Authorities (excluding those identified as having data quality issues). These are rank ordered from greatest to least emissions. The 23 selected cities are highlighted.

	Government Office Regions and NUTS4 Areas	***kg CO_2 / Dwelling***
1	Uttlesford	8,092
2	Teesdale	7,731
3	Surrey Heath	7,477
4	Chiltern	7,421
5	South Oxfordshire	7,356
6	Malvern Hills	7,329
7	Daventry	7,276
8	Hambleton	7,242
9	Rochford	7,219
10	Hinckley and Bosworth	7,209
11	Staffordshire Moorlands	7,192
12	Bridgnorth	7,176
13	South Shropshire	7,156
14	Bromsgrove	7,133
15	Mid Suffolk	7,130
16	Lichfield	7,118
17	Ryedale	7,065
18	North West Leicestershire	6,946
19	South Derbyshire	6,929
20	Mole Valley	6,928
21	Castle Morpeth	6,909
22	Epping Forest	6,905
23	Kennet	6,902
24	Runnymede	6,894
25	East Hampshire	6,892
26	Wealden	6,881
27	West Lancashire	6,866
28	Amber Valley	6,798
29	Shetland Islands	6,778
30	Macclesfield	6,751
31	Stratford-on-Avon	6,745
32	Cotswold	6,736
33	Richmond upon Thames	6,723
34	North Shropshire	6,716
35	Babergh	6,705
36	Selby	6,674
37	Richmondshire	6,671
38	Tonbridge and Malling	6,666
39	Tynedale	6,654
40	Melton	6,646
41	King's Lynn and West Norfolk	6,629
42	St. Edmundsbury	6,602
43	Stafford	6,588
44	Maldon	6,566
45	Castle Point	6,563

46	Elmbridge	6,560
47	East Dunbartonshire	6,547
48	Three Rivers	6,545
49	Fylde	6,531
50	St. Albans	6,525
51	Stirling	6,524
52	South Northamptonshire	6,514
53	Harrogate	6,494
54	Waverley	6,471
55	Sevenoaks	6,463
56	Breckland	6,456
57	Tandridge	6,454
58	Derbyshire Dales	6,452
59	Ribble Valley	6,451
60	Hertsmere	6,448
61	South Cambridgeshire	6,447
62	Horsham	6,438
63	Eden	6,433
64	Aylesbury Vale	6,406
65	Torfaen	6,396
66	Denbighshire	6,391
67	Forest of Dean	6,370
68	Barnet	6,369
69	Reigate and Banstead	6,360
70	South Holland	6,357
71	Wychavon	6,356
72	South Hams	6,346
73	East Renfrewshire	6,330
74	Aberdeenshire	6,318
75	West Berkshire	6,311
76	Windsor and Maidenhead	6,307
77	South Norfolk	6,303
78	Woking	6,296
79	Guildford	6,282
80	Rutland	6,278
81	Hart	6,277
82	Perth and Kinross	6,261
83	Vale Royal	6,257
84	Solihull	6,239
85	Brentwood	6,235
86	Bromley	6,233
87	East Hertfordshire	6,229
88	Forest Heath	6,227
89	North Norfolk	6,223
90	South Lakeland	6,220
91	Hillingdon	6,215
92	Reading	6,189
93	West Devon	6,184
94	Wokingham	6,179
95	Flintshire	6,168
96	Monmouthshire	6,148
97	Purbeck	6,143
98	North Hertfordshire	6,141
99	East Cambridgeshire	6,139

100	Broxtowe	6,137
101	Blyth Valley	6,133
102	Stockport	6,132
103	Bassetlaw	6,120
104	South Kesteven	6,114
105	East Riding of Yorkshire	6,114
106	Harborough	6,105
107	Crewe and Nantwich	6,102
108	West Oxfordshire	6,083
109	West Wiltshire	6,075
110	Shrewsbury and Atcham	6,067
111	Kettering	6,067
112	Maidstone	6,066
113	Redbridge	6,057
114	South Somerset	6,056
115	Tunbridge Wells	6,054
116	Oswestry	6,050
117	Chorley	6,044
118	Stroud	6,043
119	Fareham	6,026
120	Herefordshire, County of	6,017
121	Cambridge	6,013
122	Cherwell	6,012
123	Welwyn Hatfield	6,004
124	South Ayrshire	6,004
125	West Dorset	6,002
126	New Forest	5,997
127	Calderdale	5,995
128	Sutton	5,988
129	Tendring	5,983
130	Braintree	5,969
	AVERAGE EAST OF ENGLAND	**5,968**
131	East Lindsey	5,960
132	Powys	5,945
133	Highland	5,933
134	North Wiltshire	5,932
135	Havering	5,922
136	Chichester	5,919
137	Oldham	5,907
138	Kingston upon Thames	5,906
139	Ashford	5,892
140	Salisbury	5,879
141	East Dorset	5,876
142	Kerrier	5,860
143	Chester	5,858
144	Sedgemoor	5,852
145	Crawley	5,850
146	Huntingdonshire	5,846
147	Redditch	5,841
148	West Lindsey	5,840
149	Craven	5,838
150	Croydon	5,831
151	Harrow	5,824
152	Eastleigh	5,824

	AVERAGE SOUTH EAST	**5,808**
153	Moray	5,808
154	Dumfries and Galloway	5,801
155	Copeland	5,800
156	Orkney Islands	5,798
157	South Lanarkshire	5,792
158	East Devon	5,788
159	Bath and North East Somerset	5,788
160	Newark and Sherwood	5,779
161	East Ayrshire	5,773
162	Berwick-Upon-Tweed	5,772
163	Enfield	5,771
164	Argyll and Bute	5,756
165	Blackburn with Darwen	5,756
166	Fenland	5,754
167	Bracknell Forest	5,745
168	Colchester	5,744
	AVERAGE EAST MIDLANDS	**5,743**
169	Boston	5,729
170	Carmarthenshire	5,724
171	East Lothian	5,722
172	Gedling	5,721
173	Basingstoke and Deane	5,720
174	Midlothian	5,713
175	Newport	5,710
176	Trafford	5,702
177	St. Helens	5,701
178	Vale of White Horse	5,688
179	Poole	5,688
180	Ceredigion	5,685
181	Sedgefield	5,683
182	Shepway	5,671
	AVERAGE WEST MIDLANDS	**5,666**
183	Fife	5,663
184	Ellesmere Port and Neston	5,653
185	Wirral	5,645
186	Watford	5,644
187	Rother	5,637
188	Bexley	5,635
189	Newham	5,628
190	Warwick	5,625
191	Thurrock	5,614
192	Gwynedd	5,613
193	Chelmsford	5,612
194	North Dorset	5,611
195	Brent	5,607
196	High Peak	5,600
197	Scottish Borders	5,597
	AVERAGE GREAT BRITAIN	**5,595**
198	Ashfield	5,589
199	Haringey	5,588
200	North Lanarkshire	5,583
201	Swansea	5,578
202	Isle of Anglesey	5,574

203	York	5,570
	AVERAGE WALES	**5,568**
204	Mid Devon	5,565
205	Leicester	5,565
206	Dudley	5,560
207	Corby	5,559
208	Suffolk Coastal	5,556
209	Bridgend	5,554
210	Mid Sussex	5,546
211	Doncaster	5,540
212	Bradford	5,539
213	Preston	5,535
214	Wakefield	5,533
215	Rushcliffe	5,531
	AVERAGE YORKSHIRE AND THE HUMBER	**5,527**
216	Bolton	5,524
217	Waveney	5,519
218	Dacorum	5,507
	AVERAGE SCOTLAND	**5,505**
219	Sunderland	5,504
220	Angus	5,503
221	Pembrokeshire	5,503
222	Merton	5,500
223	Kirklees	5,498
224	Conwy	5,496
225	North Lincolnshire	5,491
226	Peterborough	5,489
227	North Cornwall	5,486
228	Rugby	5,486
	AVERAGE NORTH WEST	**5,483**
229	Eilean Siar	5,482
230	North Somerset	5,476
231	Mid Bedfordshire	5,459
232	North Ayrshire	5,447
233	Falkirk	5,446
234	Havant	5,444
235	Lincoln	5,437
236	Dartford	5,430
237	Birmingham	5,424
238	Gateshead	5,422
239	Nottingham	5,419
240	Ipswich	5,418
241	Milton Keynes	5,414
	AVERAGE NORTH EAST	**5,414**
242	Allerdale	5,407
243	Pendle	5,406
244	Gravesham	5,406
245	Swale	5,405
	AVERAGE SOUTH WEST	**5,396**
246	Blackpool	5,391
247	Canterbury	5,388
248	Wrexham	5,387
249	Wear Valley	5,386
250	Waltham Forest	5,381

251	Charnwood	5,377
252	Rochdale	5,376
253	Rotherham	5,369
254	Inverclyde	5,366
255	Great Yarmouth	5,364
256	West Lothian	5,362
257	Epsom and Ewell	5,358
258	West Somerset	5,334
259	Leeds	5,333
260	Sefton	5,331
261	Bury	5,330
262	Torridge	5,329
263	Chester-le-Street	5,322
264	Hartlepool	5,322
265	Newcastle-under-Lyme	5,321
266	South Tyneside	5,320
	AVERAGE GREATER LONDON	**5,318**
267	Mendip	5,313
268	Hounslow	5,310
269	East Staffordshire	5,310
270	South Gloucestershire	5,309
271	Wyre	5,304
272	Scarborough	5,296
273	Renfrewshire	5,296
274	Ealing	5,292
275	Wellingborough	5,290
276	Congleton	5,288
277	Arun	5,282
278	Worthing	5,275
279	Mansfield	5,268
280	Dover	5,266
281	Cannock Chase	5,261
282	Sheffield	5,247
283	Clackmannan	5,240
284	Warrington	5,217
285	Isle of Wight	5,214
286	North East Lincolnshire	5,205
287	North Kesteven	5,203
288	Broxbourne	5,198
289	Redcar and Cleveland	5,197
290	Stoke-on-Trent	5,192
291	North Tyneside	5,184
292	Lancaster	5,182
293	Carrick	5,182
294	Sandwell	5,180
295	Bolsover	5,177
296	Wansbeck	5,176
297	Aberdeen City	5,175
298	Newcastle upon Tyne	5,150
299	Edinburgh, City of	5,142
300	Darlington	5,137
301	Lambeth	5,134
302	Teignbridge	5,131
303	Restormel	5,129

304	Southend-on-Sea	5,124
305	Wolverhampton	5,124
306	Alnwick	5,111
307	Neath Port Talbot	5,101
308	Basildon	5,100
309	Northampton	5,096
310	Middlesbrough	5,092
311	Telford and Wrekin	5,091
312	Taunton Deane	5,090
313	Gloucester	5,088
314	Blaby	5,087
315	Cheltenham	5,084
316	West Dunbartonshire	5,083
317	Knowsley	5,080
318	Liverpool	5,073
319	Bournemouth	5,066
320	North Devon	5,059
321	Burnley	5,049
322	Wyre Forest	5,046
323	Bristol, City of	5,041
324	Cardiff	5,035
325	Harlow	5,034
326	Oxford	5,024
327	Tameside	5,023
328	Thanet	5,020
329	Carlisle	5,016
330	Barnsley	5,010
331	Hyndburn	5,007
332	Medway	4,996
333	Salford	4,991
334	Derwentside	4,964
335	Luton	4,961
336	Stockton-on-Tees	4,953
337	Walsall	4,953
338	Slough	4,946
339	Dundee City	4,915
340	Coventry	4,911
341	Wigan	4,910
342	Brighton & Hove	4,905
343	East Northamptonshire	4,905
344	Halton	4,897
345	Tewkesbury	4,893
346	Chesterfield	4,875
347	Tamworth	4,865
348	Manchester	4,862
349	Swindon	4,846
350	Stevenage	4,822
351	Hammersmith and Fulham	4,817
352	Derby	4,814
353	Barrow-in-Furness	4,803
354	South Ribble	4,745
355	Caradon	4,717
356	Bedford	4,715
357	Greenwich	4,703

358	Easington	4,691
359	Wandsworth	4,680
360	Islington	4,679
361	Portsmouth	4,675
362	Penwith	4,670
363	Lewisham	4,649
364	The Vale of Glamorgan	4,622
365	Glasgow City	4,611
366	Nuneaton and Bedworth	4,608
367	Exeter	4,567
368	Southampton	4,563
369	Tower Hamlets	4,507
370	Hastings	4,469
371	Torbay	4,463
372	Plymouth	4,447
373	Southwark	4,432
374	Kensington and Chelsea	4,404
375	Kingston upon Hull, City of	4,395
376	Worcester	4,390
377	Adur	4,385
378	Oadby and Wigston	4,265
379	Gosport	4,247
380	Barking And Dagenham	4,224
381	Weymouth and Portland	4,138
382	Hackney	4,036
383	Westminster	4,033
384	Norwich	3,802
385	Eastbourne	3,296
386	Camden	3,255