



UK Local and Regional estimates of non-gas, non-electricity and non-road transport energy consumption for 2005

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1 Introduction

The Energy White Paper issued in February 2003, emphasised the importance of local and regional decision making in energy policy. It confirmed BERR's (then DTI) commitment to "collect and make available data on the pattern of energy use at local levels to enable local authorities and regional bodies to target activity more effectively". Estimates for gas, electricity and road transport energy consumption at Regional Development Agency level (NUTS1) and Local Authority (NUTS4) levels are already available. Together these estimates encompass four-fifths of UK final energy consumption. It is the remaining fifth of UK energy consumption that this report investigates at comparable levels.

This report provides estimates of non-gas, non-electric and non-road transport energy consumption for 2005 and an accompanying methodology. Previous datasets have been prepared for 2003 and 2004 (King et al, 2004 and 2006) although it should be noted that owing to the continuous improvement of the National Atmospheric Emissions Inventory (NAEI) from which these dataset are derived, fuel use allocations and mapping methodologies are not directly comparable.

1.1 Aim

The aim of this study is to provide nationally consistent energy estimates at local authority and regional level for sectors other than gas, electricity and road transport. This data will allow a better understanding of the energy picture in different regions and allow regional and local activity to be targeted more effectively. It will also enable the development of indicators for Government to monitor regional progress and performance.

1.2 Methodology

On an annual basis AEA Energy and Environment compiles fuel consumption and emissions estimates for a large number of sources at the 1x1km level. This work forms part of the National Atmospheric Emissions Inventory (NAEI) and Greenhouse Gas Inventory (GHGI) programme of work for Defra. Estimates of the distribution of fuel consumption from sources other than gas, electricity and road transport are available from the mapping work currently undertaken within this contract. The methodology used to compile these maps is described in a recently published NAEI mapping report (Bush et al, 2008).

The NAEI methodology makes best use of available spatial data including:

1. Pollution inventory. The Environment Agency (EA) publishes the Pollution Inventory each year. It contains emissions data for England and Wales provided by operators of processes regulated by the EA under the Integrated Pollution Control (IPC) and Integrated Pollution Prevention & Control (IPPC) regulatory regimes. The emissions data extend from 1998 onwards to 2004 and cover air pollutants such as carbon dioxide, oxides of nitrogen and sulphur dioxide which can be used to estimate the quantity and type of fuel burnt by combustion processes.
2. Scottish Pollutant Release Inventory (SPRI). The Scottish Environmental Protection Agency (SEPA) published the Scottish Pollutant Release Inventory earlier this year containing emissions data for 2002 and 2004 for the processes they regulate under IPC and IPPC in Scotland. As with the Pollution Inventory, data from the SPRI can be used to generate estimates of fuels consumed at individual sites.
3. Inventory of Sources & Releases, provided by the Department of the Environment (Northern Ireland) since 1999, which gives data for processes in Northern Ireland equivalent to the data given in the Pollution Inventory and the SPRI for England & Wales, and for Scotland respectively.
4. Iron & Steel Statistics Bureau (ISSB) annually published compendium of statistics, which includes regional data on the production of pig iron and steels. Since there are relatively few sites involved in the production of pig iron, oxygen steel or electric arc steel, these regional numbers can be used to generate robust estimates of metal production at individual sites.
5. Household Survey data (Experian survey of main fuel used for domestic heating).
6. Regional energy statistics.

7. Population census data for 2001.
8. High resolution spatial information on industrial and commercial employment data from the Interdepartmental Business Register, produced by the Office for National Statistics (ONS).
9. EU-ETS (emissions trading scheme) fuel consumption data at industrial and commercial sites. Provides data relating to the volume of fuel being consumed, the fuel types being burnt and the precise location. This was not available for the 2003 compilation.
10. High resolution spatial information on domestic gas use across Great Britain provided by the DTI and improved assumptions on domestic energy demand
11. In addition a number of other, minor, datasets are used including some data from industry and trade associations.

These spatial data have been used to map fuel consumption for this study. However, it has been recognised by BERR that it is not meaningful to allocate energy consumption locally or regionally for some energy uses, (e.g. aviation) . In addition, for some fuel–sector combinations, no information is available for them to be spatially mapped. Those sources that have been mapped are shown below. As a result of the different fuel types associated with the fuel classes, the data are provided in terms of thousand tonnes of oil equivalent (KTOE).

Table 1 Source and fuels that have been mapped

Source	Fuel
Industry	Petroleum
Industry	Coal
Industry	Manufactured solid fuel
Domestic	Petroleum
Domestic	Coal
Domestic	Manufactured solid fuel
Rail	Petroleum
Public administration	Petroleum
Public administration	Coal
Commercial	Petroleum
Commercial	Coal
Agriculture	Petroleum
Agriculture	Coal
All sources	Waste and renewables

1.3 Structure of this report

Official estimates of total UK energy estimates for 2005 are summarised in **Section 2** of this report. **Section 3** describes the data and calculation methods used to derive the energy estimates at Local Authority and Government Office Region level. The results are summarised in **Section 4** and provided in detail in a spreadsheet that accompanies this report¹. **Section 5** of this report provides recommendations on how improvements could be made to the estimates from existing information.

¹ BERR_Local_Authority_energy_consumption_data_2005.xls

2 Summary of energy use by the UK in 2005

Details of UK fuel consumption are provided annually in the Digest of United Kingdom Energy Statistics (DUKES, DTI 2006). These data are presented in units of tonnes of oil equivalent (TOE) and provide a context for the data presented in this report. Fuels that are used as feedstock in non-combustion activities are omitted (principally natural gas used for the production of ammonia, methanol and acetic acid and some use of LPG and OPG in petrochemical plants).

The NAEI's estimates utilise DUKES data at a sectoral level to estimate fuel consumption (and emissions) for all sectors excluding fuel oil consumed by industry. This is because the NAEI has access to data that indicates that some of the fuel oil consumed is actually consumed by power stations.

Fuel consumption figures for installations which have joined the EU Emissions Trading Scheme (EU-ETS) represent a further, independent, set of data. Data are not available for all installations entered into the EU-ETS and nor does the EU ETS cover all industrial combustion plant, never-the-less, these data are an important resource and have been used in the generation of estimates of local energy use. The EU-ETS data used in this report were from the 2005 calendar year.

2.1 UK fuel consumption in 2005

Table 2 presents the estimates of fuel consumption as reported in aggregated sectors from the BERR's Digest of United Kingdom Energy Statistics (DUKES), the GHGI (compiled annually by AEA Energy and Environment) and the Local Authority dataset (presented in this report).

The data presented in this report are not fully consistent with the DUKES or the GHGI. This is primarily because of the utilisation of the EU-ETS dataset (available since 2004). However, the reallocation of gas and fuel oil between combustion sources is also partly responsible. The EU-ETS dataset has provided improved information on the fuels used at industrial and commercial sites, which was not available when the GHGI or DUKES was compiled. Detailed information on the difference between the datasets has been provided in previous reports (King et al 2005 and 2006), and a summary of observations based on data for 2005 presented in Table 2, follows in the sections below.

Table 2 UK Fuel Consumption, 2005

Fuel	Consumer	Units	DUKES	GHGI	Local Authority dataset
Coal	Domestic	KTOE	474	474	471
Coal	Industry	KTOE	1,284	1,896	2,456
Coal	Other	KTOE	117	117	116
Gas Oil	Industry	KTOE	3,593	3,341	3,342
Fuel Oil	Industry	KTOE	871	629	728
Petroleum Oils	Other	KTOE	2,716	2,987	2,736
Petroleum Oils	Domestic	KTOE	2,740	2,740	3,374
Burning Oil	Industry	KTOE	1,644	1,644	1,645
Other Solid Fuels	Industry	KTOE	646	646	1,014
Other Solid Fuels	Domestic	KTOE	223	223	223
Other Petroleum Products	All Consumers	KTOE	1,732	1,243	1,683
Waste And Renewables	Other	KTOE	419	567	1,451
Lpg	Industry	KTOE	1,116	1,131	1,071
Opg	Industry	KTOE	3,415	3,633	3,650

Source: AEA Energy and Environment, using the Digest of United Kingdom Energy Statistics published by the DTI and the Greenhouse Gas Inventory (GHGI).

2.1.1 Differences between the Local Authority dataset, the GHGI and DUKES fuel consumption estimates

Heat generation

The GHGI does not include heat generation as a separate category. Instead, fuel used for heat generation is re-allocated to final user sectors and so the fuel consumption data for 'industry' and 'other' given in the GHGI will be higher than the values in the published DUKES.

Coal

The GHGI emissions category 'other industry' is an aggregation of fuel consumption by various industries. One of these is fuel consumed by autogenerators. In DUKES autogenerators are considered as a transformation fuel use, hence they do not contribute to final consumption. However, in the NAEI database they cannot be disaggregated from 'other industry' consumption and therefore, these estimates for industrial coal use include the coal used by autogenerators.

The GHGI estimates for commercial coal use include coal burnt by the 'miscellaneous' sector and a small 'correction' to ensure that the total for final users consumption of coal is the same in both the green house gas inventory (GHGI) and DUKES. Coal used by lime producers and by the iron and steel industry are reported separately in the GHGI and are therefore subtracted from the 'other industry' figure. Coal used by cement clinker producers is also reported separately. In the past, this consumption was also removed from the 'other industry' figure. However, the cement industry's consumption of coal is larger than the total coal consumption by industry given in DUKES and, following, advice provided by DTI, the cement industry coal use is now subtracted from the figure for power stations. These differences are shown diagrammatically below (Table 3).

Table 3 Differences between DUKES and the GHGI fuel use categories

DUKES category	Related GHGI categories
Major power producers	Power stations Cement
Industry: Iron & Steel	Iron & Steel (Combustion)
Autogenerators	Lime (Combustion)
Heat generation	Other Industrial Combustion
Industry: Unallocated	
Industry: Non-ferrous metals	
Industry: Mineral Products	
Industry: Chemicals	
Industry: Mechanical Engineering	
Industry: Electrical Engineering	
Industry: Vehicles	
Industry: Food, Beverages	
Industry: Textiles, Leather	
Industry: Paper, Printing	
Industry: Other Industries	
Industry: Construction	

Fuel oil

An adjustment to the fuel oil data used by the GHGI is applied to account for the perceived underestimation in power station consumption in the DUKE's data. Several hundred thousand tonnes of fuel oil are reallocated to power stations explaining the difference between the DUKES and NAEI estimates.

Petroleum coke

The GHGI makes estimates of petroleum coke used for energy purposes based on information given in DUKES and additional information available from industry. However, DUKES currently includes this consumption of petroleum coke in the 'non-energy uses' section of the commodity balance for

petroleum coke (DUKES Tables 3.4-3.6). In addition, there is a significant difference in the petroleum coke fuel use given in the EU-ETS dataset compared to that given by DUKES.

Gas oil

The GHGI makes its own estimates of gas oil for railways, off-road vehicles and mobile machinery. In order to maintain overall consistency with DUKES' fuel balance the GHGI reallocates gas oil from a number of other source sectors including public administration and commercial other industry. For example, the GHGI generates estimates of gas oil consumed by tractors and other agricultural machinery. These estimates are significantly higher than the gas oil consumption provided by DUKES for the agricultural sector.

In previous years, the inventory used gas oil consumption figures from the DTi for specific industry and agricultural groups as the primary activity data for off-road machinery in these sectors and then used machinery population and usage data to further sub-divide them between specific machinery types for calculation of emissions. However, the DTi has recently cast doubt on the reliability of its sector allocation for gas oil consumption, which has consistently indicated much lower consumption of gas oil in industry and agriculture than suggested by the machinery population and usage data compiled by AEA Energy and Environment (2004). Gas oil consumption for different off-road machinery types could be estimated by combining fuel consumption factors (in g fuel/kWh) for individual types of machinery with their engine power rating, UK population and usage rates derived in the AEA Energy and Environment survey. Hence, the inventory this year has made a departure from using DTi fuels data and based the fuel consumption and emission estimates solely on the basis of the population and usage data. Total fuel balance for gas oil consumption was ensured by compensating with the total amount of gas oil used for other purposes, most notably for stationary combustion in industry. The gas oil allocated to these sources was reduced to obtain an overall balance with the total gas oil consumption figures reported in DUKES.

This change in methodology is responsible for a considerable increase in the emission estimates for off-road machinery.

Manufactured solid fuels

The DUKES aggregated energy balance Table 1.1 includes all manufactured solid fuels including benzole, tars, coke oven gas and blast furnace gas. In the GHGI, all use of benzole and coal tars is treated as non-energy consumption, while coke oven gas and blast furnace gas refer to transformation fuel uses. Also, there is a significant difference between the fuel use data for coke consumed by sinter production in the EU-ETS dataset compared to that given by DUKES.

Waste and renewables

The GHGI estimates for waste solvents and tyre consumption refer to their use as fuel in the cement industry and are based on data from the British Cement Association. Therefore, the figures would not necessarily be expected to match any DUKES figures. In addition, estimates for waste consumption are derived from the EU ETS data and there is no equivalent data in DUKES.

OPG

There is a significantly higher consumption of OPG in the Local Authority dataset in comparison with that given in DUKES. This difference is the result of the inclusion of the new EU-ETS dataset, which gives a far greater volume of OPG consumed by refineries and other industrial combustion.

2.2 Simplified sector split for energy estimates

As in previous reports, a simplified sectoral split has been applied for this study on local energy demands. This simplification is necessary in order to provide the estimates in the format required by BERR. The NAEI sectors included in the local energy reporting categories are summarised in Table 4 below.

Table 4 NAEI fuel consumption sectors in Local energy reporting categories

Local energy category	Detailed fuel consumption sources included in each category
Industrial and commercial	Industry and Commercial Oil Industry and Commercial Solid Fuel Industry Off-Road Machinery Management of airports and ports (support vehicles, stationary heating and power)
Public	Public Oil Public Solid Fuel
Domestic	Domestic Oil Domestic Solid Fuel Domestic house and garden machinery
Rail	Stationary combustion in the rail sector Gas oil consumption by regional, inter-city & freight trains
Agriculture	Stationary combustion in the agriculture sector Off road machinery use in the agriculture sector
Waste and renewables	Industry and Commercial Waste and Biomass Domestic Biomass Waste incineration

3 Datasets and methodology

The 2005 local authority estimates of fuel consumption presented in this report have been calculated using data from a variety of sources. These are summarised in Table 5 and descriptions of the data and methods are provided in the following sections. There have been no detailed methodological changes in our approach in 2005. However, some changes in the distribution of fuel use in the NAEI's underlying spatial inventory have been made, most notably for domestic fuel use and rail transport sector in Northern Ireland. As a result, the datasets for 2003, 2004 and 2005 are not directly comparable.

Table 5 Summary of data sources and methods

LA fuel use category	Fuel type / sector details	Data sources and method
Domestic	Domestic Oil Domestic Solid Fuel Domestic Biomass	NAEI modelling of fuel use distributions using household distributions and data on household energy demand, locations of Smoke Control Areas and locations of gas use (methodology updated for 2005).
	Domestic Home and Garden Machinery	Emissions are distributed in proportion to population.
Industrial and Commercial.	Industry and Commercial Oil Industry and Commercial Solid Fuel Industry and Commercial Waste and Biomass Stationary combustion in the rail sector	Large sources identified as point sources. The remaining fuel use distributed using NAEI modelling of fuel use based in employment and fuel intensity by sector.
	Industrial off-road machinery	Industrial off-road is allocated using a distribution of employment within heavy industries.
	Management at airports (support vehicles, stationary heating and power)	Airport support activities are allocated to airport locations weighted by numbers of aircraft movements at each (direct aircraft fuel use are excluded).
Public	Solid and liquid fuels	Large emission points from NAEI point source database. The remaining emissions in each sector distributed using NAEI modelling of employment and fuel intensity.
Agriculture	Agriculture oil	NAEI modelling of fuel use based in employment distributions and fuel intensity by sector.
	Agricultural off-road machinery	Agricultural off-road is allocated according to land use weighted by estimates of machinery usage on different land use types.
Rail	Diesel railways	Diesel emissions estimated based on train movements (methodology updated for 2005 to include Northern Ireland)

3.1 Domestic fuel use

The maps of domestic fuel use have been calculated using a methodology consistent with the 2004 estimates. Full details of this approach is provided the 2005 Local and Regional CO₂ Emissions Estimates (King, et al. 2007). New modelling of domestic fuel use was undertaken making use of new data from DTI and BRE to enable significant improvements to be made to the distributions of domestic fuel use. New distributions of domestic gas, coal, oil and smokeless solid fuels have been produced for Great Britain. These have been combined with updated distributions for Northern Ireland.

In the development of the 2004 fuel use estimate, new data were made available to AEA by DTI which provided high resolution maps of domestic gas use across Great Britain. The data included numbers of gas customers and amounts of gas use per 1km square for 2005, and data on electricity use, specifically type 2 meters (economy 7 type meters).

Estimates of total energy use by dwelling type and by fuel type, and regional data on the numbers of households using different fuels were provided by BRE (BRE, 2006). Given that gas consumption accounts for 72% of domestic non-electricity energy use, the new high resolution gas data from DTI provides a significant improvement in understanding the spatial distribution of fuel consumption in UK.

In summary the method calculated the amount of gas use in a 1km square compared to a theoretical gas consumption on the basis of complete gas coverage, i.e. every dwelling using the average gas demand for that dwelling type. The difference between the actual gas consumption and this theoretical amount was then calculated. The number of households represented by this residual energy demand was calculated and these households were apportioned to different fuels. This apportionment was based on Economy 7 electricity use, assumptions about fuel use within and outside smoke control areas and regional data from BRE on fuel usage by household type.

It has been assumed that:

- coal is burnt exclusively outside Smoke Control Areas,
- oil is burnt outside the biggest cities (of greater than 250,000 populations) but inside the smaller cities in grid squares where there is residual demand
- smokeless solid fuels (SSF, coke, anthracite) are burnt exclusively within smoke control areas.

Additionally, wood is assumed to have the same distribution as coal but has been excluded from Northern Ireland and peat has the same distribution as coal but is only burnt in Northern Ireland.

Northern Ireland

Equivalent detailed information on gas consumption and fuel use in Great Britain are not available in Northern Ireland. As a result, and also taking into account availability of updates to the core datasets underlying existing approaches to domestic fuel mapping for Northern Ireland, it was decided to maintain this methodology and update the datasets used previously (Pye and Vincent, 2003), as reported by in the 2005 NEAI mapping report (Bush et al 2008).

The fuel use grids have been generated from a wide range of data sources including:

- Northern Ireland Housing Executive household data (supplied by the NIHE 2006 PRAWL property database)
- Gas household data (supplied by Phoenix Gas 2005)
- Belfast household data (from fuel use survey undertaken by Belfast City Council 2001)
- Northern Ireland Census output area households data (supplied by the 2001 Census)
- The Northern Ireland Interim House Condition Survey 2004.
- The Northern Ireland 2005 Home Energy Conservation Report
- Other household data not covered by the above (from number of sources, including Housing Condition Survey (HCS) data).
- Household fuel use survey data from 16 Northern Ireland Local Authorities collected under their obligations to Review and Assessment of air quality under the UK's Air Quality Strategy (AQS)

Using these data it was possible to update the bottom up approach developed by Pye and Vincent (2003). The fuels used by the Northern Ireland housing stock was characterised as follows:

1. Geographic household distribution. Derived from the 2001 Census at an output area level and scaled to 2004 using information from the 2004 HCS and 2005 HECA report for Northern Ireland.
2. Fuels used in the NIHE social housing stock. Derived from the NIHE's 2005 PRAWL database.
3. Fuels used in the private housing stock. Derived from the 2001 detailed HCS, scaled to 2004 using information from the 2004 HCS and 2005 HECA report for Northern Ireland.
4. Distribution of Households connected to gas. Derived from Phoenix Gas 2005.
5. Fuels used in in Belfast. Derived from 2001 Belfast City Council fuel use survey
6. Geographical distribution of Smoke Control Areas. Derived from GIS data provided by DoE Northern Ireland.

Using these data a detailed estimate of domestic fuel use across Northern Ireland was possible using datasets more appropriate to the timeframe covered by the 2005 inventory. Full details of the methodology that was followed for Northern Ireland are available in Pye and Vincent (2003).

Other domestic emissions

The NAEI source called Domestic house and garden machinery is also included in the domestic sector for the LA CO₂ estimates. Domestic household products include emissions from the use of petroleum waxes and detergents. These emissions are distributed across the UK Local Authorities according to the population distribution in the 2001 Census.

3.2 Diesel rail transport

Prior to the 2004 inventory compilation, estimates of gas oil consumption by the railway sector were taken from DUKES. This data was however found to be unreliable and therefore when compiling the 2004 inventory, gas oil consumption was taken from data provided by the Association of Train Operating Companies (ATOC) for passenger trains and estimated from (AEA Energy and Environment, 2004) for freight trains. This additional gas oil consumption was then subtracted from the industrial gas oil consumption provided in DUKES so that the overall UK gas oil consumption still matched that in DUKES.

The UK total diesel railway fuel use estimates cover three journey types: freight, intercity and regional. The fuel use estimates are distributed across Great Britain using maps of rail links and details of the number of vehicle kilometres by the three journey types on each rail link. This work was undertaken by the London Research Centre in 2000.

The 2003 fuel use estimates included an assumption that all rail fuel consumption were in Great Britain because data were not available for Northern Ireland. However since 2004 the Northern Ireland fuel use has been separated and LA estimates for Northern Ireland are included. Rail fuel use for diesel locomotives is distributed across Northern Ireland using data from Translink (Smyth 2006) on amounts of fuel used on different sections of track aggregated to Local Authority. These data are for passenger trains only as there is no freight activity in Northern Ireland. The Northern Ireland fuel consumption has been distributed over a digital representation of the Northern Ireland rail network derived from Ordnance Survey Northern Ireland raster datasets to provide an accurate representation of the location of fuel used by rail transport in Northern Ireland

3.3 Other industrial and commercial fuel use

The industrial sectors in the NAEI are mapped using a combination of site specific (point source) estimates of fuel use and area source employment based distributions. For some sectors the site specific fuel use totals are equal to the NAEI fuel use estimate for that sector. In other cases there are other sources that are not included within the site specific dataset. In such instances, the remaining fuel consumption is then treated as an 'area source' and distributed across the UK using detailed employment data. Small industrial combustion is an example of a sector for which the area source distribution is particularly important. The commercial and public service sectors of the NAEI are mapped entirely as area sources.

3.3.1 Site Specific Fuel Use

The site specific data have been compiled from a number of sources:

- Environment Agency Pollution Inventory;
- EU Emissions Trading Scheme Installations that reported emissions to the Environment Agency for 2005;
- SEPA European Pollutant Emission Register;
- Northern Ireland Inventory of Statutory Releases;

- The UK's National Allocation Plan for the EU carbon emission trading scheme;
- And other information obtained from AEA Energy & Environment's industry contacts.

Site specific fuel use estimates have been made for the following sectors:

- Non power station plant regulated as combustion processes under Integrated Pollution Control (IPC);
- Refineries;
- Integrated steelworks;
- Coke ovens;
- Cement clinker manufacture;
- Lime manufacture;
- Other plant regulated under IPC;
- Other sites for which ETS annual emissions data for 2005 were available;
- Combustion processes not subject to regulation as combustion processes under IPC but included in the EU carbon emission trading scheme (EU-ETS).

The data presented in this report are not fully consistent with the UK Greenhouse Gas Inventory (including the Devolved Administration GHGI) because of the use of data reported by operators and also the EU-ETS dataset. This has provided better information on the fuels used at industrial and commercial sites but the total fuel use across the UK is therefore different from that reported in DUKES. Full details of the method used to derive the fuel use estimates are provided in Annex 1 of the 2004 report (King et al, 2007) and remains applicable for the current study.

For the purposes of reporting fuel consumption by fuel type a simplified classification of fuel types has been used. This is shown in Table 6.

Table 6 Fuel categories for reporting fuel consumption

Fuel Name	Fuel Category		Fuel Name	Fuel Category
Aviation turbine fuel	Petroleum		Anthracite	Coal
Burning oil	Petroleum		Coal	Coal
Flare gas	Petroleum		Coke	Manufactured solid fuels
Fuel oil	Petroleum		SSF	Manufactured solid fuels
Gas oil	Petroleum		Wood	Wastes & biofuels
LPG	Petroleum		Waste	Wastes & biofuels
Lubricants	Petroleum		Waste solvents	Wastes & biofuels
Naphtha	Petroleum		Biomass	Wastes & biofuels
OPG	Petroleum		MSW	Wastes & biofuels
Orimulsion	Petroleum		Scrap tyres	Wastes & biofuels
Petrol	Petroleum		Clinical waste	Wastes & biofuels
Petroleum coke	Petroleum			

3.3.2 Employment based distributions for area sources

To distribute the fuel consumption estimates over all of the local authorities for the small industrial combustion, public services, commercial and agriculture (stationary combustion) sectors the following data sets are used:

- Office of National Statistics Inter-Departmental Business Register (IDBR) 2005 which provides data on employment at business unit level by Standard Industrial Classification (SIC) code; and
- DTI Energy Consumption in the UK data on industrial and commercial sector fuel usage for 2002. (DTI, undated report, Tables 4.6, 5.2 and 5.5)

The SIC codes in the IDBR database were matched with the DTI energy datasets in order to calculate total employment by DTI energy sector. From this a fuel intensity per employee was calculated.

These intensities could then be applied to employment distributions across the UK to make maps of fuel use.

In the case of the industrial sectors this energy intensity calculation was made at the level of 4 figure SIC codes (over 250 separate industry types) to retain the level of detail required for the mapping. Any aggregation of SIC codes would have resulted in a reduction in the quality of the final distribution. The DTI fuel data was reported for coal, manufactured fuel (SSF), LPG, gas oil and fuel oil. These were aggregated to calculate industry specific fuel intensities for Coal, SSF, Oil and Gas.

In the case of the commercial and public service sectors the employment data were aggregated to be equivalent to the energy data provided by DTI. These sectors are shown in Table 7. There was not sufficient data to be able to calculate a fuel specific fuel intensity factor for these sectors. Therefore a total fossil fuel intensity factor was calculated.

Table 7 Service sector energy consumption sub-sectors and NAEI sectors

Service sector energy consumption sub-sectors	NAEI emissions sector
Commercial Offices	Commercial
Communication and Transport	Commercial
Hotel and Catering	Commercial
Other	Commercial
Retail	Commercial
Sport and Leisure	Commercial
Warehouses	Commercial
Education	Public admin & services
Government	Public admin & services
Health	Public admin & services

The IDBR employment data at local unit level were aggregated to 4 figure SIC codes at 1km resolution using grid references provided as part of the database. The employment totals for each sector were then multiplied by the appropriate fuel intensity values to make fuel use distributions across the UK. These were then used to distribute CO₂ emissions for the relevant sector from the NAEI for 2005. It has been assumed that fuel intensity for each sector is even across the sector. This is a simplification of reality but necessary because of lack of more detailed estimates of fuel use.

As a result of the lack of detailed information about the fuel types used by the commercial and service sectors, a simple assumption was used to decide where the different fuels were used. Gas is assumed to be used in urban areas where there is a gas supply (based on postcode sector level data from National Grid Transco and a percentage continuous urban land cover at 1km resolution of greater than 10%). For all other areas a mix of fuels is assumed according to the national mix of fuel used in the relevant service sector using data from the NAEI derived from DUKES.

Wood combustion by industry was distributed on the same basis as coal and is therefore quite uncertain.

3.3.3 Industrial off-road fuel use

For some sectors a simple map of employment has been used instead of fuel use. These are mostly for sectors where process emissions are important but also for estimating the distribution of industrial off-road emissions. These have been mapped using a distribution of employment in heavy industries.

3.3.4 Agriculture

Agriculture fuel use is mapped using employment distributions as described in the section above.

Agriculture off-road data are distributed using a combination of arable, pasture and forestry land use data. Each of these land cover classes was weighted according to the off-road machinery activity on

each land use. This used data on the number of hours of use of tractors and other machinery on these land use types, sourced by AEA Energy and Environment for improving the UK inventory in this sector.

3.4 Waste and Renewables

Estimates for renewable energy sources were made for combustion of wood, poultry litter, municipal solid waste (MSW) and clinical waste incineration. Point source data were made for all UK MSW incinerators and all four sites generating electricity from poultry litter. No point source data are available for other renewable energy sources and regional estimates have been made using NAEI distributions. In the case of wood, distributions developed specifically for coal combustion have had to be used since no distribution for wood exists. The distribution of clinical waste incineration relies upon data concerning the location of hospitals.

3.5 Aggregation of fuel consumption to Local Authority level

Prior to the aggregation of the fuel consumption data to local authority level the data required converting to a common unit. The fuel consumption data came either in mega tonnes or mega therms depending on the fuel type. If the fuel was gaseous the units were given in mega therms and if the fuel type was solid or liquid it was given in mega tonnes. A mega tonne of burning oil does not offer the same amount of energy as the same mass of gas oil. Therefore, for this project the original fuel consumption data in mega tonnes and mega therms were converted to thousand tonnes of oil equivalent (KTOE) by employing the appropriate conversion factor (Table 8), converting from giga joules to tera joules by dividing by a thousand and then multiplying by 0.023885 to convert from Tera joules to thousand tonnes of oil equivalent.

The calculations of fuel consumption for all of the sectors has been done by using the NAEI 1km resolution maps and point sources at known locations. A map of Local Authorities boundaries has been used to assign each 1km square of the NAEI maps to a Local Authority. The 1 kilometre emission maps could then be aggregated up to Local Authority level. However, there are a few 1 kilometre squares that have not been allocated to Local Authorities because of a slight mismatch in the GIS files used (if the centre of a 1km square falls in a location that is not in a Local Authority then it is unallocated). This means that some coastal squares are not included and has resulted in roughly 1% of the area source emissions being unallocated.

Table 8 Conversion factors employed for conversion into giga joules (DUKES, 2006)

Activity Name	Fuel Category	Units	Conversion factor	Conversion Factor Name
Aviation	Oils	tonnes	46.2	Aviation turbine fuel
Burning oil	Oils	tonnes	46.2	Burning oil
DERV	Oils	tonnes	45.7	Gas/diesel oil (DERV)
Flare gas	Oils	tonnes	50.7	Ethane (petroleum product not manufactured solid fuel)
Fuel oil	Oils	tonnes	43.5	Fuel oil
Gas oil	Oils	tonnes	45.7	Gas/diesel oil (DERV)
LPG & OPG	Oils	Mtherms	2.5	N/A
Lubricants	Oils	tonnes	45.7	Crude oil (weighted average)
Petrol	Oils	tonnes	47.0	Motor spirit
Anthracite	Solid fuels	tonnes	33.8	Domestic - Anthracite and dry steam coal
Coal	Solid fuels	tonnes	30.7	Domestic - House coal
Coal	Solid fuels	tonnes	29.8	Coal - Collieries (Industrial - Collieries combustion)
Coal	Solid fuels	tonnes	30.5	Low temp. carbonisation plant & manufactured fuel plants (Industrial - Solid smokeless fuel production)
Coal	Solid fuels	tonnes	25.5	Other industry (wt'ed mean Autogenerators)
Coal	Solid fuels	tonnes	25.5	Other industry (wt'ed mean Other industry combustion)
Coal	Solid fuels	tonnes	28.0	Agriculture
Coal	Solid fuels	tonnes	29.4	Other consumers (Public sector combustion)
Coke	Solid fuels	tonnes	29.6	Coke (including low temperature carbonisation cokes)
Petroleum coke	Solid fuels	tonnes	35.8	Petroleum coke (Table A.2)
Scrap tyres	Solid fuels	tonnes	32.0	Tyres
SSF	Solid fuels	tonnes	32.5	Other manufactured solid fuel
Clinical waste	Wastes & biofuels	tonnes	14.0	Hospital waste
MSW	Wastes & biofuels	tonnes	9.5	Municipal solid waste
Waste	Wastes & biofuels	tonnes	16.0	General industrial waste
Waste solvents	Wastes & biofuels	tonnes	42.9	Non-fuel products (notional value)
Wood - Domestic	Wastes & biofuels	tonnes	10.0	Domestic wood
Wood - Industrial	Wastes & biofuels	tonnes	11.9	Industrial wood

Source: Tables A1 and A1 DUKES, 2006

4 Results

The following table presents the results of this work and shows local authority fuel consumption totals in thousand tonnes of oil equivalent (KTOE).

Although there have been no detailed changes in methodology for characterising the UK's non-gas, non-road transport, non-electric fuel use, some changes in the distribution of fuel use in the NAEI's underlying spatial inventory have been made as part of the inventory's continuous improvement programme. As a result, the datasets for 2003, 2004 and 2005 are not directly comparable.

Table 9 Total fuel consumption by Local Authority (KTOE of fuel consumed)

Local authority	Total	Local authority	Total
ABERDEENSHIRE	427.8	MALDON	13.2
ADUR	6.5	MALVERN HILLS	26.4
ALLERDALE	46.2	MANCHESTER	56.5
ALNWICK	16.1	MANSFIELD	10.6
AMBER VALLEY	46.4	MEDWAY	22.7
ANGUS	33.8	MELTON	16.9
ANTRIM	60.3	MENDIP	46.7
ARDS	74.1	MERTHYR TYDFIL	10.5
ARGYLL AND BUTE	60.5	MERTON	6.9
ARMAGH	64.9	MID BEDFORDSHIRE	36.4
ARUN	16.3	MID DEVON	39.3
ASHFIELD	19.9	MID SUFFOLK	31.7
ASHFORD	32.0	MID SUSSEX	18.5
AYLESBURY VALE	39.5	MIDDLESBROUGH	12.4
BABERGH	32.2	MIDLOTHIAN	9.9
BALLYMENA	81.0	MILTON KEYNES	30.2
BALLYMONEY	30.7	MOLE VALLEY	17.7
BANBRIDGE	47.2	MONMOUTHSHIRE	47.8
BARKING AND DAGENHAM	12.0	MORAY	32.2
BARNET	8.5	MOYLE	18.2
BARNSLEY	51.6	NEATH PORT TALBOT	350.6
BARROW-IN-FURNESS	8.0	NEW FOREST	1,292.9
BASILDON	25.2	NEWARK AND SHERWOOD	26.3
BASINGSTOKE AND DEANE	60.7	NEWBURY	58.4
BASSETLAW	38.6	NEWCASTLE UPON TYNE	21.8
BATH AND NORTH EAST SOMERSET	39.3	NEWCASTLE-UNDER-LYME	19.0
BEDFORD	35.2	NEWHAM	14.1
BELFAST	203.2	NEWPORT	51.7
BERWICK-UPON-TWEED	16.8	NEWRY AND MOURNE	93.3
BEXLEY	20.4	NEWTOWNABBEY	64.1
BIRMINGHAM	119.2	NORTH AYRSHIRE	49.9
BLABY	13.3	NORTH CORNWALL	46.0
BLACKBURN	31.1	NORTH DEVON	49.1
BLACKPOOL	6.2	NORTH DORSET	29.1
BLAENAU GWENT	16.0	NORTH DOWN	59.5
BLYTH VALLEY	18.3	NORTH EAST DERBYSHIRE	29.3

Local authority	Total	Local authority	Total
BOLSOVER	127.4	NORTH EAST LINCOLNSHIRE	52.8
BOLTON	33.2	NORTH HERTFORDSHIRE	22.8
BORDERS	60.6	NORTH KESTEVEN	25.8
BOSTON	15.5	NORTH LANARKSHIRE	56.3
BOURNEMOUTH	8.3	NORTH LINCOLNSHIRE	1,800.6
BRACKNELL FOREST	9.4	NORTH NORFOLK	111.9
BRADFORD	61.4	NORTH SHROPSHIRE	30.9
BRAINTREE	33.8	NORTH TYNESIDE	23.2
BRECKLAND	42.3	NORTH WARWICKSHIRE	21.5
BRENT	12.6	NORTH WEST LEICESTERSHIRE	23.5
BRENTWOOD	8.9	NORTH WEST SOMERSET	53.4
BRIDGEND	63.7	NORTH WILTSHIRE	64.4
BRIDGNORTH	23.1	NORTHAMPTON	19.5
BRIGHTON & HOVE	11.6	NORWICH	32.9
BROADLAND	70.6	NOTTINGHAM	25.3
BROMLEY	11.3	NUNEATON AND BEDWORTH	9.5
BROMSGROVE	18.5	OADBY AND WIGSTON	8.0
BROXBOURNE	9.1	OLDHAM	25.0
BROXTOWE	16.3	OMAGH	56.5
BURNLEY	14.0	ORKNEY ISLANDS	23.7
BURY	17.3	OSWESTRY	16.9
CAERPHILLY	44.7	OXFORD	20.3
CALDERDALE	40.1	PEMBROKESHIRE	776.6
CAMBRIDGE	6.7	PENDLE	20.6
CAMDEN	7.7	PENWITH	15.8
CANNOCK CHASE	15.3	PERTH AND KINROSS	48.8
CANTERBURY	16.1	PETERBOROUGH	25.7
CARADON	31.1	PLYMOUTH	34.9
CARDIFF	32.0	POOLE	21.0
CARLISLE	39.4	PORTSMOUTH	27.0
CARMARTHENSHIRE	105.3	POWYS	89.9
CARRICK	26.3	PRESTON	14.8
CARRICKFERGUS	30.3	PURBECK	67.5
CASTLE MORPETH	17.8	READING	12.6
CASTLE POINT	3.5	REDBRIDGE	6.3
CASTLEREAGH	43.2	REDCAR AND CLEVELAND	699.7
CEREDIGION	54.1	REDDITCH	15.2
CHARNWOOD	26.8	REIGATE AND BANSTEAD	11.0
CHELMSFORD	25.2	RENFREWSHIRE	32.8
CHELTENHAM	17.7	RESTORMEL	31.1
CHERWELL	50.0	RHONDDA, CYNON, TAFF	57.0
CHESTER	26.0	RIBBLE VALLEY	121.8
CHESTERFIELD	16.5	RICHMOND UPON THAMES	4.4
CHESTER-LE-STREET	6.9	RICHMONDSHIRE	19.8
CHICHESTER	33.3	ROCHDALE	31.3
CHILTERN	18.8	ROCHFORD	8.7
CHORLEY	20.7	ROSSENDALE	15.5

Local authority	Total	Local authority	Total
CHRISTCHURCH	6.9	ROTHER	21.0
CITY AND COUNTY OF THE CITY OF LONDON	1.2	ROTHERHAM	59.4
CITY OF ABERDEEN	43.3	RUGBY	129.9
CITY OF BRISTOL	82.5	RUNNYMEDE	6.4
CITY OF DUNDEE	70.9	RUSHCLIFFE	25.9
CITY OF EDINBURGH	46.8	RUSHMOOR	8.7
CITY OF GLASGOW	45.7	RUTLAND	92.8
CITY OF KINGSTON UPON HULL	46.6	RYEDALE	30.0
CITY OF WESTMINSTER	9.1	SALFORD	22.8
CLACKMANNAN	37.5	SALISBURY	43.1
COLCHESTER	20.5	SANDWELL	44.2
COLERAINE	65.0	SCARBOROUGH	23.3
CONGLETON	29.2	SEDFIELD	67.9
CONWY	26.7	SEDEMOOR	45.3
COOKSTOWN	143.7	SEFTON	16.9
COPELAND	14.5	SELBY	45.9
CORBYP	17.4	SEVENOAKS	18.8
COTSWOLD	124.5	SHEFFIELD	90.5
COUNCIL OF THE ISLES OF SCILLY	3.4	SHEPWAY	14.5
COVENTRY	51.7	SHETLAND ISLANDS	53.7
CRAIGAVON	123.2	SHREWSBURY AND ATCHAM	28.0
CRAVEN	26.8	SLOUGH	29.2
CRAWLEY	24.9	SOLIHULL	54.5
CREWE AND NANTWICH	35.6	SOUTH AYRSHIRE	36.6
CROYDON	7.4	SOUTH BEDFORDSHIRE	37.3
DACORUM	20.8	SOUTH BUCKS	15.5
DARLINGTON	18.5	SOUTH CAMBRIDGESHIRE	94.8
DARTFORD	23.5	SOUTH DERBYSHIRE	37.9
DAVENTRY	24.9	SOUTH GLOUCESTER	68.1
DENBIGHSHIRE	36.7	SOUTH HAMS	40.9
DERBY	61.0	SOUTH HOLLAND	22.6
DERBYSHIRE DALES	51.2	SOUTH KESTEVEN	30.6
DERWENTSIDE	24.2	SOUTH LAKELAND	43.2
DONCASTER	75.9	SOUTH LANARKSHIRE	80.7
DOUGLAS	7.6	SOUTH NORFOLK	40.9
DOVER	23.0	SOUTH NORTHAMPTONSHIRE	22.3
DOWN	63.8	SOUTH OXFORDSHIRE	46.3
DUDLEY	32.2	SOUTH RIBBLE	21.9
DUMFRIES AND GALLOWAY	105.6	SOUTH SHROPSHIRE	25.1
DUNGANNON	73.0	SOUTH SOMERSET	79.3
DURHAM	20.0	SOUTH STAFFORDSHIRE	24.0
EALING	21.8	SOUTH TYNESIDE	10.9
EASINGTON	16.1	SOUTHAMPTON	18.2
EAST AYRSHIRE	53.0	SOUTHEND-ON-SEA	6.6
EAST CAMBRIDGESHIRE	26.9	SOUTHWARK	10.2
EAST DEVON	42.0	SPELTHORNE	9.5
EAST DORSET	20.3	ST ALBANS	13.4

Local authority	Total	Local authority	Total
EAST DUNBARTONSHIRE	10.9	ST EDMUNDSBURY	64.0
EAST HAMPSHIRE	26.8	ST HELENS	32.6
EAST HERTFORDSHIRE	28.4	STAFFORD	36.5
EAST LINDSEY	78.9	STAFFORDSHIRE MOORLANDS	221.1
EAST LoTHIAN	188.8	STEVENAGE	8.9
EAST NORTHAMPTONSHIRE	16.0	STIRLING	31.8
EAST RENFREWSHIRE	10.7	STOCKPORT	27.8
EAST RIDING OF YORKSHIRE	264.0	STOCKTON-ON-TEES	467.9
EAST STAFFORDSHIRE	34.5	STOKE-ON-TRENT	42.3
EASTBOURNE	8.0	STRABANE	41.5
EASTLEIGH	22.8	STRATFORD-ON-AVON	40.7
EDEN	40.2	STROUD	45.1
ELLESMERE PORT AND NESTON	1,048.6	SUFFOLK COASTAL	22.6
ELMBRIDGE	10.3	SUNDERLAND	56.5
ENFIELD	15.2	SURREY HEATH	7.9
EPPING FOREST	15.8	SUTTON	4.4
EPSOM AND EWELL	2.9	SWALE	29.5
EREWASH	16.2	SWANSEA	47.4
EXETER	15.4	SWINDON	40.6
FALKIRK	1,213.5	TAMESIDE	34.9
FAREHAM	12.3	TAMWORTH DISTRICT	7.5
FENLAND	25.0	TANDRIDGE	12.6
FERMANAGH	102.4	TAUNTON DEANE	33.2
FIFE	163.7	TEESDALE	17.8
FLINTSHIRE	144.8	TEIGNBRIDGE	38.5
FOREST HEATH	13.8	TENDRING	33.6
FOREST OF DEAN	37.6	TEST VALLEY	47.0
FYLDE	24.4	TEWKESBURY	35.1
GATESHEAD	33.5	THANET	14.2
GEDLING	10.1	THE WREKIN	42.9
GLOUCESTER	13.2	THREE RIVERS	9.3
GOSPORT	7.3	THURROCK	675.4
GRAVESHAM	274.0	TONBRIDGE AND MALLING	44.8
GREAT YARMOUTH	13.2	TORBAY	21.4
GREENWICH	17.2	TORFAEN	21.3
GUILDFORD	21.4	TORRIDGE	30.7
GWYNEDD	50.1	TOWER HAMLETS	6.5
HACKNEY	3.9	TRAFFORD	42.1
HALTON	48.3	TUNBRIDGE WELLS	17.8
HAMBLETON	47.9	TYNEDALE	30.3
HAMMERSMITH AND FULHAM	9.4	UTTLESFORD	34.9
HARBOROUGH	20.1	VALE OF GLAMORGAN	143.1
HARINGEY	6.0	VALE OF WHITE HORSE	46.1
HARLOW	6.9	VALE ROYAL	39.1
HARROGATE	42.5	WAKEFIELD	63.5
HARROW	9.1	WALSALL	38.4

Local authority	Total	Local authority	Total
HART	18.1	WALTHAM FOREST	6.2
HARTLEPOOL	14.9	WANDSWORTH	9.9
HASTINGS	9.3	WANSBECK	749.3
HAVANT	21.6	WARRINGTON	55.7
HVERING	12.3	WARWICK	26.8
HEREFORDSHIRE	79.9	WATFORD	4.5
HERTSMERE	10.1	WAVENEY	24.6
HIGH PEAK	355.9	WAVERLEY	15.9
HIGHLAND	139.5	WEALDEN	34.2
HILLINGDON	56.0	WEAR VALLEY	11.8
HINCKLEY AND BOSWORTH	26.8	WELLINGBOROUGH	15.4
HORSHAM	33.5	WELWYN HATFIELD	21.4
HOUNSLOW	11.1	WEST DEVON	29.6
HUNTINGDONSHIRE	38.4	WEST DORSET	39.6
HYNDBURN	15.5	WEST DUNBARTONSHIRE	13.6
INVERCLYDE	21.1	WEST LANCASHIRE	35.8
IPSWICH	9.1	WEST LINDSEY	62.4
ISLE OF ANGLESEY	38.9	WEST LoTHIAN	40.9
ISLE OF WIGHT	28.7	WEST OXFORDSHIRE	33.8
ISLINGTON	4.9	WEST SOMERSET	17.4
KENNET	39.4	WEST WILTSHIRE	162.6
KENSINGTON AND CHELSEA	3.9	WESTERN ISLES	19.7
KERRIER	31.1	WEYMOUTH AND PORTLAND	6.4
KETTERING	17.2	WIGAN	45.6
KINGS LYNN AND WEST NORFOLK	42.0	WINCHESTER	38.4
KINGSTON UPON THAMES	5.9	WINDSOR AND MAIDENHEAD	35.8
KIRKLEES	82.4	WIRRAL	52.8
KNOWSLEY	28.0	WOKING	6.6
LAMBETH	3.3	WOKINGHAM	23.2
LANCASTER	23.3	WOLVERHAMPTON	30.8
LARNE	30.8	WORCESTER	21.8
LEEDS	100.9	WORTHING	11.2
LEICESTER	41.1	WREXHAM	56.9
LEWES	16.5	WYCHAVON	41.9
LEWISHAM	4.0	WYCOMBE	34.3
LICHFIELD	26.2	WYRE	16.7
LIMAVADY	31.9	WYRE FOREST	23.6
LINCOLN	12.9	YORK	28.8
LISBURN	90.4		
LIVERPOOL	36.3		
LONDONDERRY	126.5		
LUTON	16.5		
MACCLESFIELD	56.2		
MAGHERAFELT	49.1		
MAIDSTONE	28.1		

5 Recommendations for improvements

Previous reports have eluded to a number of improvements to the NAEI's fuel consumption estimates and those presented in this report. Many of these have depended on developing datasets from local authorities, trade organisations and other bodies specifically for this purpose. The costs and uncertainties associated in generating such datasets has historically been a barrier to their production. As a result, recommendations in this report focus on recognised robust and readily available datasets for the purpose of improving fuel use estimates.

Fuels used by large point sources are compiled in the NAEI's point source database. Included in this database are emissions from all regulated processes in the UK, all installations covered by the EU-ETS and other sites that are significant sources of pollution and for which appropriate data are available to the NAEI. However there are a large number of smaller industrial and commercial sources for which data are not available in a consistent format across the UK. Therefore, proxy data relating to employment and/or energy use are currently used to estimate emissions from these sources, as detailed elsewhere in this report.

Our recommendation for improving both the fuel use estimates presented in this series of reports and the NAEI's emission estimates, is to update this proxy data for spatially disaggregating fuel use and emissions for smaller point sources. Because of the complexity in developing such proxy data and the fact that, on an annual cycle the distributions change very little, this information is only periodically updated within the NAEI. The current level of data within the NAEI systems were last updated in 2003 using data provided by the Office of National Statistics Inter-Departmental Business Register (IDBR) database. Our recommendation is to re-evaluate prior assumptions based on the most current IDBR dataset and energy statistics by industrial and commercial sector provided by BERR.

6 Summary

This report has presented the 2005 Local Authority fuel use estimates for the UK as determined by AEA Energy and Environment. These data were compiled using national spatial data and attempts to locate fuel consumption where they occur. Only very limited local knowledge or data has been used due to the resource limitations of this project. Therefore, there are a number of sectors that have a high level of uncertainty in the data. These sectors include the combustion of coal and liquid fuels in small industry/commercial/public service and domestic. The uncertainties arise because there is very limited knowledge of the spatial distribution of coal and liquid fuel use.

Several improvements have been made to the methodology employed to derive the 2005 estimates. Most important is the development and use of the EU-ETS dataset, however the revision of the spatial distribution of domestic fuel consumption to include Northern Ireland is also a significant. Due to these methodological revisions and other small changes in the emissions mapping methodology, it is not possible to directly compare the 2005 dataset with those produce in previous years

Improved survey data on, or spatial reporting by, small industrial and commercial solid and liquid fuel consumption would improve the local and regional estimates significantly (by an order of magnitude).

This work does not take into account localised renewable consumption or energy efficiency through the use of CHP. If used as an indicator (e.g. by dividing the total or sub totals by the population or GDP) some misleading results will occur due to the over simplification of the consumption allocations and the lack of local knowledge.

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http://www.airquality.co.uk/archive/reports/cat05/0401151142_NI_PAH_draftv4.pdf

Emissions data used in this work can be found on the following websites:

Pollution Inventory - www.environment-agency.gov.uk/business/444255/446867/255244/?version=1&lang=e

Scottish Pollutant Release Inventory - www.sepa.org.uk/spri/index.htm

NAEI data including estimates of emissions from sources other than those given in the Pollution Inventory and Scottish Pollutant Release Inventory can be obtained from www.naei.org.uk.



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