National
Atmospheric
Emissions
Inventory

Report

Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990 – 2006

A report of the National Atmospheric Emissions Inventory
AEA

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Air Quality Pollutant Inventories for England, Scotland, Wales and Northern Ireland: 1990 – 2006

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Preface

This is the Air Quality Pollutant Inventory Report for England, Scotland, Wales and Northern Ireland, submitted in the year 2008 to the UK Department for Environment, Food & Rural Affairs, the Scottish Government, the National Assembly for Wales and the Department of Environment for Northern Ireland. It contains emission inventories for the constituent countries of the UK for the period 1990 to 2006, for the following priority Air Quality (AQ) pollutants:

- Ammonia (NH_3)
- Carbon monoxide (CO)
- Nitrogen oxides (NO_X as NO_2)
- Non-methane volatile organic compounds (NMVOCs)
- Sub-10 micron particulate matter (PM_{10})
- Sulphur dioxide (SO_2)

The report provides a description of the inventory estimation methodology and a summary of how these inventories have been derived as part of an ongoing programme of development of the National Atmospheric Emissions Inventory.

The emission estimates for each pollutant are presented in NFR format, to be consistent with presentational formats required for the UK's annual inventory submissions to the United Nations Economic Commission for Europe (UNECE). These air quality pollutant inventories are based on the same datasets used by the National Atmospheric Emissions Inventory (NAEI) for reporting atmospheric emissions under international agreements and are consistent with the NAEI where possible.

This inventory is compiled on behalf of the UK Department for Environment, Food & Rural Affairs (Air & Environmental Quality Division) and the Devolved Administrations, by AEA. We acknowledge the support and advice from DEFRA and the Devolved Administrations throughout the work, and are grateful to all those who have contributed to this report.

Executive Summary

This report presents emission inventories for priority air quality pollutants for the constituent countries of the UK. The pollutant species reported are:

- Ammonia (NH_3)
- Carbon monoxide (CO)
- Nitrogen oxides (reported as nitrogen dioxide) (NO_X as NO_2)
- Non-methane volatile organic compounds (NMVOC)
- Sub-10 micron particulate matter (PM_{10})
- Sulphur dioxide (SO_2)

The estimates have been compiled by disaggregating the UK emission totals presented within "UK Emissions of Air Pollutants 1970 to 2006" (Dore *et al.*, 2008), derived from the National Atmospheric Emissions Inventory (NAEI) database. The UK data is compiled annually in accordance with the requirements of United Nations Economic Commission for Europe (UNECE) reporting guidelines and submitted to the Convention on Long-Range Transboundary Air Pollution (CLRTAP).

The study method for disaggregating UK emission totals across the constituent countries draws on a combination of point source data (e.g. Pollution Inventory[1] data for industrial emissions) and regional and local datasets such as:

- Regional statistics on energy use (e.g. the BERR regional energy statistics) or other raw material consumption
- Major road traffic counts
- Domestic and international flight data for all major UK airports
- Passenger rail company fuel use data
- Regional housing, population and consumption data
- Agricultural surveys (livestock numbers, crop production, fertiliser application)
- Land use survey data

Some emissions, mainly off – road mobile machinery and offshore sources, cannot be allocated to any country, so an unallocated category is used to report these.

The disaggregation of air quality (AQ) pollutant emissions across the four constituent countries of the UK has been conducted twice previously, using the 1990-2003 and 1990-2005 NAEI dataset; this report presents the ongoing development of methodologies to provide AQ emission estimates for the Devolved Administrations (DAs), in many cases using data management systems and datasets developed to provide DA greenhouse gas inventories in recent years.

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[1] The term "Pollution Inventory" is used here to represent the industrial emissions databases of the UK environmental regulators (The Environment Agency of England & Wales, the Scottish Environmental Protection Agency and the Northern Ireland Department of Environment), which comprise annual emission estimates from all IPC/IPPC-regulated processes under their authority.

For many sources of AQ pollutants, the data available for constituent country emissions are less detailed than for the UK as a whole, and for some sources, country-level data are not available at all. In particular, complete sets of fuel consumption data are not available for England, Wales and Scotland. In the compilation of these inventories, regional energy statistics from BERR have been used, although some elements of these data are regarded as experimental; for example the solid and liquid fuel use patterns are modelled, based on local gas and electricity data.

For other key emission sources there are more reliable and complete, country-level datasets available either through plant operator data (e.g. for industrial processes that are regulated under IPPC, WML or EU-ETS) or from regional surveys (e.g. for agricultural or land use change and forestry sources).

In some instances where regional data are not available, current local mapping grids have been used; these mapping grids are commonly based on census and other survey data that are periodically updated and used within UK emissions mapping and modelling work.

In many source sectors, there is insufficient local data available back to 1990, and assumptions and extrapolations of available datasets have frequently been used to present a time-series of air quality pollution emissions.

As a result of these data availability issues, it should be noted that the AQ pollutant emission inventories for the England, Scotland, Wales and Northern Ireland are subject to greater uncertainty than the equivalent UK inventories.

The main findings of this report are summarised below:

Carbon monoxide (CO)
UK emissions in 2006 (2.3 Mt) represent a 72% reduction on the emissions in 1990. UK emissions of CO are dominated by those from road transport (43% of UK emissions in 2006).

The change in emissions between 1990 and 2006 is dominated by the reduction in emissions from the road transport sector, caused by the increased use of catalytic converters in cars; this trend is evident for all DAs. For Scotland and Northern Ireland, decreased emissions from the commercial and domestic sectors also make a significant contribution to the time trend (due to a decrease in the use of solid fuels). In Wales, emissions arising from industrial combustion and processes make a larger relative contribution, and whilst these emissions have decreased, they have declined at a lower rate than emissions from road transport.

Non-methane volatile organic compounds (NMVOCs)
UK emissions of NMVOC are estimated as 2.4 Mt for 1990 and 0.91 Mt for 2006, a decrease of 62%. The observed decrease arises primarily from the road transport and industrial sectors, but is evident generally across all sources.

England, Wales and Northern Ireland show generally similar trends with time. In Scotland the emissions from Oil and Gas Processes and Industrial Processes make a considerably higher contribution to the total, although data reported by oil terminals appears to be incomplete and / or inconsistent over the time-series. The percentage reduction from these sources are less than those observed for road transport, and as a result the trend with time indicates that emissions in Scotland do not fall to the same extent as other DAs.

Nitrogen oxides reported as nitrogen dioxide (NO_X as NO_2)
UK emissions of NO_X were 3.0 Mt in 1990. Emissions have fallen significantly to 1.6 Mt in 2006, representing a 46% reduction on the 1990 emissions estimate. This is primarily a consequence of abatement measures in road transport and at coal-fired power stations, and the increased use of other fuels for power generation. Road transport and coal combustion combine to account for 53% of UK emissions in 2006.

Emissions from all of the DAs show broadly similar trends over time, with a few notable differences. For example, emissions from the Energy Industry in Wales initially reduced significantly, but have shown a gradual increase since 1999 due to an increase in the use of coal in power generation.

Sulphur dioxide (SO_2)
UK emissions of sulphur dioxide have fallen from 3.7 Mt in 1990 to 0.7 Mt in 2006, representing a decrease of 82%. This is a result of reduced emissions from the industrial and public power sectors arising from the decreasing use of coal and increasing use of abatement equipment.

The trends with time for the DAs are generally similar with power generation dominating and emissions falling rapidly across the time series. Significant differences between the DAs include: the varying importance of industrial combustion – this ranges from a 10% to 17% contribution. and the relatively high emissions from the domestic sector in Northern Ireland (11% of the 2006 total, compared to a UK average of 3%, primarily due to the greater use of solid fuels).

Ammonia (NH_3)
The total UK emission of ammonia for 2006 is estimated at 0.31 Mt, compared to the 1990 estimate of 0.38 Mt, representing an 18% reduction. The agricultural sector dominates ammonia emissions, which have declined since 1999, most notably in England. There have been increases in the emissions from the road transport sector (caused by increased use of catalytic converters, although emissions are now declining due to the introduction of second generation catalysts which emit less NH_3), but these have been more than offset by the impacts of reducing livestock numbers.

Agricultural emissions dominate all DA inventories; the contribution varies from 89% to 98%.

Sub-10 micron Particulate Matter (PM_{10})
The UK emissions of PM_{10} declined by 50% from 1990 to 0.15 Mt in 2006. This reflects a trend away from coal use particularly by domestic users. However, coal combustion still contributed 10% of UK emissions of PM_{10} in 2006, whilst road transport sources contributed a further 21%.

The relative emissions across the DAs reflect characteristics already highlighted in other pollutants. Emissions from England show proportionally higher emissions from the road transport sector (23.6% compared to 21.3% UK-wide in 2006) and emissions from Northern Ireland show proportionally higher emissions from the domestic sector (45% compared to 14% UK-wide in 2006) due to the more extensive use of solid fuels.

Contacts

This work forms part of the Air & Environmental Quality Research Programme of the Department for Environment, Food and Rural Affairs (Contract RMP/2106). The land use, land use change and forestry estimates were provided by the Centre for Ecology and Hydrology (Edinburgh) (Contract CPEG 1). The Institute of Grassland and Environmental Research (IGER) provide the estimates of agricultural emissions.

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A copy of this report and related data may be found on the website maintained by AEA for Defra: http://www.naei.org.uk

Contents

1 Introduction

1.1 BACKGROUND TO INVENTORY DEVELOPMENT FOR THE DEVOLVED ADMINISTRATIONS

This study to develop DA-level AQ pollutant datasets has been commissioned by Defra Air & Environmental Quality Division in order to better inform energy and environmental policy-makers within the Devolved Administrations in their pursuit of objectives set by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS for ESWNI). These objectives also contribute to the UK's targets as a whole in terms of meeting both national and international targets on both local and transboundary air pollution.

The provision of DA-level datasets and subsequent identification of key sources at more regional and local levels is a key step to enable prioritisation of local action and to highlight the potential impacts of specific policies and measures. The time-series of AQ pollutant emissions provides an insight into the effects of environmental policies through the 1990s, and can help to identify where win-win policies could be pursued to achieve both AQ and GHG policy goals.

1.1.1 Air quality emission reduction drivers

Overall air quality in the UK is currently estimated to be better than at any time since the industrial revolution. However air pollution is still estimated to reduce the life expectancy of every person in the UK by an average of 7-8 months (AQS, 2007). A number of policies are currently in place in an attempt to improve air quality, including the air quality strategy for England, Scotland, Wales and Northern Ireland.

Air Quality Strategy for England, Scotland, Wales and Northern Ireland

The original National Air Quality Strategy (NAQS) published in 1997 (DOE 1997) set out a framework of standards and objectives for the air pollutants of most concern (SO_2, PM_{10}, NO_X, CO, lead, benzene, 1,3-butadiene and tropospheric ozone). The aim of the strategy was to reduce the air pollutant impact on human health by reducing airborne concentrations.

The NAQS identified air quality standards for 8 priority pollutants based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) or World Health Organisation (WHO) guidance where no EPAQS recommendation existed. The NAQS has been subject to periodic review, with consultation documents being published in 1998 and 2001 (DETR 1998a, Defra 2001), and has subsequently evolved into the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS for ESWNI), with the same goals. A second edition of the strategy was published in 2000 (DETR 2000), identifying further revisions and focused on the incorporation of air quality limit values in European Directives, and the impacts of devolution. On 17 July 2007 a new Air Quality Strategy was published by Defra and the Devolved Administrations. The details of this AQS can be found on the Defra website at:
(http://www.defra.gov.uk/environment/airquality/strategy/index.htm)

The new Air Quality Strategy supersedes previous versions and covers the whole of the UK, therefore including DA-specific objective values that were previously detailed in addenda to the previous AQS.

Air Quality Framework Directive

The air quality framework directive (AQFD) is an EU directive that provides a framework for setting limit values, assessing concentrations and managing air quality to avoid exceeding the limits for air pollutants known to be harmful to human health and the environment via a series of daughter directives (DD).

Currently limit values are set for twelve pollutants under the AQFD. These include NO_x, SO_2, PM and CO. The first of these daughter directives requires that member states report annually to the European Commission on whether limits have been achieved.

UN/ECE's Convention on Long-Range Transboundary Air Pollution

The UK is committed to reducing acidifying gas and ozone precursor emissions and is a party to several protocols under the UNECE's Convention on Long-Range Transboundary Air Pollution.

Under the Second Sulphur Protocol, the UK must reduce its total SO_2 emissions by 50% by 2000, 70% by 2005 and 80% by 2010 (all from a 1980 baseline).

The NMVOC Protocol requires the UK to achieve a 30% reduction of anthropogenic NMVOC emissions by 1999 from a 1988 baseline. The emission estimates given in the 1999 version of the emissions inventory indicated that this was achieved.

The NO_X Protocol required that the total emissions of NO_X in 1994 should be no higher than they were in 1987; UK emissions were 17% lower in 1994 than in 1987 and have fallen substantially since 1994.

In 1996, the UNECE started negotiating a new multi-effect, multi-pollutant protocol on nitrogen oxides and related substances. This was aimed at addressing photochemical pollution, acidification and eutrophication. The Protocol to Abate Acidification, Eutrophication and Ground-level Ozone was adopted in Gothenburg in December 2000, where it was signed by the UK. The multi-pollutant protocol incorporates several measures to facilitate the reduction of emissions:

- Emission ceilings are specified for sulphur, nitrogen oxides, NH_3 and NMVOCs;
- Emission limits are specified for sulphur, nitrogen oxides and NMVOCs from stationary sources;
- Emission limits are indicated for CO, hydrocarbons, nitrogen oxides and particulates from new mobile sources;
- Environmental specifications for petrol and diesel fuels are given;
- Several measures to reduce NH_3 emissions from the agriculture sector are required.

The Gothenburg Protocol forms a part of the Convention on Long-range Transboundary Air Pollution. More detailed information on both of the Gothenburg protocol and the Convention may be found at the UNECE web site:

www.unece.org/env/lrtap/

National Emissions Ceilings Directive

Within the EU, the National Emission Ceilings Directive was agreed in 2001. It sets emission ceilings to be achieved from 2010 onwards for each Member State for the same 4 pollutants as in the Gothenburg Protocol. A number of member states (including the UK for SO_2 and NO_x) reduced their ceilings somewhat below the levels included in the Protocol.

Large Combustion Plants Directive
Within the UK, the implementation of the EC's Large Combustion Plant Directive and other associated policy measures has led to substantial reductions in acidifying pollutants, specifically NO_x, SO_2 and dust from power plants and industrial sources.

1.2 DEVOLVED ADMINISTRATION AIR QUALITY POLLUTANT INVENTORIES & DATA AVAILABILITY

This report presents emission inventories for priority air quality pollutants for the constituent countries of the UK. The pollutant species reported are:

- Ammonia (NH_3)
- Carbon monoxide (CO)
- Nitrogen oxides (reported as nitrogen dioxide) (NO_X as NO_2)
- Non-methane volatile organic compounds (NMVOC)
- Sub-10 micron particulate matter (PM_{10})
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The estimates have been compiled by disaggregating the UK emission totals presented within "UK Emissions of Air Pollutants 1970 to 2006" (Dore *et al.*, 2008), derived from the National Atmospheric Emissions Inventory database. The UK data is compiled annually in accordance with the requirements of United Nations Economic Commission for Europe (UNECE) reporting guidelines using the NFR reporting format and submitted to the Convention on Long-Range Transboundary Air Pollution (CLRTAP).

The method for disaggregating UK emission totals across the constituent countries draws on a combination of point source data (e.g. Pollution Inventory[2] data for industrial emissions) and regional and local datasets such as:

- Regional statistics on energy use or other raw material consumption
- Road traffic count point data
- Rail company fuel use data
- Regional housing, population and consumption data
- Regional agricultural datasets such as animal numbers and crop production
- Regional land use data

Some emissions, mainly off-road mobile and offshore sources, cannot be allocated to any country, so an unallocated category is used to report these.

This is the third time that air quality emission inventories have been prepared for the Devolved Administrations; firstly estimates for 1990-2003 were compiled in 2005 and secondly estimates for 1990 – 2005 were presented in 2007. This report presents the development of methodologies to provide such estimates for the Devolved Administrations (DAs), in some cases building on

[2] The term "Pollution Inventory" is used here to represent the industrial emissions databases of the UK environmental regulators (The Environment Agency of England & Wales, the Scottish Environmental Protection Agency and the Northern Ireland Department of Environment) which comprise annual emission estimates from all IPC/IPPC-regulated processes under their authority.

existing data management systems and datasets that have been used to provide DA greenhouse gas inventories in recent years.

For many emission sources of AQ pollutants, the data available for constituent country emissions are less detailed than for the UK as a whole, and for some sources country-level data are not available at all. For this reason, a "top-down" approach using UK inventory data as the core dataset has been adopted, and percentage splits of the UK total have been derived for each of the constituent countries using appropriate regional datasets.

In particular, complete sets of fuel consumption data are not available for England, Wales and Scotland. In order to make emission estimates for fuel consumption, therefore, the available data has been supplemented with surrogate statistics including: plant capacities, boiler capacities, employment statistics and production of industrial products.

For other key emission sources (such as industrial processes, agriculture, land-use change and forestry, waste disposal) there are more reliable and complete country-level datasets available, although some of these are less detailed than data used for the UK Inventory.

In many instances existing NAEI local mapping grids have been used. These mapping grid datasets are commonly based on census and other survey data that are periodically updated and used within UK emissions mapping and modelling work.

In many source sectors, there is insufficient local data available back to 1990, and assumptions and extrapolations of available datasets have frequently been used to present a time-series of air quality pollution emissions.

As a result of these data availability issues, it should be noted that the emission estimates for the England, Scotland, Wales and Northern Ireland AQ pollutant inventories are subject to greater uncertainty than the equivalent UK estimates. The results presented within this report should therefore be considered as indicative only.

It is anticipated that the quality of DA-level AQ pollutant emission estimates (if undertaken) will be improved in future work through the integration of more rigorous local datasets and improvement of disaggregation methodologies.

1.3 REGIONAL DATA SOURCES AND INVENTORY COMPILATION METHODOLOGY

A comprehensive list of all sources and emissions for the target pollutants (CO, NO_X, SO_2, VOC, NH_3, PM_{10}) was extracted from the UK NAEI database for the years 1990 and 2006. The percentage contribution to the UK emissions total (by pollutant) was then determined for each source sector (by NFR code) to identify the most significant source sectors for each pollutant.

For each of the source sectors for each pollutant, the options for determining regional drivers were assessed between the following:

- NAEI point source database.
- Use of emissions mapping grid data available within the NAEI database.
- Use of existing regional driver methods used in determining DA-level Greenhouse Gas (GHG) Inventories.

- Use of simple generic parameters (only considered for relatively insignificant source sectors) such as population or regional GDP data.

The development of more consistent reports and datasets between different scales (national-regional-local) derived from the NAEI database is a key improvement that this study has enabled.

1.3.1 NAEI Point Source Database

Operators of all IPC/IPPC-regulated industrial plant are required to submit annual emission estimates of a range of pollutants (including all of those pertinent to this study) to their local UK environmental regulatory agency, and these emission estimates are subject to established procedures of Quality Assurance and Quality Checking prior to publication. These industrial point-source pollution inventories (held by the Environment Agency, the Scottish Environmental Protection Agency and the Northern Ireland Department of the Environment) are emission datasets that have been developing and improving since their inception in the mid-1990s. Robust and reliable data for installations in England and Wales have been widely available since around 1998, whilst the equivalent datasets in Scotland and Northern Ireland became available a couple of years later.

NAEI point source datasets have been improved over recent years through the increasing quality and availability of these IPC/IPPC-regulated industrial pollution emission datasets. Annual data requests are also made directly to plant operators in key sectors such as power stations, refineries, cement & lime manufacture, iron & steel manufacture, chemical industry and waste treatment and disposal, in order to procure more detailed emissions data and other parameters (e.g. production data).

Through analysis of the time-series of data and review of the latest emission estimates, the point source data is amended as appropriate to fill in gaps and rectify any errors. These finalised data are then used as the basis for the NAEI industrial emissions estimates. The location of each site is known and therefore the point-source database can be queried to extract all emissions information relevant to a given geographical area, and hence the DA-level inventories can partly be populated in this way.

Although the use of this dataset can only provide a limited time-series of emissions from a given source sector, it is nevertheless a useful tool for deriving recent regional drivers for a broad range of pollutants, including CO, NO_X, SO_2, VOC, NH_3 and PM_{10}. The NAEI point-source database is most useful for industries that are dominated by large IPC/IPPC-authorised plant.

1.3.2 NAEI Emission Mapping Grids

Emission maps for the whole of the UK are routinely produced as part of the NAEI for 25 pollutants, including the six pollutants considered in this study. The maps are compiled at a 1km resolution and are produced annually for the most recent NAEI database (1990-2006 in this case). The mapped emissions data are made freely available on the NAEI web site at:

www.naei.org.uk and

http://www.naei.org.uk/mapping/mapping_2006.php

The emission maps are used by AEA and other organisations for a variety of Government policy support work at the national scale. In particular, the maps are used as input into a programme of air pollution modelling studies.

The geographical distribution of emissions across the UK is built up from distributions of emissions in each source sector. These source sector distributions are developed using a set of statistics appropriate to that sector. For large industrial 'point' sources, emissions are compiled from a variety of official UK sources (Environment Agency, Scottish Environmental Protection Agency, Local Authority data). For sources that are distributed widely across the UK (known as 'area' sources), a distribution map is generated using appropriate surrogate statistics for that sector. The method used for each source sector varies according to the data available, but is commonly based on either local activity statistics such as raw material use, energy use, industrial production and employment data, housing and population data, road vehicle and fuel sales data, periodic census or socio-economic survey data.

Periodic surveys and censuses of industrial, commercial, domestic, and other economic sectors provide indicators regarding the location and scale of a wide variety of activity data that can be used to disaggregate emissions totals, and these are commonly utilised within the NAEI mapping grids. For details of mapping grid data sources, see Chapter 3 of *"NAEI UK Emission Mapping Methodology 2005"* (Bush *et al*., 2008). Appendix B of this report provides a summary table of the mapping grid data availability for each UNECE sector.

The key limitation to the use of mapping grids within inventory development is the difficulty in obtaining an accurate time-series of emissions from a given sector, as the mapping grids are typically only updated every few years as more survey data becomes available. The data availability limitations inevitably impact upon the reliability of emission inventory estimates. In this study we have endeavoured to focus resources on ensuring that the most significant sources are assessed most accurately across the time-series, whilst less significant source sectors may be subject to a single mapping-grid-based disaggregation across all years.

1.3.3 Other Regional Datasets

In recent years, the NAEI team has aimed to develop a consistent time-series of detailed datasets to inform regional GHG inventories (back to 1990) and pollutant mapping campaigns. Examples of such datasets that have been used in this study include:

- Regional fuel use datasets for natural gas and some petroleum-based fuels from UK Transco and the Department of Business Enterprise and Regulatory Reform (BERR)

- The Road Transport emissions database uses local traffic count data from the Department for Transport (DfT), fuel use datasets (BERR), vehicle fleet data (DfT) and emission factors from European research sources (COPERT III) to derive detailed emission estimates for a wide range of pollutants across the UK.

- Aircraft emissions are derived from the Civil Aviation Authority's (CAA) database of flight movements, fuel use data (BERR), aircraft fleet information (CAA) and emission factors from international guidance and research (Intergovernmental Panel on Climate Change, IPCC) to derive local and national emission estimates for take-off and landing cycles as well as cruising emissions.

- Regional quarry production data and quarry location information (British Geological Survey, BGS).
- Regional iron & steel production data (Corus, Iron & Steel Statistics Bureau).
- Regional cement production capacities (British Cement Association).
- Regional railway diesel consumption data (local train operating companies, including freight, intercity and local passenger services).
- Regional refinery production capacities (UK Petroleum Industries Association).
- Regional housing & population data (Department of Communities and Local Government)
- Regional economic activity & industrial production indices (Office of National Statistics)

1.4 REPORT STRUCTURE

This report is structured as follows:

Main body of the report: This part of the report presents and discusses the inventories for England, Scotland, Wales and Northern Ireland, providing AQ pollutant emissions data for the years 1990, 1995, and 1998 to 2006. Emission inventories for PM_{10} CO, VOCs, NH_3, NO_X and SO_2 are included in chapter 2. Where appropriate, the reasons for any significant trends in emissions, issues regarding data availability and uncertainty estimates are provided for each inventory. A qualitative assessment of the accuracy of the inventories is presented in Chapter 3.

Appendix A: This appendix provides National Reporting Format sector code descriptions.

Appendix B: This appendix provides a summary of the disaggregation methods and mapping grids used in this study, for each UNECE sector.

Appendix C: Devolved Administration Emission Inventories for PM_{10}, 1990-2006 in NFR format.

Appendix D: Devolved Administration Emission Inventories for CO, 1990-2006 in NFR format.

Appendix E: Devolved Administration Emission Inventories for NO_X, 1990-2006 in NFR format.

Appendix F: Devolved Administration Emission Inventories for SO_2, 1990-2006 in NFR format.

Appendix G: Devolved Administration Emission Inventories for NMVOC, 1990-2006 in NFR format.

Appendix H: Devolved Administration Emission Inventories for NH_3, 1990-2006 in NFR format.

2 Air Quality Pollutants

Inventories for England, Scotland, Wales and Northern Ireland for NH_3, CO, NO_X, NMVOC, PM_{10} and SO_2 are discussed in the following sections. These data have been derived by disaggregation of the UK figures using point source, mapping and regional datasets as appropriate (see Appendix B for details).

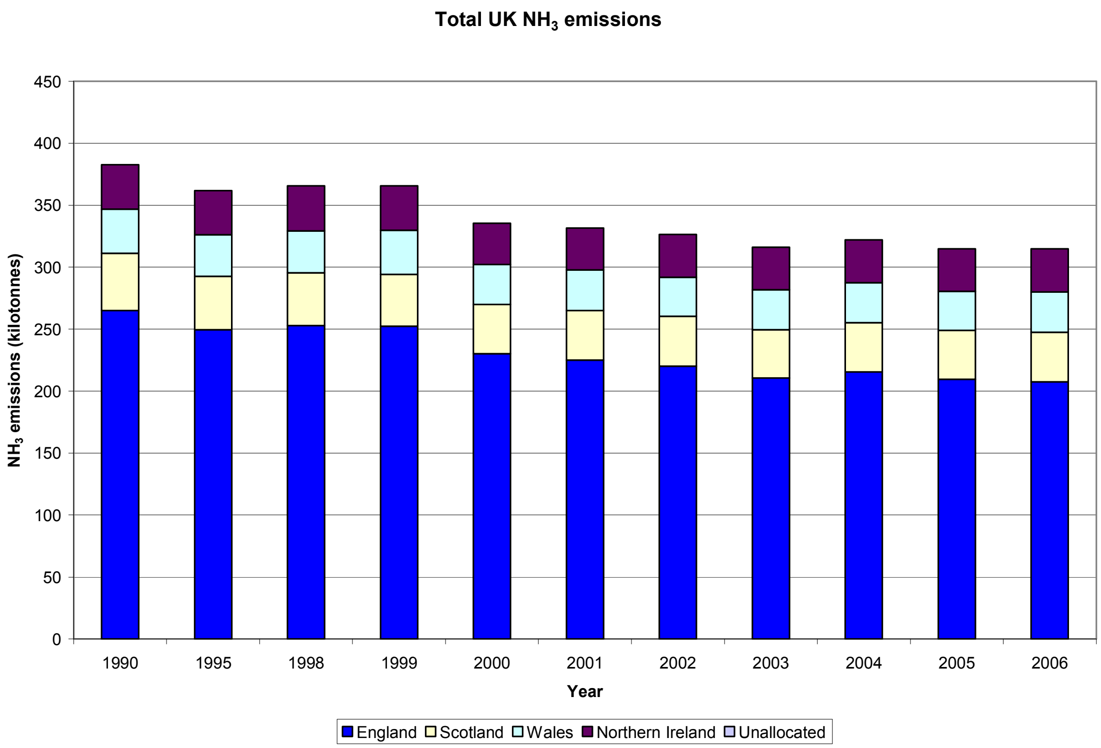
For information on the main sources & emission trends of Air Quality Pollutants in the UK National Atmospheric Emissions Inventory (NAEI) as well as supplementary information on particulate size & composition, monitoring and epidemiological evidence regarding effects on human health, please see Chapter 2 of *"UK Emissions of Air Pollutants 1970 to 2006"* (Dore *et al*., 2008).]

2.1 AMMONIA EMISSION ESTIMATES

NH_3 emissions play an important role in a number of different environmental issues including acidification, nitrification and eutrophication. The atmospheric chemistry of NH_3 and NH_4^+ mean that transport of the pollutants can vary greatly. As a result NH_3 emissions can impact on a highly localised level, as well as contributing to the effects of long-range pollutant transport.

UK emission estimates for NH_3 are only available from 1990 onwards, because earlier data from the most significant industrial sources are not available (or are not considered to be reliable) for use in emission inventory estimates. UK ammonia emissions in 2006 represent a decrease of 18% on the 1990 emissions (Figure 2.1).

Figure 2-1 – Total UK NH_3 emissions



The main source of NH_3 emissions in the UK is livestock manure management, and in particular cattle manure management. These emissions derive mainly from the decomposition of urea in animal wastes and uric acid in poultry wastes. Emissions depend on animal species, age, weight, diet, housing systems, waste management and storage techniques. Emissions are affected by a large number of factors that make the interpretation of experimental data difficult and emission estimates uncertain. Estimates are based on official livestock datasets and a number of emission factors from recent literature sources.

As well as emissions from livestock, the ammonia inventory includes emissions from fertiliser use, crops and decomposition of agricultural vegetation. It should be noted that these estimates are particularly uncertain due to the complexity of the processes involved and a greater uncertainty associated with literature emission factors.

Decreasing cattle numbers in the UK during the 1990s have led to reductions in UK ammonia emissions, and it is the trend in agricultural sources at a regional level that influence the DA-level inventories most significantly.

Non-agricultural sources of ammonia comprise a number of diverse sources. Emission estimates for these sources are often highly uncertain due to a lack of activity and emission factor data. Emissions from road transport (although relatively insignificant compared to agricultural emissions) increased in the 1990's as a result of the increasing number of three way catalysts in the vehicle fleet. However, emissions are now falling as the second generation of catalysts (which emit less NH_3 than first generation catalysts) penetrate the vehicle fleet.

Emissions of ammonia for England, Wales, Scotland and Northern Ireland are summarised in the tables and graphs below, with more detailed inventory tables in Appendix H. Table 2.1 shows how total UK NH_3 emissions are split between the 4 constituent countries.

Table 2-1 Proportion of total NH_3 emissions from UK constituent countries

Year	England	Scotland	Wales	NI	Unallocated
1990	69%	12%	9%	9%	0%
2006	66%	13%	10%	11%	0%

2.1.1 England Ammonia Inventory by NFR Sector, 1990-2006

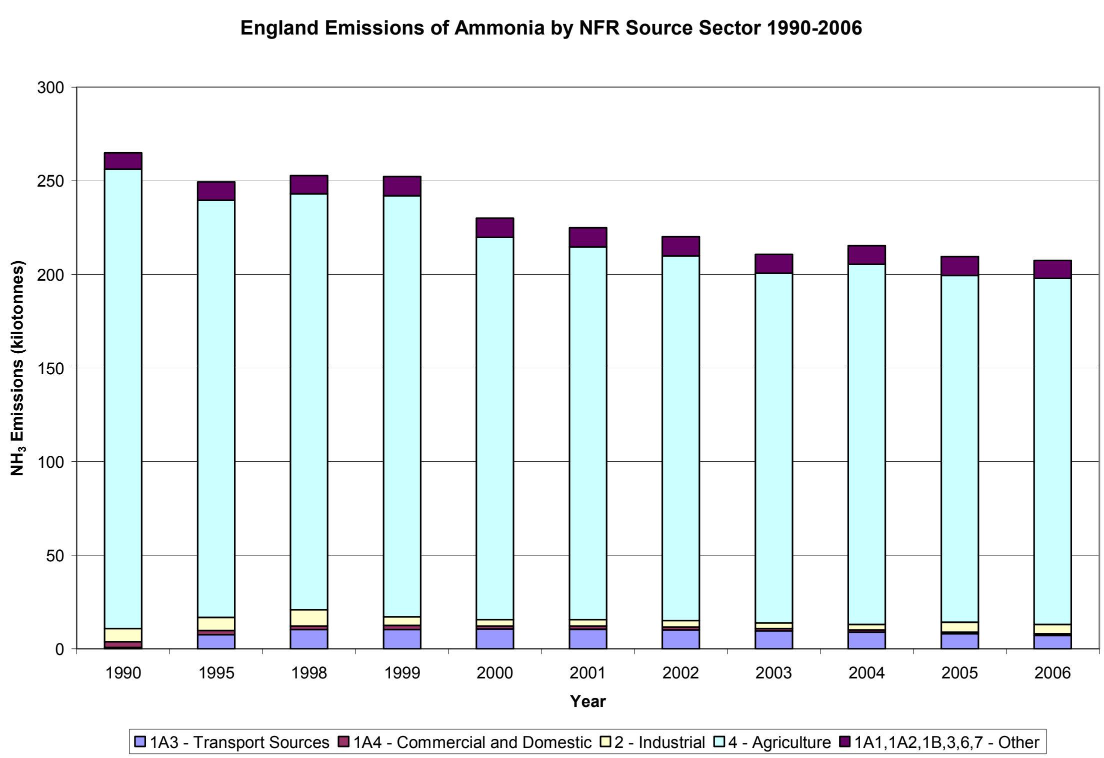
The table and graph below give a summary of the ammonia emissions in England by broad NFR sector categories. The detailed data are available in Appendix H.

Table 2-2 - England emissions of NH_3 by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A3 - Transport Sources	0.7	7.6	10.2	10.4	10.5	10.4	10.1	9.6	8.9	8.0	7.1	3%
1A4 - Commercial and Domestic	3.1	2.2	2.0	2.2	1.8	1.8	1.4	1.3	1.2	1.0	1.0	0%
2 - Industrial	7.1	7.0	8.7	4.6	3.4	3.5	3.4	3.1	3.0	5.2	4.9	2%
4 - Agriculture	245.4	222.9	222.2	225.0	204.2	199.1	195.0	186.7	192.3	185.4	184.9	89%
1A1,1A2,1B,3,6,7 - Other	8.6	9.9	9.8	10.1	10.2	10.2	10.3	10.1	9.9	10.1	9.6	5%
Total	**265.0**	**249.5**	**252.9**	**252.3**	**230.1**	**225.0**	**220.2**	**210.7**	**215.4**	**209.6**	**207.6**	**100%**

Units: kilotonnes

Figure 2-2 - Time series of England NH_3 emissions 1990-2006



England's NH_3 emissions have declined by 22% since 1990 and currently account for 66% of the UK total. The inventory is dominated by emissions from agricultural sources with 78% of the total in 2006 coming from manure management (4B: down 21% since 1990). 41% of the English total is from cattle manure management alone (4B1: down 20% since 1990). Other sources of note include transport emissions (1A3: 3.4 % of the England total in 2006) and waste treatment and disposal (6: 3.5 % of the England total in 2006).

2.1.2 Scotland Ammonia Inventory by NFR Sector, 1990-2006

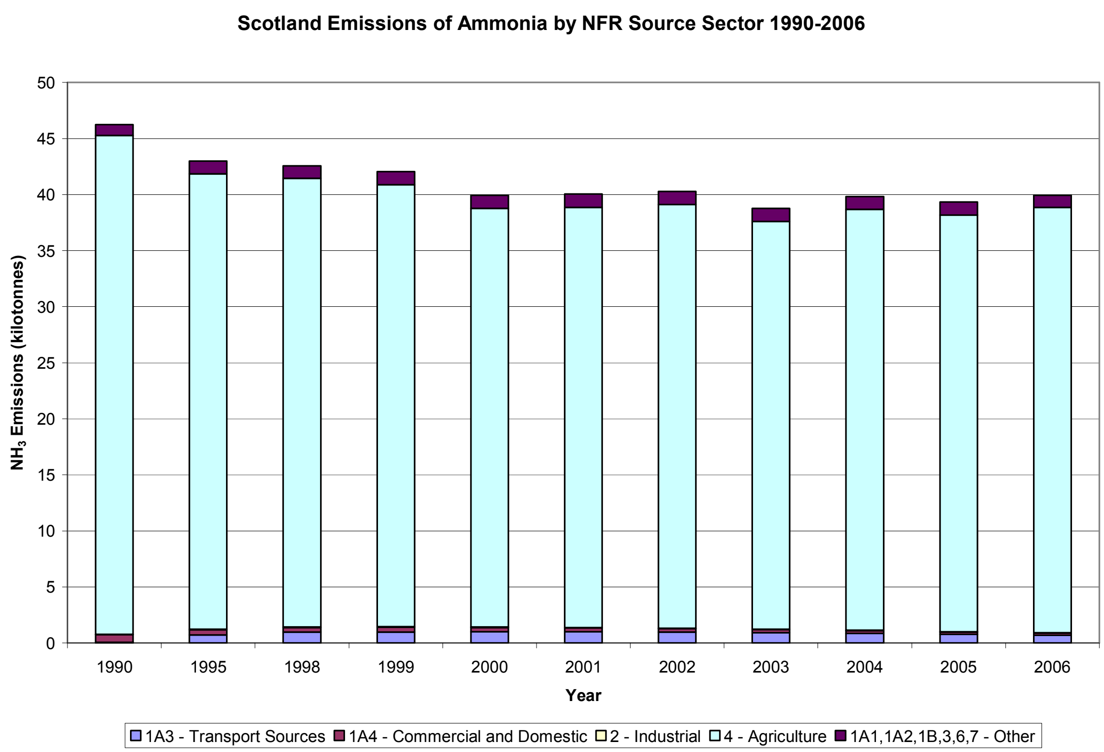
The table and graph below give a summary of the ammonia emissions in Scotland by broad NFR sector categories. The detailed data are available in Appendix H.

Table 2-3 - Scotland emissions of NH_3 by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A3 - Transport Sources	0.1	0.7	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.7	2%
1A4 - Commercial and Domestic	0.7	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0%
2 - Industrial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%
4 - Agriculture	44.5	40.6	40.0	39.4	37.3	37.5	37.8	36.4	37.5	37.2	37.9	95%
1A1,1A2,1B,3,6,7 - Other	1.0	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	3%
Total	**46.2**	**43.0**	**42.6**	**42.0**	**39.9**	**40.0**	**40.3**	**38.8**	**39.8**	**39.3**	**40.0**	**100%**

Units: kilotonnes

Figure 2-3 - Time series of Scotland NH_3 emissions 1990-2006



Scotland's NH_3 emissions have declined by 14% since 1990 and accounted for 13% of the UK total in 2006. The inventory is dominated by emissions from agricultural sources with 80% of the total in 2006 coming from manure management (4B: down 7% since 1990). Other sources of note include transport emissions (1A3: 1.7% of the Scotland total in 2006) and waste treatment and disposal (6: 2.2 % of the Scotland total in 2006).

2.1.3 Wales Ammonia Inventory by NFR Sector, 1990-2006

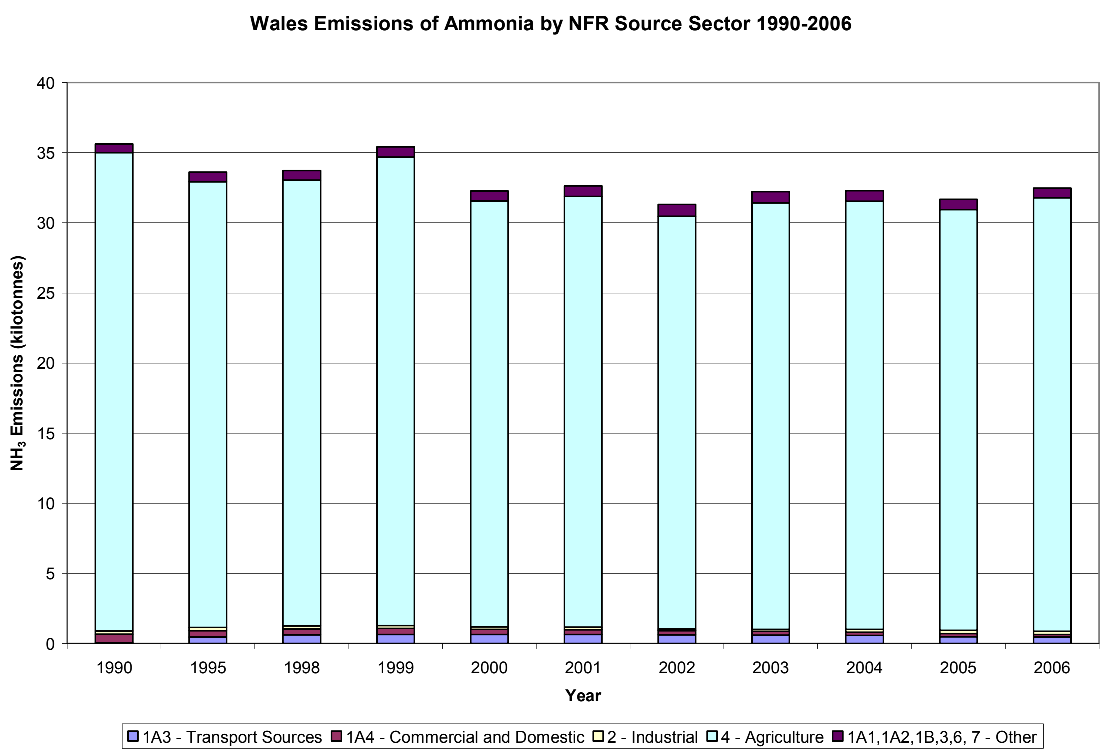
The table and graph below give a summary of the ammonia emissions in Wales by broad NFR sector categories. The detailed data are available in Appendix H.

Table 2-4 - Wales emissions of NH_3 by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A3 - Transport Sources	0.0	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	1.4%
1A4 - Commercial and Domestic	0.6	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	1%
2 – Industrial	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	1%
4 – Agriculture	34.1	31.8	31.8	33.4	30.4	30.7	29.4	30.4	30.5	30.0	30.9	95%
1A1,1A2,1B,3,6, 7 - Other	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.7	0.7	2%
Total	**35.6**	**33.6**	**33.7**	**35.4**	**32.3**	**32.6**	**31.3**	**32.2**	**32.3**	**31.7**	**32.5**	**100%**

Units: kilotonnes

Figure 2-4 - Time series of Wales NH_3 emissions 1990-2006



NH_3 emissions in Wales have declined by 9% since 1990 and accounted for 10% of the UK total in 2006. The inventory is dominated by emissions from agricultural sources with 83% of the total in 2006 coming from manure management (4B: down 3% since 1990). 60% of the Welsh total is from cattle manure management alone (4B1: up 4% since 1990). Other sources of note include transport emissions (1A3: 1.4% of the Wales total in 2006) and waste treatment and disposal (6: 1.4 % of the Wales total in 2006).

2.1.4 Northern Ireland Ammonia Inventory by NFR Sector, 1990-2006

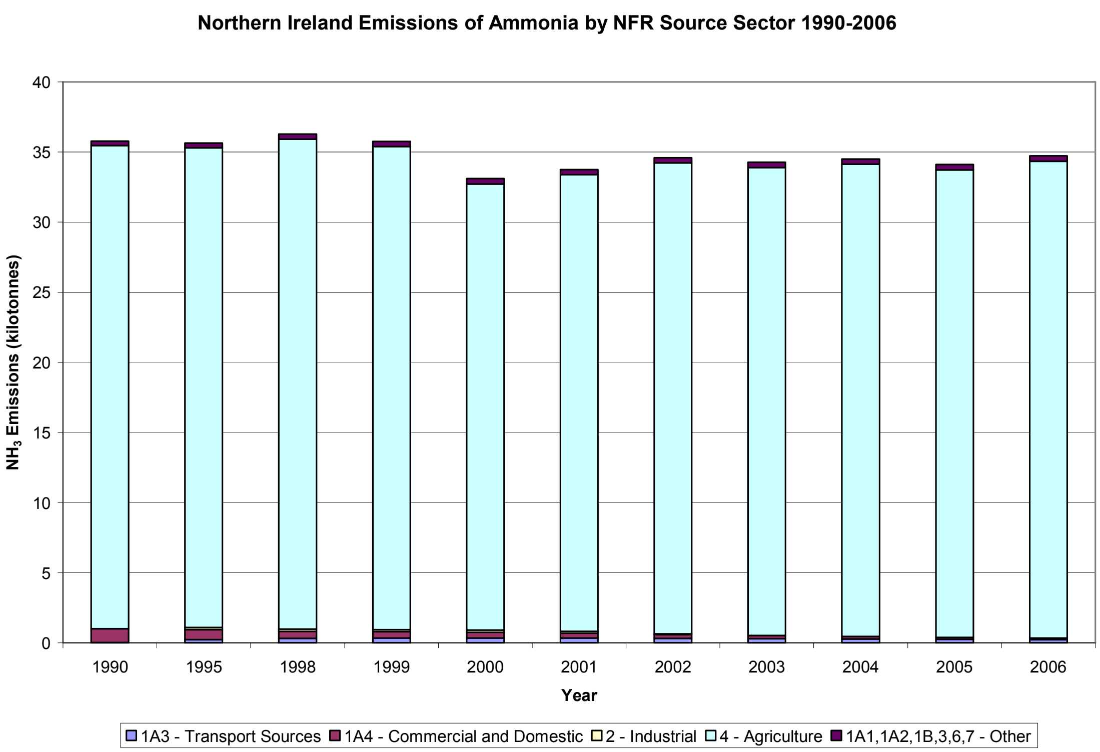
The table and graph below give a summary of the ammonia emissions in Northern Ireland by broad NFR sector categories. The detailed data are available in Appendix H.

Table 2-5 - Northern Ireland emissions of NH_3 by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A3 - Transport Sources	0.0	0.2	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.7%
1A4 - Commercial and Domestic	1.0	0.7	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0%
2 - Industrial	0.0	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0%
4 - Agriculture	34.5	34.2	34.9	34.4	31.8	32.5	33.6	33.4	33.7	33.3	34.0	98%
1A1,1A2,1B,3,6,7 - Other	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	1%
Total	**35.8**	**35.7**	**36.3**	**35.8**	**33.1**	**33.8**	**34.6**	**34.3**	**34.5**	**34.1**	**34.7**	**100%**

Units: kilotonnes

Figure 2-5 - Time series of Northern Ireland NH_3 emissions 1990-2006



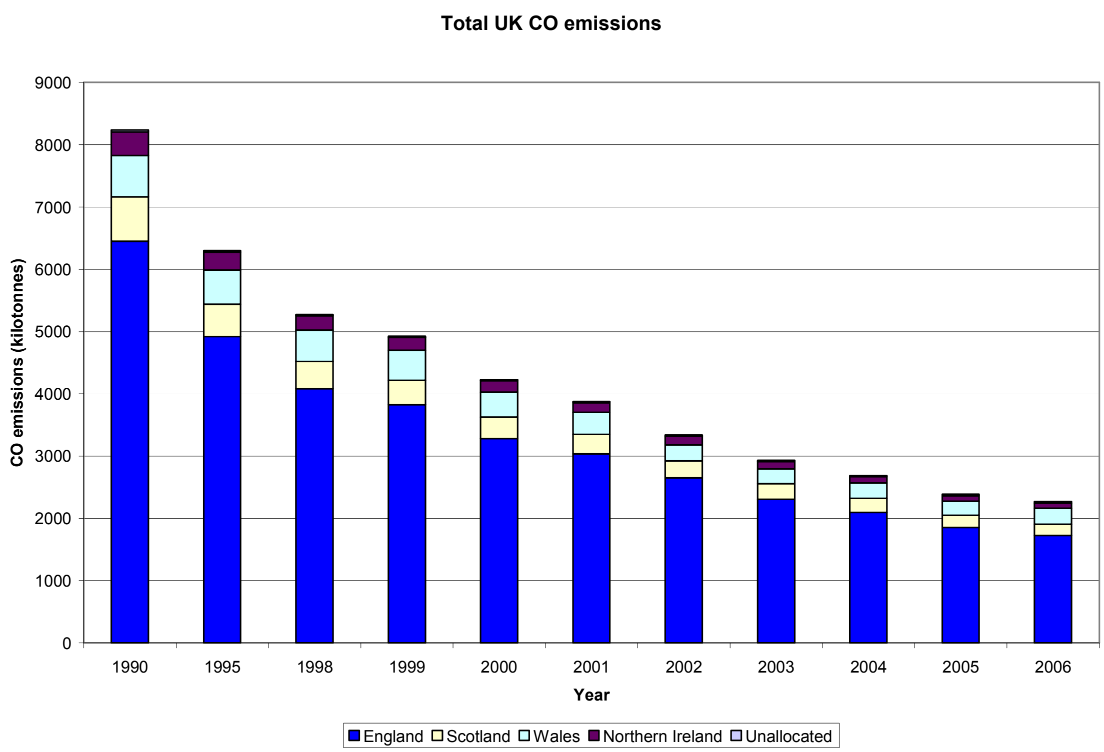
Northern Ireland's NH_3 emissions have declined by 3% since 1990 and currently account for 11% of the UK total. The inventory is dominated by emissions from agricultural sources with 88% of the total in 2006 coming from manure management (4B: down 4% since 1990). 66% of the Northern Ireland total is from cattle manure management alone (4B1: up 16% since 1990). Other sources of note include transport emissions (1A3: 0.7% of the Northern Ireland total in 2006) and commercial and domestic combustion (1A4: 0.3 % of the Northern Ireland total in 2006).

2.2 CARBON MONOXIDE EMISSION ESTIMATES

Carbon monoxide arises from incomplete fuel-combustion and is of concern mainly due to its effect on human health and its role in tropospheric ozone formation. It leads to a decreased uptake of oxygen by the lungs and leads to a range of further symptoms as the concentration increases.

Across the UK, over the period 1970-2006 emissions decreased by 81% reflecting significant reduction in emissions from road transport, agricultural field burning and the domestic sector.

Figure 2-6 Total UK emissions of CO



The main sources of CO are outlined below:

- **Road Transport.** Petrol engines are the main source of CO emissions. Since 1990, emissions from road transport sources have reduced quite significantly due to improvements to the development of more efficient engine combustion technology, the increased use of catalytic converters and the growth in diesel engine use.

- **Off-road transport and machinery.** Significant CO emission sources include portable generators, forklift trucks, lawnmowers and cement mixers. Recent studies have been aimed at improving these estimates, but the quality of CO emission estimates from such machinery remains uncertain due to the lack of activity data and the resultant use of survey data and assumptions regarding equipment numbers and utilisation.

Other sources of CO emissions are small compared with transport and off-road sources. Combustion-related emissions from the domestic and industrial sectors have decreased by 94% and 59% respectively since 1970 due to the decline in the use of solid fuels in favour of gas and electricity. The sudden decline in emissions from the agricultural sector reflects the banning of stubble burning in 1993 in England and Wales. Currently power generation accounts for only 3% of UK emissions.

Emissions of CO for England, Wales, Scotland and Northern Ireland are summarised in the tables and graphs below, with more detailed inventory tables in Appendix D. Table 2.6 shows how total UK CO emissions are split between the 4 constituent countries.

Table 2-6 Proportion of total CO emissions from UK constituent countries

Year	England	Scotland	Wales	NI	Unallocated
1990	78%	9%	8%	5%	0%
2006	76%	8%	11%	4%	1%

2.2.1 England CO Inventory by NFR Sector, 1990-2006

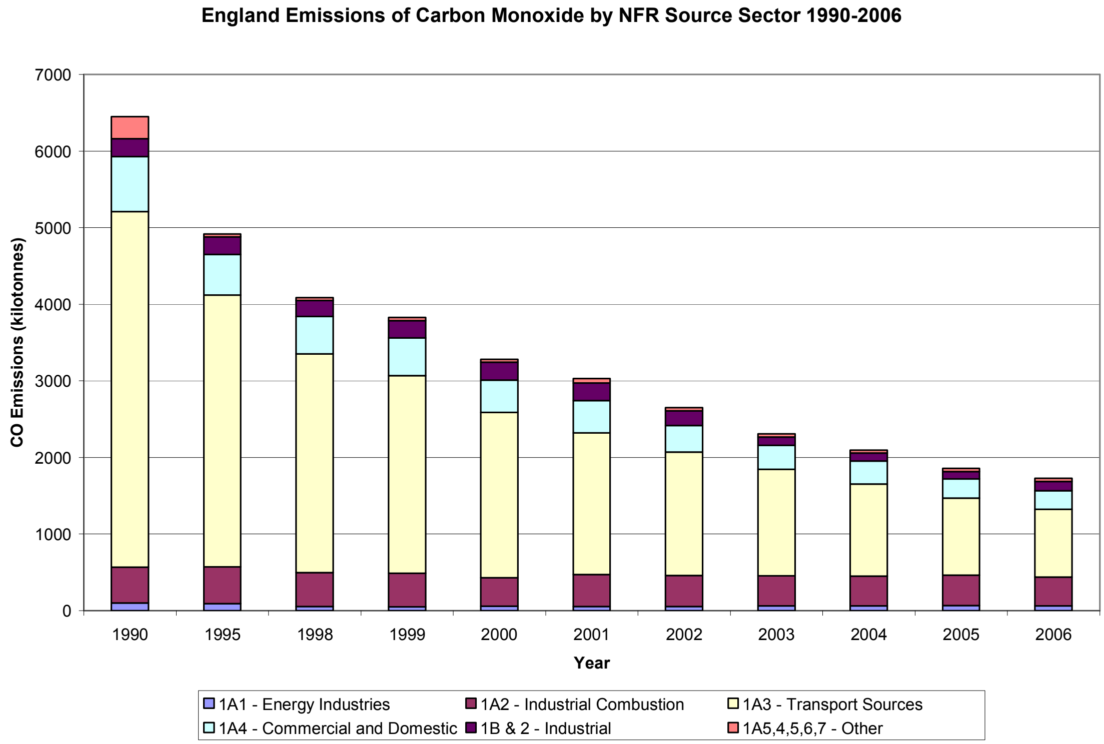
The table and graph below give a summary of the CO emissions in England by broad NFR sector categories. The detailed data are available in Appendix D.

Table 2-7 England emissions of CO by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006 %
1A1 - Energy Industries	98.6	92.0	54.9	49.2	57.2	55.4	53.6	61.7	59.1	63.9	62.1	4%
1A2 - Industrial Combustion	467.3	476.7	441.9	435.9	372.9	414.9	405.5	392.9	391.1	398.9	375.3	22%
1A3 - Transport Sources	4644.5	3551.7	2853.9	2582.0	2159.6	1852.2	1610.2	1388.7	1203.2	1005.0	883.4	51%
1A4 - Commercial and Domestic	719.8	529.7	490.2	494.0	421.5	420.0	346.6	313.4	299.7	252.9	243.2	14%
1B & 2 - Industrial	229.8	227.7	206.1	225.3	229.5	230.6	190.4	109.5	102.9	96.9	123.7	7%
1A5,4,5,6,7 - Other	289.2	39.6	38.5	40.4	40.7	58.4	41.8	41.7	40.2	39.6	38.8	2%
Total	**6449.3**	**4917.3**	**4085.4**	**3826.7**	**3281.5**	**3031.5**	**2648.1**	**2307.9**	**2096.1**	**1857.2**	**1726.6**	**100%**

Units: kilotonnes

Figure 2-7 Time series of England CO emissions 1990-2006



England's CO emissions have declined by 73% since 1990 and account for 76% of the UK total. 48% of CO emissions in England stem from road transport combustion sources (1A3bi-iv: down by 82% since 1990), whilst 22% stem from industrial combustion (1A2: down 20% since 1990) and 14% from commercial and residential combustion (1A4: down 66% since 1990). Notable increasing trends in emissions over recent years arise from civil aviation (1A3aii.i: up by 103% since 1990 to 2% of the 2006 England total).

2.2.2 Scotland CO Inventory by NFR Sector, 1990-2006

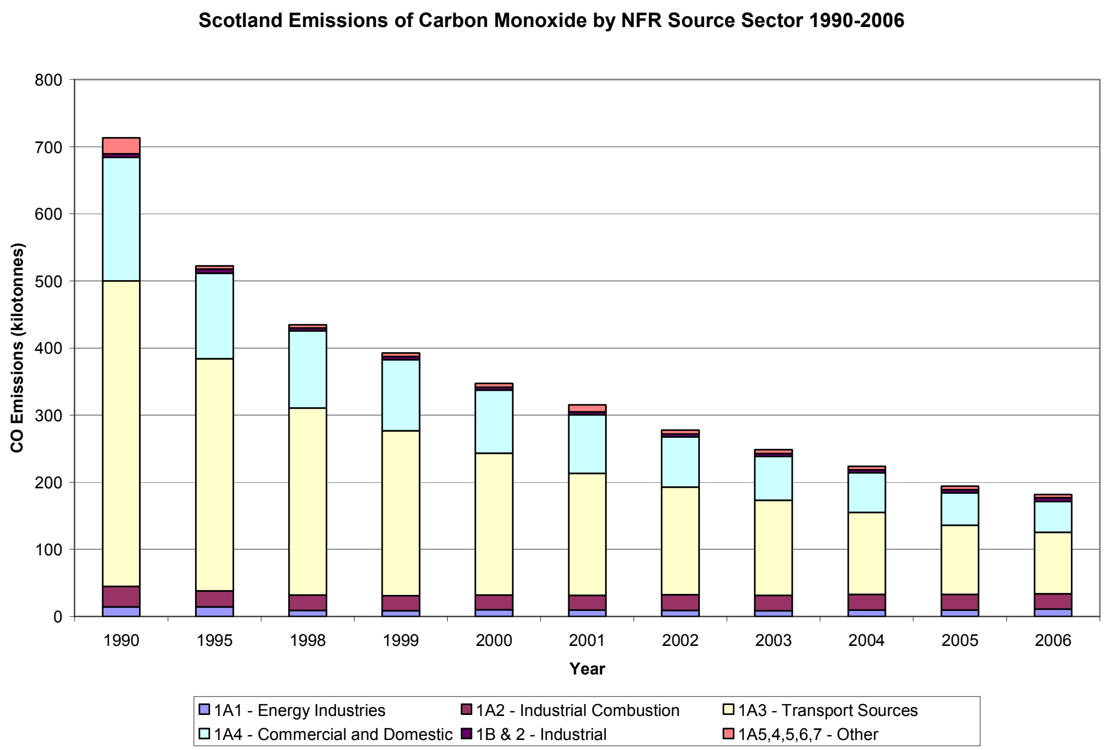
The table and graph below give a summary of the CO emissions in Scotland by broad NFR sector categories. The detailed data are available in Appendix D.

Table 2-8 Scotland emissions of CO by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	14.3	13.9	8.8	8.3	10.2	9.6	9.0	8.5	9.1	9.4	10.8	6%
1A2 - Industrial Combustion	30.4	24.2	23.1	22.7	21.5	21.5	23.2	23.1	23.7	23.6	22.9	13%
1A3 - Transport Sources	455.2	345.9	278.5	246.0	211.7	182.0	160.6	141.2	122.1	102.6	91.7	50%
1A4 - Commercial and Domestic	184.3	127.8	115.0	105.8	93.7	87.5	74.6	65.6	59.0	48.5	45.8	25%
1B & 2 - Industrial	5.2	6.0	4.6	4.7	4.5	4.4	4.4	4.2	4.3	4.4	5.5	3%
1A5,4,5,6,7 - Other	23.8	4.8	4.8	5.3	5.6	10.1	5.7	5.7	5.4	5.3	5.1	3%
Total	**713.2**	**522.5**	**434.7**	**392.7**	**347.2**	**315.0**	**277.5**	**248.3**	**223.6**	**193.9**	**181.9**	**100%**

Units: kilotonnes

Figure 2-8 Time series of Scotland CO emissions 1990-2006



Scotland's CO emissions have declined by 75% since 1990 and account for 8% of the UK total. 45% of CO emissions in Scotland stem from road transport combustion sources (1A3bi-iv: down by 82% since 1990), whilst 13% stem from industrial combustion (1A2: down 24% since 1990) and 25% from commercial and residential combustion (1A4: down 75% since 1990).

2.2.3 Wales CO Inventory by NFR Sector, 1990-2006

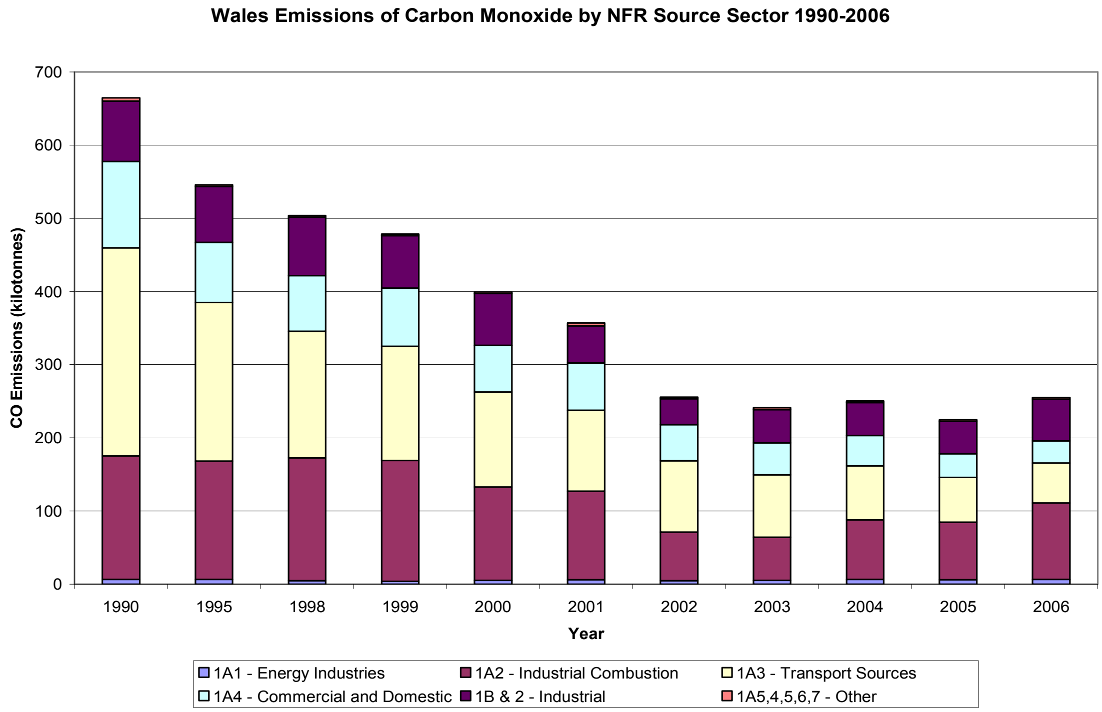
The table and graph below give a summary of the CO emissions in Wales by broad NFR sector categories. The detailed data are available in Appendix D.

Table 2-9 Wales emissions of CO by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	6.6	6.1	4.4	3.8	5.1	5.8	4.6	5.1	6.1	6.0	6.4	3%
1A2 - Industrial Combustion	168.6	162.1	168.2	165.2	127.6	121.4	66.4	59.2	81.4	78.8	104.4	41%
1A3 - Transport Sources	284.6	216.8	173.1	156.2	130.0	110.5	97.5	85.1	74.2	61.2	54.6	21%
1A4 - Commercial and Domestic	117.9	82.4	75.8	79.2	63.9	64.7	49.6	43.4	41.4	32.3	30.1	12%
1B & 2 - Industrial	82.8	76.3	80.3	71.9	70.7	50.7	35.3	45.9	44.9	44.2	57.4	22%
1A5,4,5,6,7 - Other	4.4	2.2	2.2	2.3	2.3	3.6	2.4	2.4	2.3	2.3	2.2	1%
Total	**664.9**	**545.9**	**503.9**	**478.6**	**399.5**	**356.8**	**255.8**	**241.1**	**250.4**	**224.7**	**255.0**	**100%**

Units: kilotonnes

Figure 2-9 Time series of Wales CO emissions 1990-2006



Wales's CO emissions have declined by 62% since 1990 and account for 11% of the UK total. The iron & steel industry contributes a very significant emission to the Welsh total, with a total of 41% of CO from industrial combustion (1A2: down 52% since 1990). 20% of CO emissions in Wales stem from road transport combustion sources (1A3bi-iv: down by 82% since 1990), whilst 12% stem from commercial and residential combustion (1A4: down 74% since 1990). Total CO emissions have gone up between 2005 and 2006, with increased emissions from the iron & steel industry (1A2), solid fuel transformation (1B1b) and metal production (2C). This is due to increased industrial output that is notable in Wales and the above average concentration of heavy industry within the country.

2.2.4 Northern Ireland CO Inventory by NFR Sector, 1990-2006

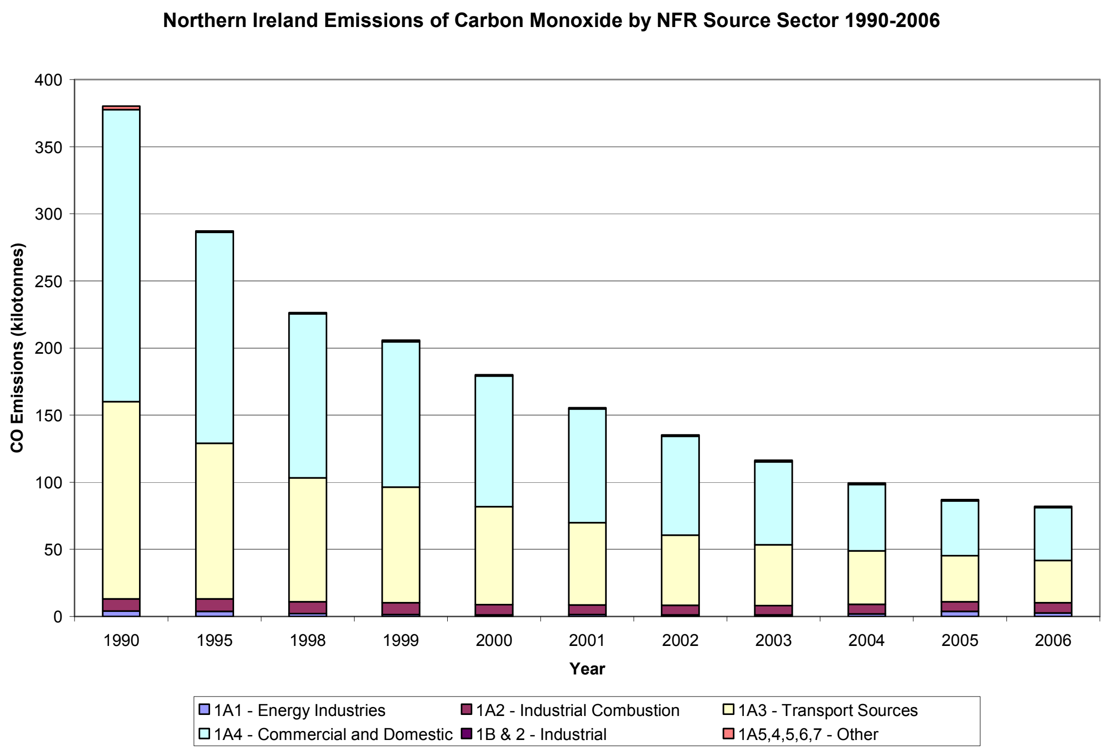
The table and graph below give a summary of the CO emissions in Northern Ireland by broad NFR sector categories. The detailed data are available in Appendix D.

Table 2-10 Northern Ireland emissions of CO by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	4.1	3.8	2.1	1.3	1.2	1.4	1.1	1.1	2.0	3.8	2.6	3%
1A2 - Industrial Combustion	9.0	9.2	8.9	8.9	7.6	7.1	7.1	7.0	7.1	7.0	7.6	9%
1A3 - Transport Sources	146.8	116.1	92.2	86.2	73.0	61.4	52.4	45.5	39.8	34.3	31.6	39%
1A4 - Commercial and Domestic	217.8	157.0	122.1	108.1	97.3	84.6	73.7	61.7	49.5	40.9	39.1	48%
1B & 2 - Industrial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%
1A5,3,4,5,6,7 - Other	2.4	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1%
Total	380.2	287.3	226.4	205.6	180.2	155.5	135.3	116.3	99.4	87.1	82.0	100%

Units: kilotonnes

Figure 2-10 Time series of Northern Ireland CO emissions 1990-2006



Northern Ireland's CO emissions have declined by 78% since 1990 and accounted for 4% of the UK total in 2006. 34% of CO emissions in Northern Ireland stem from road transport combustion sources (1A3bi-iv: down by 81% since 1990), whilst only 9% come from industrial combustion sources (1A2: down 16% since 1990). 48% of the Northern Ireland total emission comes from commercial and residential combustion (1A4: down 82% since 1990). This contribution is much greater than in other DAs (commercial and residential emissions contribute 14%, 25% and 12% within England, Scotland and Wales respectively) due to the greater use of solid fuels in domestic heating combined and the significantly lower industrial emissions in the region.

2.3 NITROGEN OXIDES EMISSION ESTIMATES

Across the UK, NO_X emissions arise primarily from combustion sources. The estimation of these emissions is complex since the nitrogen can be derived from either the fuel or atmospheric nitrogen. The emission is dependent on the conditions of combustion, in particular temperature and excess air ratio, which can vary considerably. Thus combustion conditions, load and even state of maintenance are important. The main three combustion sources of NO_x are:

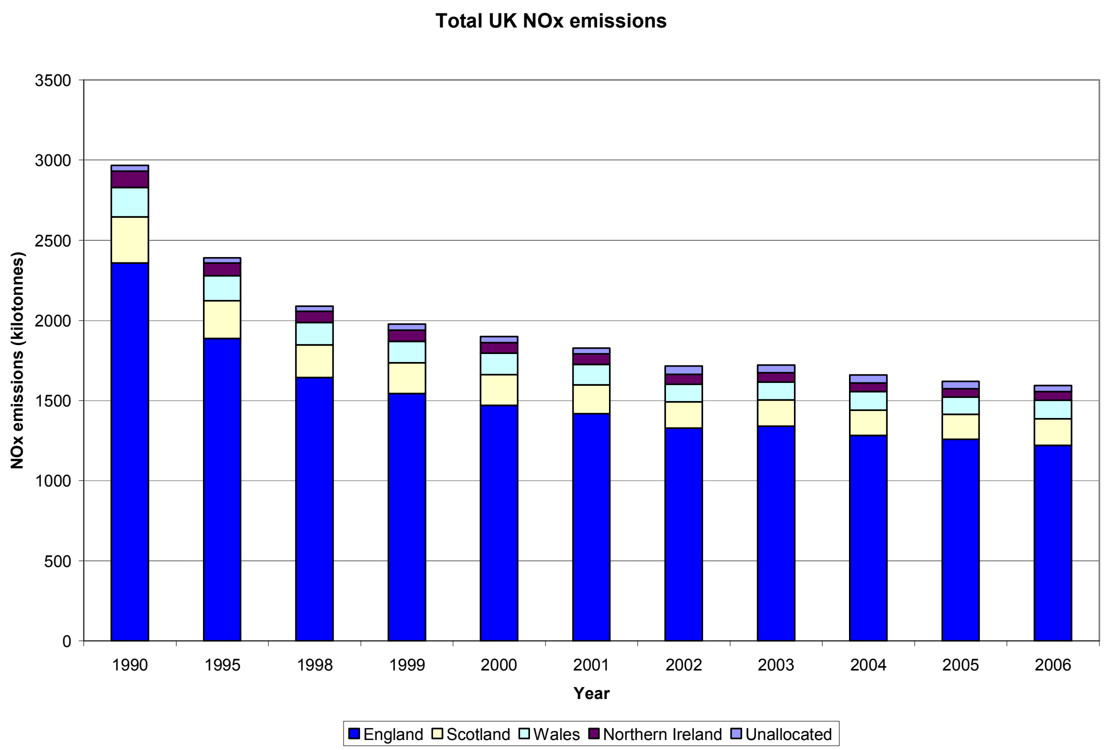
- **Transport.** In 2006 road vehicles contributed 32% of total UK NO_X emissions. Since 1990 there has been a steady decline in emissions due to the introduction of catalytic converters on cars and stricter regulations on truck emissions. Research indicates that conurbations and city centres show high localised emissions due to the combination of road transport, residential and commercial combustion sources. Similarly, around ports and major terminals, significant localised emissions arise from shipping, railway locomotives and road vehicles.

- **Power Generation.** Since 1988 the electricity generators have adopted a programme of progressively fitting low-NO_X burners to their 500 MWe (megawatt electric) or larger coal fired units. More recently the increased use of nuclear generation and the introduction of CCGT (Combined Cycle Gas Turbine) plant burning natural gas have further reduced NO_X emissions. The emissions from the low-NO_X turbines used are much lower than those of pulverised coal fired plant even when low-NO_X burners are fitted. Assuming that these trends continue, power station emissions are expected to fall further.

- **Industrial Combustion.** The emissions from industrial combustion have declined by 60% since 1970 and they currently contribute 15% to total UK emissions. This is primarily due to the decline in coal use in favour of gas and electricity.

As can be seen in figure 2.11, total UK emissions of NO_x have decreased by 46% since 1990.

Figure 2-11 Total UK emissions of NO_x



Emissions of NO_X for England, Wales, Scotland and Northern Ireland are summarised in the tables and graphs below, with more detailed inventory tables in Appendix E. Table 2.11 shows how total UK NO_x emissions are split between the 4 constituent countries.

Table 2-11 Proportion of total NO_x emissions from UK constituent countries

Year	England	Scotland	Wales	NI	Unallocated
1990	79%	10%	6%	3%	1%
2006	77%	10%	7%	3%	2%

2.3.1 England NO_X Inventory by NFR Sector, 1990-2006

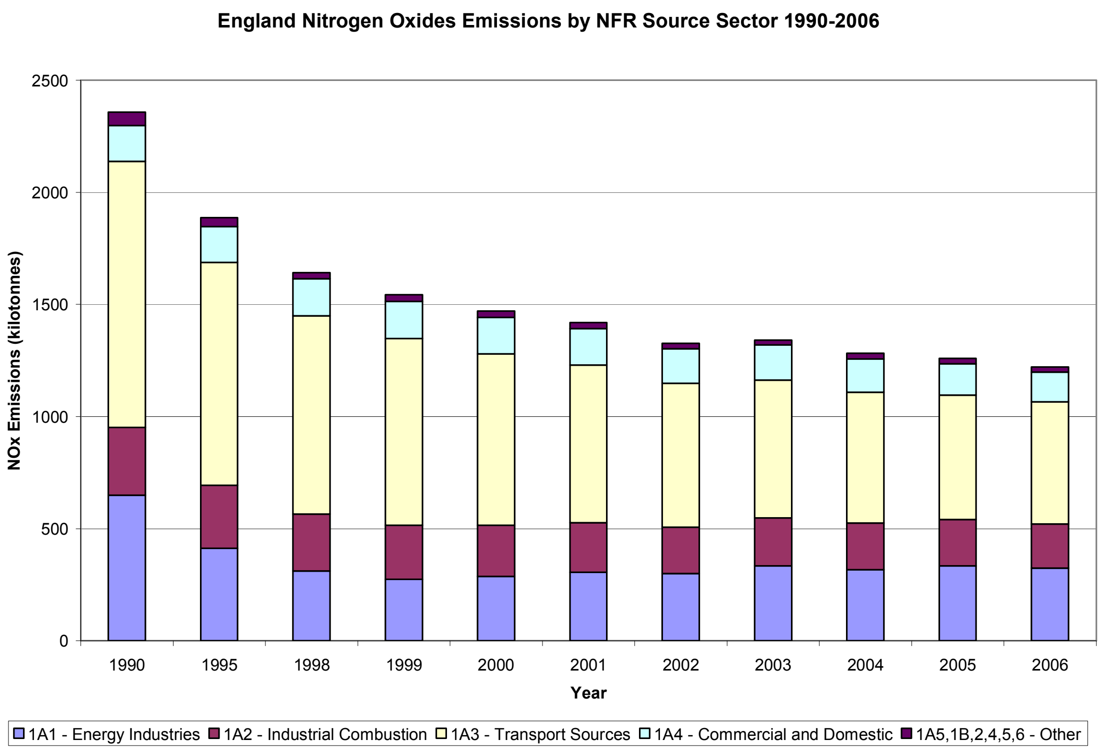
The table and graph below give a summary of the NO_X emissions in England by broad NFR sector categories. The detailed data are available in Appendix E.

Table 2-12 England emissions of NO_x by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006 %
1A1 - Energy Industries	649.9	412.3	310.6	274.1	287.4	306.5	298.9	334.2	317.3	334.6	324.3	27%
1A2 - Industrial Combustion	301.9	280.9	253.7	241.4	228.3	219.8	207.8	213.3	208.5	207.3	195.9	16%
1A3 - Transport Sources	1187.0	993.4	884.8	833.0	764.9	703.0	642.3	615.9	583.1	553.6	546.3	45%
1A4 - Commercial and Domestic	158.9	160.8	165.9	164.9	161.1	162.6	153.7	156.7	148.3	140.5	131.6	11%
1A5,1B,2,4,5,6 - Other	59.9	39.9	27.9	29.8	28.1	26.6	24.6	20.0	25.4	23.4	22.8	2%
Total	**2357.6**	**1887.4**	**1642.8**	**1543.1**	**1469.7**	**1418.5**	**1327.3**	**1340.1**	**1282.6**	**1259.5**	**1220.9**	**100%**

Units: kilotonnes

Figure 2-12 Time series of England NO_x emissions 1990-2006



England's NO_X emissions have declined by 48% since 1990 and account for 77% of the UK total. Power generation is a very significant source, accounting for 24% of the England total in 2006, although emissions from this source have reduced by 52% since 1990. 35% of NO_X emissions in England stem from road transport combustion sources (1A3bi-iv: down by 62% since 1990), whilst 16% stem from industrial combustion (1A2: down 35% since 1990). Notable increases in emissions arise from railways (1A3c: up by 95% since 1990 to 2% of the 2006 England total) and from national navigation (1A3dii: up 47% since 1990 to 7% of the 2006 England total).

2.3.2 Scotland NO_X Inventory by NFR Sector, 1990-2006

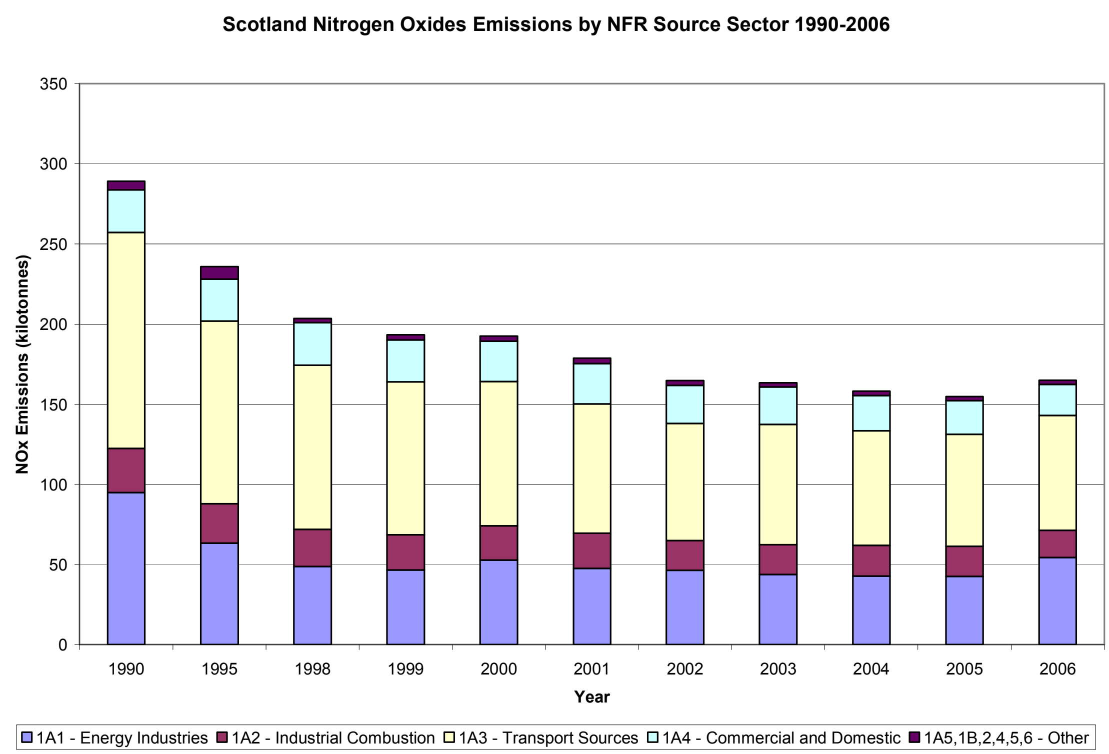
The table and graph below give a summary of the NO_X emissions in Scotland by broad NFR sector categories. The detailed data are available in Appendix E.

Table 2-13 - Scotland emissions of NO_x by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	95.0	63.3	48.8	46.6	52.8	47.4	46.4	43.7	42.9	42.5	54.4	33%
1A2 - Industrial Combustion	27.5	24.6	23.2	22.0	21.5	22.0	18.4	18.5	19.0	18.8	17.0	10%
1A3 - Transport Sources	134.8	113.9	102.5	95.5	90.0	80.7	73.3	75.1	71.5	69.9	71.8	44%
1A4 - Commercial and Domestic	26.4	26.2	26.4	26.0	25.1	25.3	23.7	23.5	22.0	20.9	19.3	12%
1A5,1B,2,4,5,6 - Other	5.3	7.7	2.7	3.2	3.2	3.4	3.0	2.5	2.8	2.7	2.5	2%
Total	**289.1**	**235.8**	**203.5**	**193.3**	**192.5**	**178.8**	**164.8**	**163.3**	**158.1**	**154.8**	**164.9**	**100%**

Units: kilotonnes

Figure 2-13 - Time series of Scotland NO_x emissions 1990-2006



Scotland's NO_X emissions have declined by 43% since 1990 and currently account for 10% of the UK total. Power generation is a very significant source, accounting for 29% of the Scotland total in 2006, although emissions from this source have reduced by 44% since 1990. 26% of NO_X emissions in Scotland arise from road transport combustion sources (1A3bi-iv: down by 61% since 1990), 10% stem from industrial combustion (1A2: down 38% since 1990) and 6% is from residential combustion sources (1A4bi: down 4% since 1990). Increases in emissions are only apparent in relatively minor source sectors such as civil aviation (1A3aii: up by 141% since 1990 to 2% of the Scottish total in 2006).

2.3.3 Wales NO_X Inventory by NFR Sector, 1990-2006

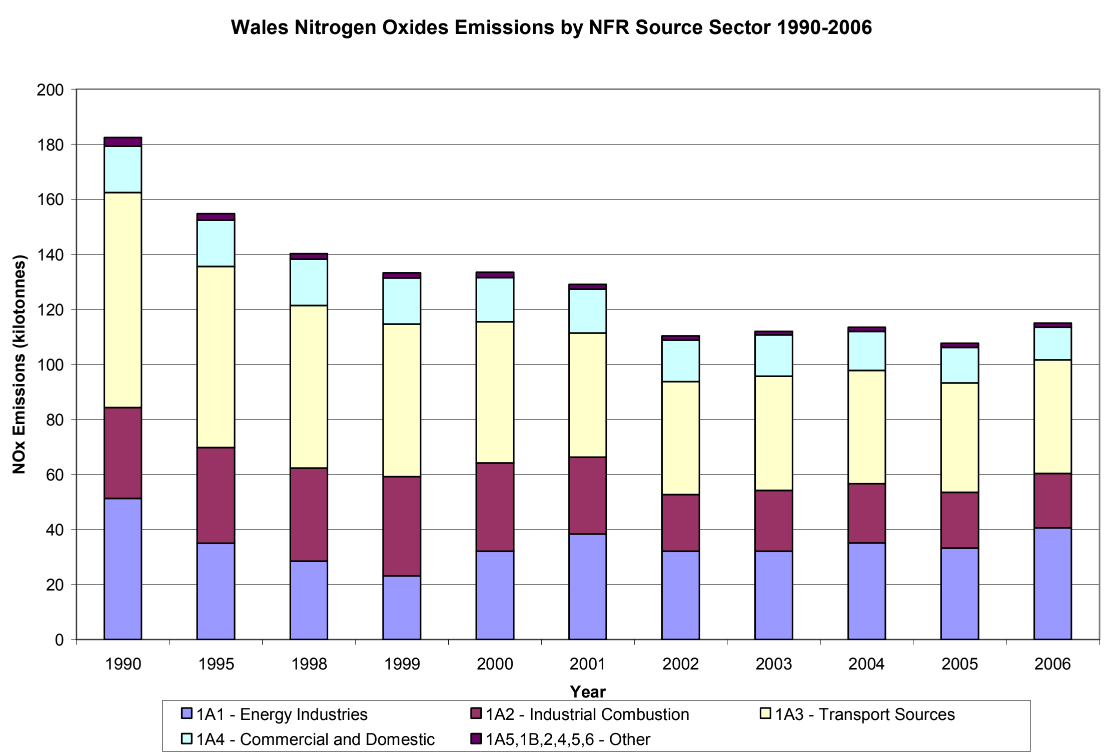
The table and graph below give a summary of the NO_X emissions in Wales by broad NFR sector categories. The detailed data are available in Appendix E.

Table 2-14 - Wales emissions of NO_x by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	51.3	35.1	28.5	23.2	32.2	38.4	32.2	32.1	35.2	33.3	40.6	35%
1A2 - Industrial Combustion	33.1	34.7	33.8	36.0	32.1	27.9	20.5	22.1	21.5	20.2	19.8	17%
1A3 - Transport Sources	78.0	65.8	59.1	55.4	51.2	45.2	41.1	41.6	41.1	39.8	41.3	36%
1A4 - Commercial and Domestic	17.0	16.8	16.9	16.7	16.1	15.9	15.1	15.0	14.2	12.9	11.9	10%
1A5,1B,2,4,5,6 - Other	3.0	2.4	1.9	1.9	1.9	1.8	1.5	1.2	1.6	1.6	1.5	1%
Total	**182.4**	**154.8**	**140.2**	**133.2**	**133.5**	**129.1**	**110.3**	**112.0**	**113.6**	**107.8**	**115.1**	**100%**

Units: kilotonnes

Figure 2-14 - Time series of Wales NO_x emissions 1990-2006



Wales' NO_X emissions have declined by 37% since 1990 and accounted for 7% of the UK total in 2006. Power generation is a very significant source, accounting for 29% of the Wales total in 2006, although emissions from this source have reduced by 22% since 1990. 22% of NO_X emissions in Wales stem from road transport combustion sources (1A3bi-iv: down by 61% since 1990), 17% stem from industrial combustion (1A2: down 40% since 1990) and 5% of emissions are from residential combustion sources (1A4bi: down 4% since 1990). Notable increases in emissions arise from railways (1A3c: up by 70% since 1990 to 3% of the 2006 Wales total) and from national navigation (1A3dii: up 25% since 1990 to 10% of the 2006 Wales total). Total NO_x emissions have gone up slightly between 2005 and 2006 due to increased coal use from power stations and increased emissions from national navigation.

2.3.4 Northern Ireland NO_X Inventory by NFR Sector, 1990-2006

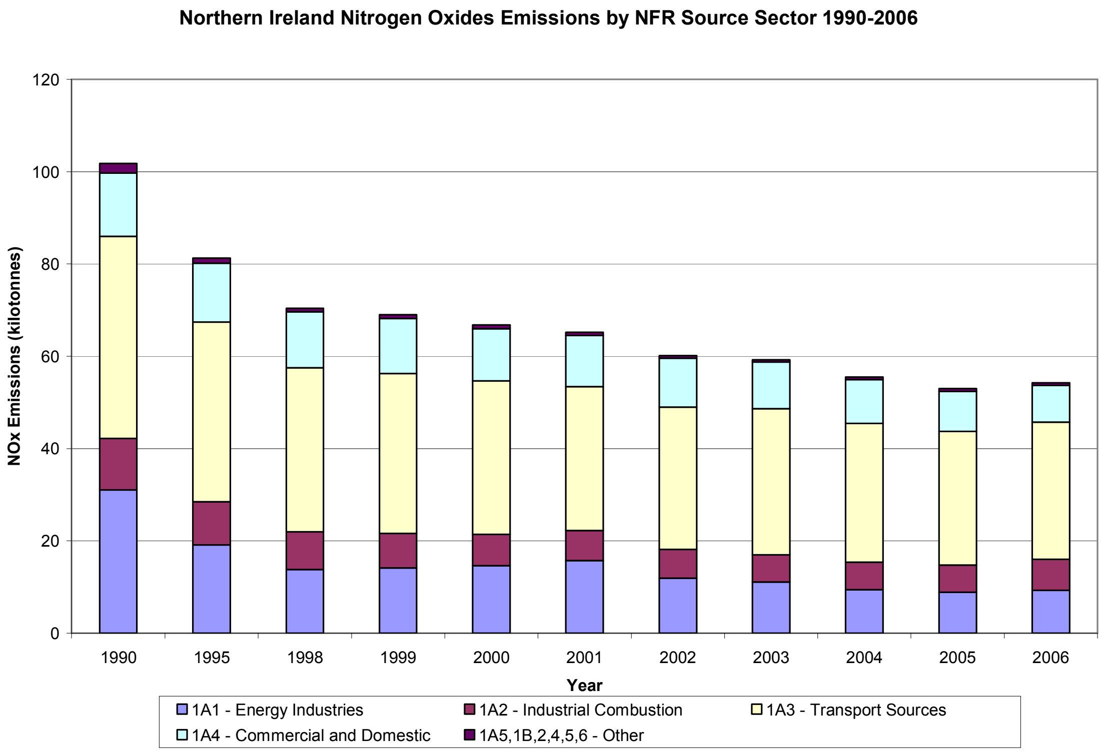
The table and graph below give a summary of the NO_X emissions in Northern Ireland by broad NFR sector categories. The detailed data are available in Appendix E.

Table 2-15 - Northern Ireland emissions of NO_x by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	31.0	19.2	13.8	14.1	14.6	15.8	11.9	11.1	9.4	8.9	9.3	17%
1A2 - Industrial Combustion	11.2	9.3	8.1	7.5	6.8	6.5	6.2	5.9	6.0	5.9	6.7	12%
1A3 - Transport Sources	43.8	39.0	35.5	34.7	33.3	31.2	30.8	31.6	30.1	29.0	29.7	55%
1A4 - Commercial and Domestic	13.7	12.8	12.1	11.9	11.3	11.0	10.6	10.2	9.4	8.7	8.0	15%
1A5,1B,2,4,5,6 - Other	2.1	1.1	0.8	0.9	0.8	0.7	0.6	0.5	0.6	0.6	0.6	1%
Total	**101.8**	**81.2**	**70.4**	**69.0**	**66.8**	**65.2**	**60.1**	**59.2**	**55.5**	**53.0**	**54.3**	**100%**

Units: kilotonnes

Figure 2-15 - Time series of Northern Ireland NO_x emissions 1990-2006



Northern Ireland's NO_X emissions have declined by 47% since 1990 and account for only 3% of the UK total. Power generation is a significant source, accounting for 17% of the Northern Irish total in 2006, although emissions from this source have reduced by 70% since 1990. 43% of NO_X emissions in Wales stem from road transport combustion sources (1A3bi-iv: down by 42% since 1990), whilst 12% stem from industrial combustion (1A2: down 40% since 1990) and 5% are from residential combustion sources (1A4bi: down 37% since 1990). Notable increases in emissions arise from national navigation (1A3dii: up 52% since 1990 to 9% of the 2006 Northern Irish total) and from very minor sources sector such as civil aviation (1A3aii: up by 122% since 1990 but only 1 % of the Northern Irish total in 2006).

2.4 NON-METHANE VOLATILE ORGANIC COMPOUNDS EMISSION ESTIMATES

NMVOCs are emitted to air as combustion products, as vapour arising from handling or use of petroleum distillates, solvents or chemicals, and from numerous other sources. The diversity of processes which emit NMVOCs is huge, covering not only many branches of industry, but also transport, agriculture and domestic sources.

UK emissions inventory data indicate that only 22% of the NMVOC emissions arise from combustion sources (unlike SO_2 and NO_x where the contribution from combustion sources is much higher). Of these emissions from combustion sources, it is the transport sector that dominates. NMVOC emissions are dependent on vehicle speed and are higher on minor and urban major roads than on the high-speed motorways and major roads.

A large proportion of emissions are caused either as a result of the activities of people in and around their homes (e.g. domestic solvent use or domestic combustion), or by widespread industrial activities such as small-scale industrial coating processes, dry cleaning shops, and small bakeries, which are present in towns and cities throughout the UK.

- **Solvent and other product use.** This sector comprises both industrial and domestic applications, and the manufacturing and processing on chemical products. It represents 44 of the UK total emission in 2006. During the 1990s, industrial NMVOC emissions have fallen as a result of emission controls, technological changes, and reduced manufacturing output in some sectors. Emissions from the chemical industry have reduced during the 1990s as tighter emission controls have been introduced. Domestic solvent emissions have also fallen due to a trend towards formulating products such as paints and aerosols with lower solvent contents.

- **Stationary Combustion.** This sector includes emissions from public electricity and heat production as well as those from petroleum refining and the manufacture of iron and steel. Emissions from the petroleum-refineries have fallen significantly due to a reduction in refinery capacity and tighter emission regulations during the 1990s.

- **Production processes**. This sector includes emissions from metal production, road construction, and non-fuel mining. It represents 4% of the UK total emission in 2006.

- **Processes in wood, paper pulp and food & drink.** Emissions from the food and drink industry comprised 9% of the total NMVOC emission in 2006. The largest source is whisky maturation although bread baking, animal feed manufacture, fat and oil processing and barley malting are also important.

- **Transport.** Emissions from transport sources are currently responsible for 12% of NMVOC emissions of which 11% are a result of road transport. During the 1990s, these emissions have declined significantly due to the increased use of catalytic converters and fuel switching from petrol to diesel cars.

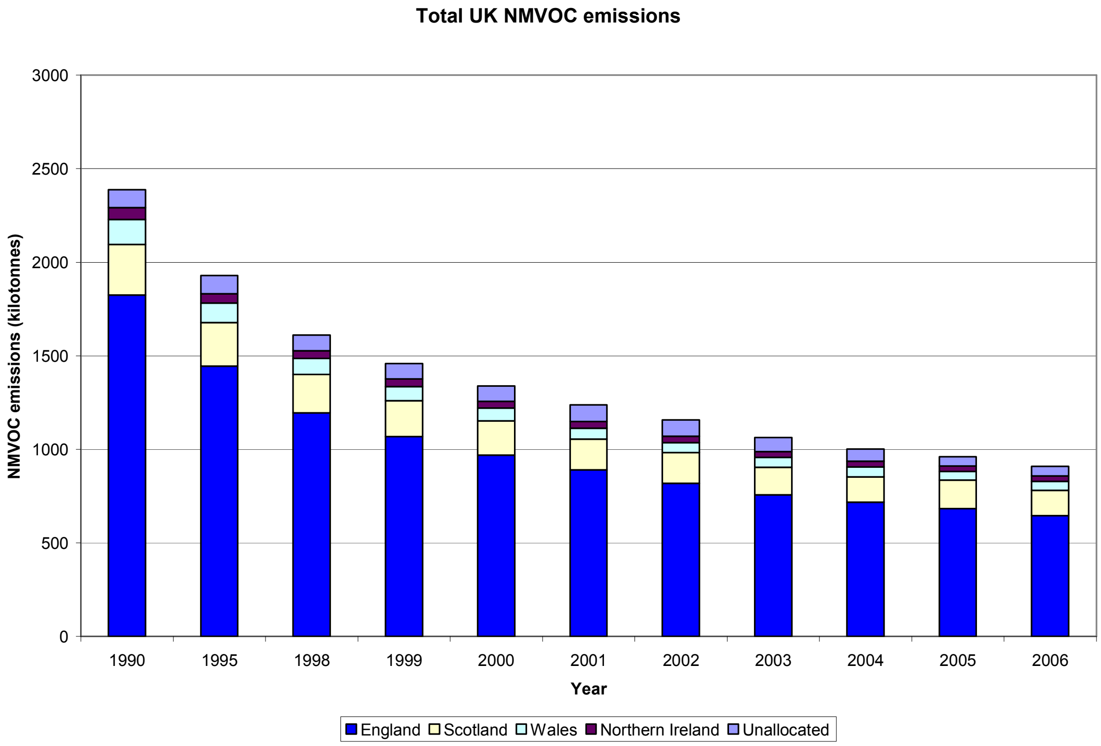
- **Offshore oil and gas.** Emissions from this sector have increased substantially with the growth of the UK's offshore activities. The most important sources of NMVOC emissions are tanker loading, flaring and fugitive emissions.

Other sources of NMVOCs include:

- Gas leakage from the national gas distribution networks.
- Evaporative losses from the distribution and marketing of petrol.
- Domestic heating.
- Waste treatment and disposal contribute.
- Natural and agricultural sources.

As can be seen in Figure 2-16 total UK emissions of NMVOC fell by 62% between 1990 and 2006.

Figure 2-16 – Total UK NMVOC emissions



Emissions of NMVOCs for England, Wales, Scotland and Northern Ireland are summarised in the tables and graphs below, with more detailed inventory tables in Appendix G. Table 2.16 shows how total UK NMVOC emissions are split between the 4 constituent countries.

Table 2-16 Proportion of total NMVOC emissions from UK constituent countries

Year	England	Scotland	Wales	NI	Unallocated
1990	76%	11%	6%	3%	4%
2006	71%	15%	5%	3%	6%

2.4.1 England NMVOC Inventory by NFR Sector, 1990-2006

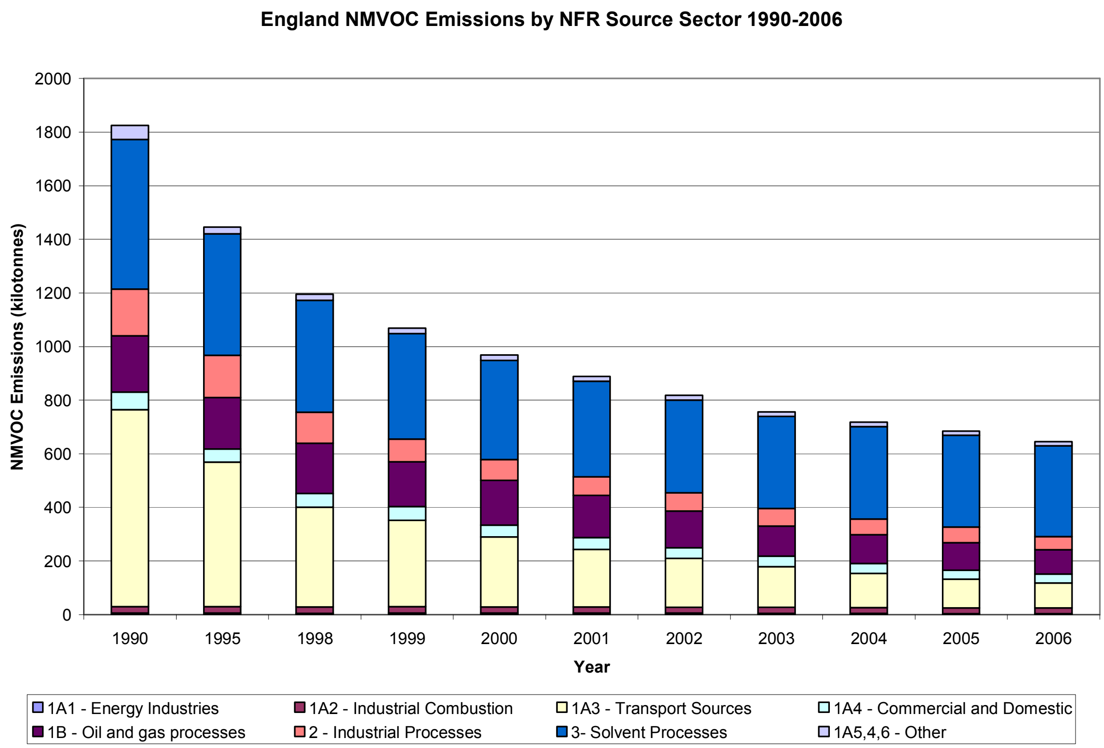
The table and graph below give a summary of the NMVOC emissions in England by broad NFR sector categories. The detailed data are available in Appendix G.

Table 2-17 - England emissions of NMVOC by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006 %
1A1 - Energy Industries	5.6	5.9	4.2	5.3	5.7	5.2	5.7	4.6	4.4	3.6	3.6	1%
1A2 - Industrial Combustion	23.0	23.8	23.9	23.4	22.8	22.9	22.1	21.8	21.5	21.9	21.3	3%
1A3 - Transport Sources	735.2	538.4	372.8	322.5	260.9	215.5	181.6	152.6	127.0	106.4	93.4	14%
1A4 - Commercial and Domestic	65.5	49.8	50.5	51.7	45.0	42.8	39.4	38.3	36.8	34.1	32.9	5%
1B - Oil and gas processes	211.4	192.6	187.0	167.3	167.0	157.5	137.6	113.3	107.7	102.5	90.6	14%
2 - Industrial Processes	172.9	156.1	115.7	84.2	76.8	70.2	67.5	64.9	59.0	58.0	48.9	8%
3- Solvent Processes	558.6	453.3	418.6	393.2	369.8	356.3	346.2	344.1	344.8	341.7	338.7	52%
1A5,4,6 - Other	52.6	26.0	22.4	21.3	20.2	18.7	17.7	16.5	15.8	15.6	16.2	3%
Total	**1824.8**	**1446.0**	**1195.2**	**1068.9**	**968.2**	**889.1**	**817.9**	**756.0**	**717.1**	**683.6**	**645.6**	**100%**

Units: kilotonnes

Figure 2-17 - Time series of England NMVOC emissions 1990-2006



England's NMVOC emissions have declined by 65% since 1990 and account for 71% of the UK total. Significant sources include:

- Road transport sources, including evaporative losses (1A3bi-v: 13% of the total in 2006, down 88% since 1990)
- Oil & gas processes (1B: 14% of the total in 2006, down 57% since 1990)
- Industrial processes (2: 8% of the total in 2006, down 72% since 1990)
- Solvent processes (3: 52% of the total in 2006, down 39% since 1990)

2.4.2 Scotland NMVOC Inventory by NFR Sector, 1990-2006

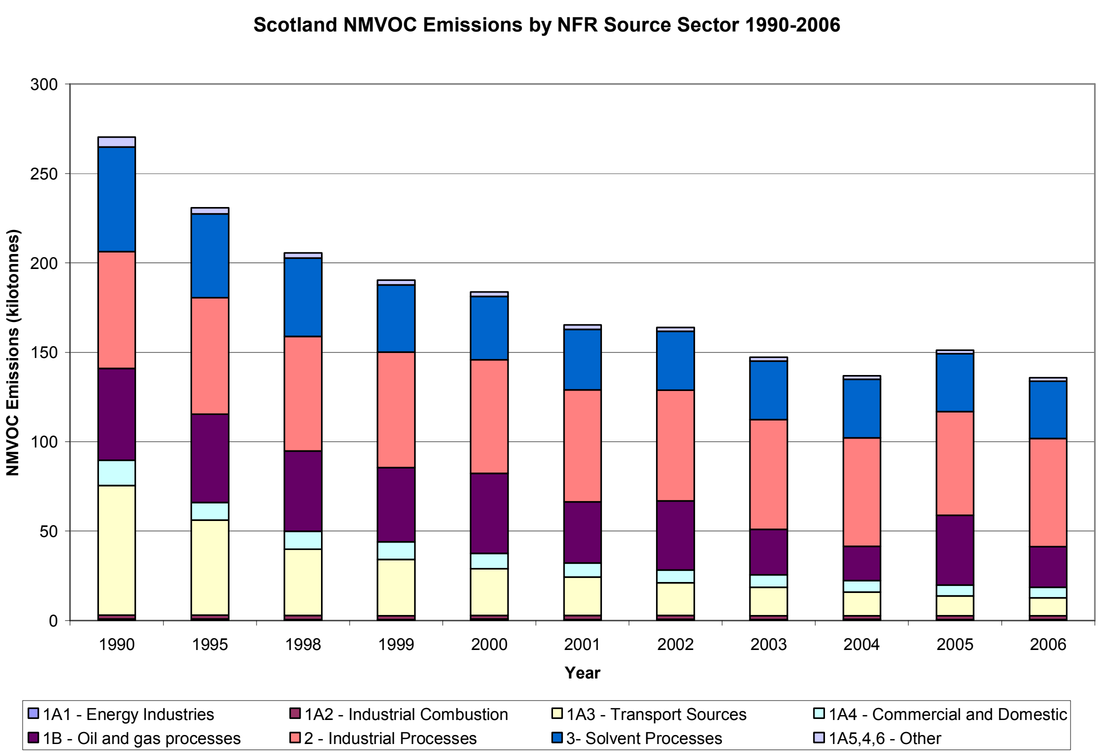
The table and graph below give a summary of the NMVOC emissions in Scotland by broad NFR sector categories. The detailed data are available in Appendix G.

Table 2-18 - Scotland emissions of NMVOC by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	0.8	0.8	0.6	0.5	0.8	0.6	0.7	0.6	0.6	0.6	0.6	0%
1A2 - Industrial Combustion	2.2	2.2	2.2	2.2	2.1	2.2	2.1	2.1	1.9	1.9	1.9	1%
1A3 - Transport Sources	72.5	53.1	37.1	31.4	26.1	21.5	18.4	15.8	13.3	11.3	10.2	8%
1A4 - Commercial and Domestic	14.1	10.0	9.9	9.8	8.6	7.9	7.2	7.0	6.5	6.0	5.8	4%
1B - Oil and gas processes	51.4	49.3	45.1	41.5	44.7	34.1	38.5	25.5	19.1	39.0	22.8	17%
2 - Industrial Processes	65.3	65.1	64.1	64.7	63.6	62.6	61.9	61.4	60.6	57.9	60.5	45%
3- Solvent Processes	58.5	46.9	43.8	37.5	35.3	33.9	32.9	32.7	32.7	32.5	32.0	24%
1A5,4,6 - Other	5.6	3.4	2.9	2.7	2.6	2.3	2.2	2.0	2.0	1.9	2.0	1%
Total	**270.4**	**230.8**	**205.6**	**190.4**	**183.7**	**165.2**	**163.9**	**147.1**	**136.7**	**151.2**	**135.8**	**100%**

Units: kilotonnes

Figure 2-18 - Time series of Scotland NMVOC emissions 1990-2006



Scotland's NMVOC emissions have declined by 50% since 1990 and account for 15% of the UK total. Significant sources include:

- Road transport sources, including evaporative losses (1A3bi-v: 6% of the total in 2006, down 88% since 1990)
- Oil & gas processes (1B: 17% of the total in 2006, down 56% since 1990)

- Industrial processes (2: 45% of the total in 2006, down 7% since 1990), including food & drink emissions (2D2: dominated by brewers and distilleries, 39% of the Scottish total in 2006, up 12% since 1990)
- Solvent processes (3: 24% of the total in 2006, down 45% since 1990)

2.4.3 Wales NMVOC Inventory by NFR Sector, 1990-2006

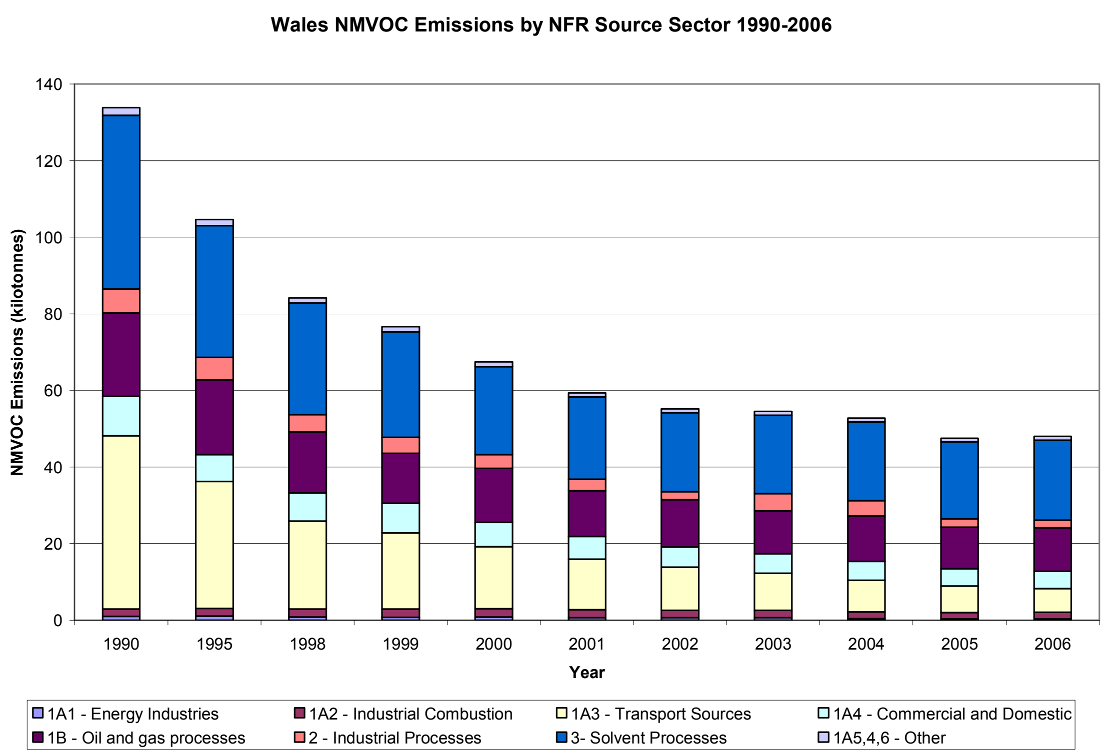
The table and graph below give a summary of the NMVOC emissions in Wales by broad NFR sector categories. The detailed data are available in Appendix G.

Table 2-19 - Wales emissions of NMVOC by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	1.0	1.0	0.8	0.7	0.8	0.6	0.7	0.6	0.4	0.3	0.3	1%
1A2 - Industrial Combustion	1.9	2.0	2.1	2.1	2.2	2.0	1.9	2.0	1.8	1.7	1.7	4%
1A3 - Transport Sources	45.2	33.2	23.0	19.9	16.1	13.2	11.2	9.6	8.2	6.9	6.2	13%
1A4 - Commercial and Domestic	10.3	7.0	7.4	7.7	6.4	5.9	5.3	5.1	4.9	4.6	4.5	9%
1B - Oil and gas processes	21.8	19.5	16.0	13.1	14.1	12.0	12.3	11.2	11.8	10.8	11.4	24%
2 - Industrial Processes	6.3	5.8	4.5	4.2	3.6	3.0	2.1	4.5	4.1	2.1	2.0	4%
3- Solvent Processes	45.3	34.4	29.1	27.6	23.1	21.4	20.6	20.5	20.5	20.2	20.8	43%
1A5,4,6 - Other	2.0	1.6	1.4	1.3	1.2	1.1	1.1	1.0	1.0	1.0	1.0	2%
Total	**133.9**	**104.6**	**84.2**	**76.6**	**67.5**	**59.3**	**55.2**	**54.5**	**52.7**	**47.5**	**48.0**	**100%**

Units: kilotonnes

Figure 2-19 - Time series of Wales NMVOC emissions 1990-2006



Wales' NMVOC emissions have declined by 64% since 1990 and account for 5% of the UK total. Significant sources include:

- Road transport sources, including evaporative losses (1A3bi-v: 11% of the total in 2006, down 88% since 1990)
- Oil & gas processes (1B: 24% of the total in 2006, down 48% since 1990)
- Industrial processes (2: 4% of the total in 2006, down 68% since 1990)
- Solvent processes (3: 43% of the total in 2006, down 54% since 1990)

2.4.4 Northern Ireland NMVOC Inventory by NFR Sector, 1990-2006

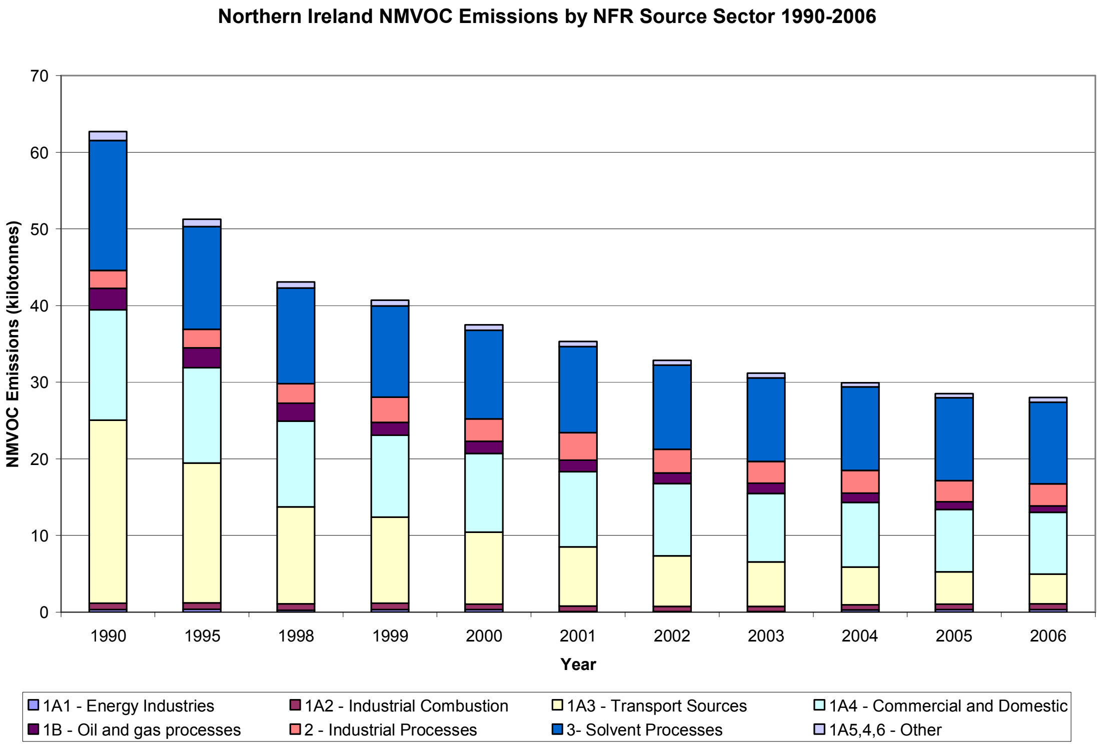
The table and graph below give a summary of the NMVOC emissions in Northern Ireland by broad NFR sector categories. See Appendix G for more detailed data.

Table 2-20 - Northern Ireland emissions of NMVOC by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	0.3	0.4	0.2	0.3	0.3	0.1	0.0	0.0	0.2	0.3	0.4	1%
1A2 - Industrial Combustion	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	3%
1A3 - Transport Sources	23.9	18.3	12.6	11.2	9.4	7.7	6.6	5.8	4.9	4.2	3.8	14%
1A4 - Commercial and Domestic	14.4	12.4	11.2	10.7	10.3	9.8	9.4	8.9	8.5	8.1	8.1	29%
1B - Oil and gas processes	2.8	2.6	2.3	1.7	1.6	1.5	1.4	1.3	1.2	1.0	0.8	3%
2 - Industrial Processes	2.4	2.4	2.6	3.3	2.9	3.6	3.1	2.9	3.0	2.7	2.9	10%
3- Solvent Processes	16.9	13.4	12.5	11.9	11.6	11.2	11.0	10.9	10.9	10.8	10.7	38%
1A5,4,6 - Other	1.2	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.6	2%
Total	**62.7**	**51.3**	**43.1**	**40.7**	**37.5**	**35.3**	**32.8**	**31.2**	**29.9**	**28.5**	**28.0**	**100%**

Units: kilotonnes

Figure 2-20 - Time series of Northern Ireland NMVOC emissions 1990-2006



Northern Ireland's NMVOC emissions have declined by 55% since 1990 and account for 3% of the UK total. Significant sources include:

- Road transport sources, including evaporative losses (1A3bi-v: 12% of the total in 2006, down 85% since 1990)
- Oil & gas processes (1B: 3% of the total in 2006, down 70% since 1990)
- Commercial & domestic combustion (1A4: 29% of the total in 2006, down 44% since 1990)
- Solvent processes (3: 38% of the total in 2006, down 37% since 1990)
- Food & drink sector (2D2: 10% of the total in 2006, up 78% since 1990).

2.5 PARTICULATE MATTER & PM_{10}

PM_{10} in the atmosphere arises from primary and secondary sources:

Primary Sources

Direct emissions of particulate matter into the atmosphere arise from a wide range of sources such as fuel combustion, surface erosion and wind blown dusts and mechanical break-up in, for example, quarrying and construction sites.

Secondary Sources

Particulate matter may be formed in the atmosphere through reactions of other pollutants such as sulphur dioxide, nitrogen oxides and ammonia to form solid sulphates and nitrates, as well as organic aerosols formed from the oxidation of NMVOCs.

These inventories only consider primary sources. For further information on secondary particulates see the Air Quality Expert Group's Report on particulate matter in the United Kingdom (AQEG, 2005)
http://www.defra.gov.uk/environment/airquality/publications/particulate-matter/index.htm

The main sources of primary PM_{10} are briefly described below:

- **Road Transport.** Diesel engines typically emit a greater mass of particulates per vehicle kilometre than petrol engines, and particulate emissions also arise from brake and tyre wear and from the re-entrainment of dust from road surfaces.

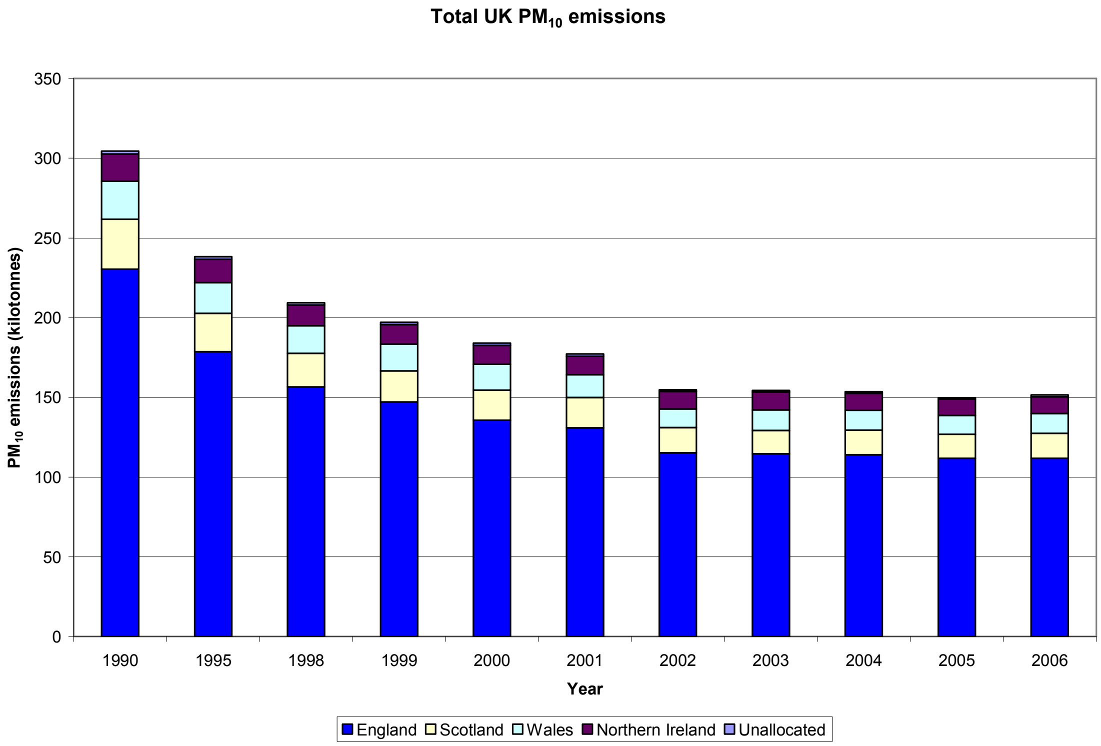
- **Stationary Combustion.** Domestic coal combustion has historically been the main source of particulate emissions in the UK, but restrictions in the use of coal for domestic combustion through the Clean Air Acts has lead to other sources becoming more important nationally. Domestic coal is still a significant source in Northern Ireland, some smaller towns and villages, and in areas associated with the coal industry. Other fossil fuels emit PM_{10}, with combustion of wood, gas oil and fuel oil all contributing significantly to UK emissions. In general, particles emitted from fuel combustion are of a smaller size than from other sources.

- **Industrial Processes.** Particulates are emitted from a wide range of industrial processes including: the production of metals, cement, lime, coke & chemicals, bulk handling of dusty materials, construction, mining and quarrying. Whilst emission monitoring results are now widely available for stack and other point-source emissions of particulates from regulated industrial processes, the quantification of diffuse & fugitive emissions from industrial sources is more difficult. Few UK measurements are available for these fugitive releases but there have been substantial improvements in the estimation of PM_{10} emissions from industrial processes in recent years.

2.5.1 UK Trends in PM_{10} Emissions

Emissions of PM_{10} from across the UK have declined significantly since 1970, mainly due to improved abatement of industrial and power generation emission sources and a general reduction in coal use as an energy source across many economic sectors. For example, emissions in the domestic and commercial sector have fallen from 221 ktonnes (45% of the total emission) in 1970 to 21 ktonnes (14%) in 2006.

Figure 2-21 Total UK emissions of PM_{10}



It is notable that emissions from power stations have declined despite a significant growth in electricity generation capacity, due to fuel switching from coal to both natural gas and nuclear power and also due to abatement being fitted at some coal-fired power stations. For example, the installation of flue gas desulphurisation (FGD) at a number of plants has reduced particulate matter emissions substantially. Emissions from road transport have varied across the time-series as a number of factors have combined. The main source of road transport emissions is exhaust gases from diesel engines. Emissions from diesel vehicles have been growing due to the growth in heavy-duty vehicle traffic and the move towards more diesel cars. Since around 1992, however, emissions from diesel vehicles have been decreasing due to the penetration of new vehicles meeting tighter PM_{10} emission regulations ("Euro standards" for diesel vehicles were first introduced in 1992).

Among the non-combustion and non-transport sources, the major emissions are from industrial processes, the most important of which is quarrying whose emission rates have remained fairly constant. Other industrial processes, including the manufacture of steel, cement, lime, coke, and primary and secondary non-ferrous metals, are collectively important sources of particulate matter although emissions from individual sectors are relatively insignificant.

Emissions of PM_{10} for England, Wales, Scotland and Northern Ireland are summarised in the tables and graphs below, with more detailed inventory tables in Appendix C. Table 2.21 shows how total UK PM_{10} emissions are split between the 4 constituent countries.

Table 2-21 Proportion of total PM_{10} emissions from UK constituent countries

Year	England	Scotland	Wales	NI	Unallocated
1990	76%	10%	8%	6%	1%
2006	74%	10%	8%	7%	1%

2.5.2 England PM_{10} Inventory by NFR Sector, 1990-2006

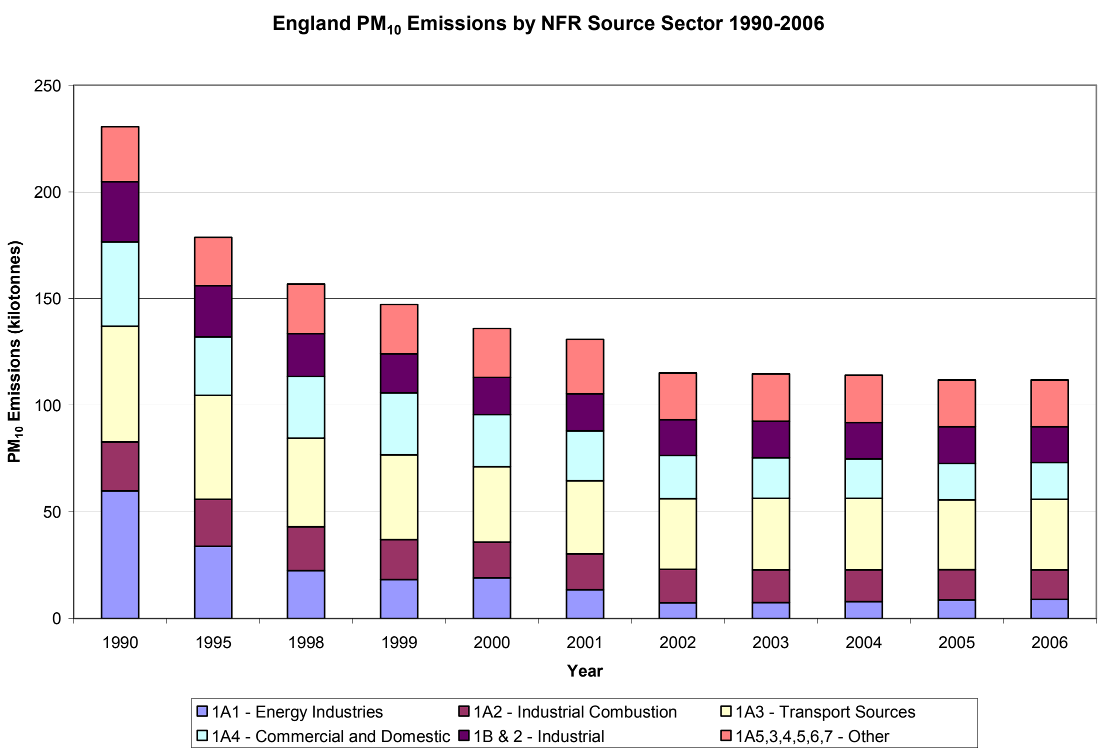
The table and graph below give a summary of the PM_{10} emissions in England by broad NFR sector categories. The detailed data are available in Appendix C.

Table 2-22 England emissions of PM_{10} by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	59.8	33.9	22.4	18.2	19.0	13.4	7.4	7.5	7.8	8.7	9.0	8%
1A2 - Industrial Combustion	22.9	22.1	20.7	18.9	16.7	16.9	15.7	15.3	15.0	14.2	13.8	12%
1A3 - Transport Sources	54.2	48.6	41.5	39.7	35.4	34.4	33.1	33.6	33.5	32.7	33.1	30%
1A4 - Commercial and Domestic	39.6	27.4	28.8	29.0	24.4	23.4	20.1	19.1	18.5	17.1	17.2	15%
1B & 2 - Industrial	28.1	24.0	20.1	18.3	17.5	17.3	17.0	17.1	17.2	17.2	16.9	15%
1A5,3,4,5,6,7 - Other	25.8	22.7	23.2	23.1	22.8	25.5	21.9	22.2	22.1	21.9	21.9	20%
Total	**230.5**	**178.6**	**156.7**	**147.2**	**135.8**	**130.8**	**115.1**	**114.6**	**114.1**	**111.8**	**111.8**	**100%**

Units: kilotonnes

Figure 2-22 Time series of England PM_{10} emissions 1990-2006



England's PM_{10} emissions have declined by 51% since 1990 and account for 74% of the UK total. 30% of PM_{10} emissions in England come from transport sources (down by 39% since 1990), whilst 15% stem from commercial and residential combustion (mainly of coal and solid fuels, down by 57% since 1990). Emissions from power generation (1A1a) were 25% of the England total emission in 1990, but have been significantly reduced to 7% of the England total in 2006.

2.5.3 Scotland PM_{10} Inventory by NFR Sector, 1990-2006

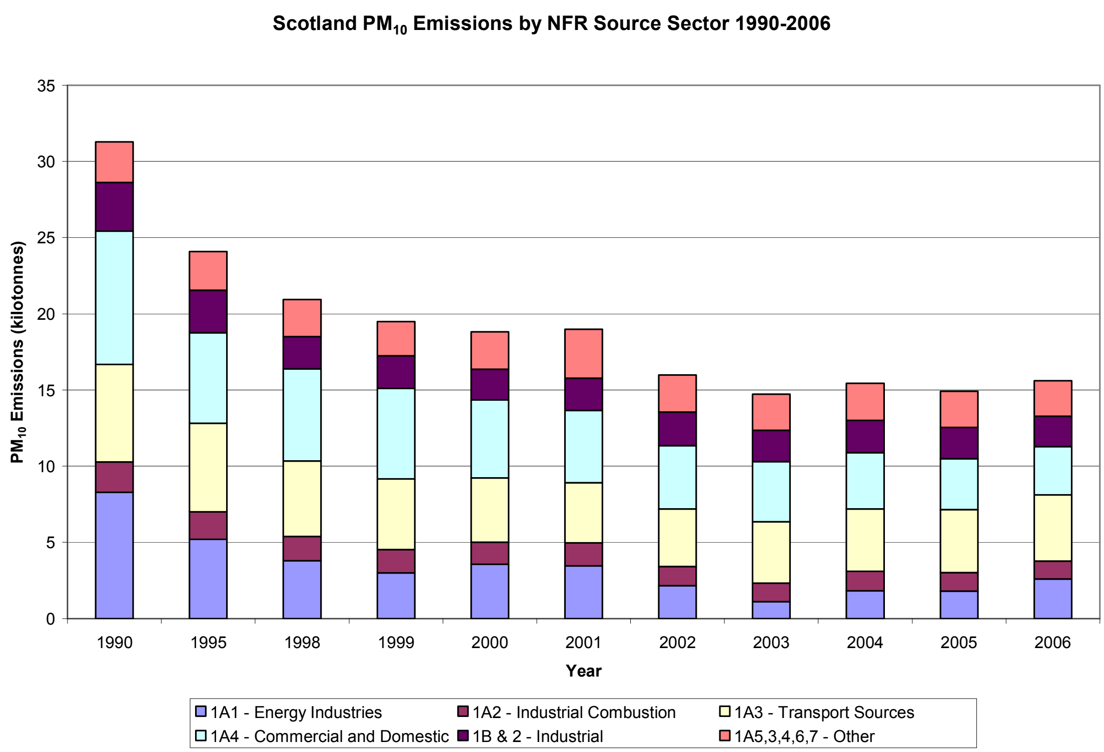
The table and graph below give a summary of the PM_{10} emissions in Scotland by broad NFR sector categories. The detailed data are available in Appendix C.

Table 2-23 Scotland emissions of PM_{10} by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	8.3	5.2	3.8	3.0	3.6	3.5	2.2	1.1	1.8	1.8	2.6	17%
1A2 - Industrial Combustion	2.0	1.8	1.6	1.5	1.4	1.5	1.3	1.2	1.3	1.2	1.2	7%
1A3 - Transport Sources	6.4	5.8	4.9	4.6	4.2	4.0	3.8	4.0	4.1	4.1	4.4	28%
1A4 - Commercial and Domestic	8.8	5.9	6.0	5.9	5.1	4.7	4.2	4.0	3.7	3.3	3.2	20%
1B & 2 - Industrial	3.2	2.8	2.1	2.1	2.0	2.1	2.2	2.0	2.1	2.0	2.0	13%
1A5,3,4,6,7 - Other	2.7	2.5	2.4	2.2	2.5	3.2	2.4	2.4	2.4	2.4	2.3	15%
Total	**31.3**	**24.1**	**20.9**	**19.5**	**18.8**	**19.0**	**16.0**	**14.7**	**15.4**	**14.9**	**15.6**	**100%**

Units: kilotonnes

Figure 2-23 Time series of Scotland PM_{10} emissions 1990-2006



Scotland's PM_{10} emissions have declined by 50% since 1990 and account for 10% of the UK total. 28% of PM_{10} emissions in Scotland come from transport sources (down by 32% since

1990), whilst 20% stem from commercial and residential combustion (mainly of coal and solid fuels, down by 64% since 1990). Emissions from power generation (1A1a) were 24% of the Scotland total emission in 1990, but have been reduced to 15% of the Scotland total in 2006. Reduction in emissions from the iron & steel combustion sector (1A2a) of 98% over 1990-2005 are primarily due to the closure of the Ravenscraig steelworks.

2.5.4 Wales PM_{10} Inventory by NFR Sector, 1990-2006

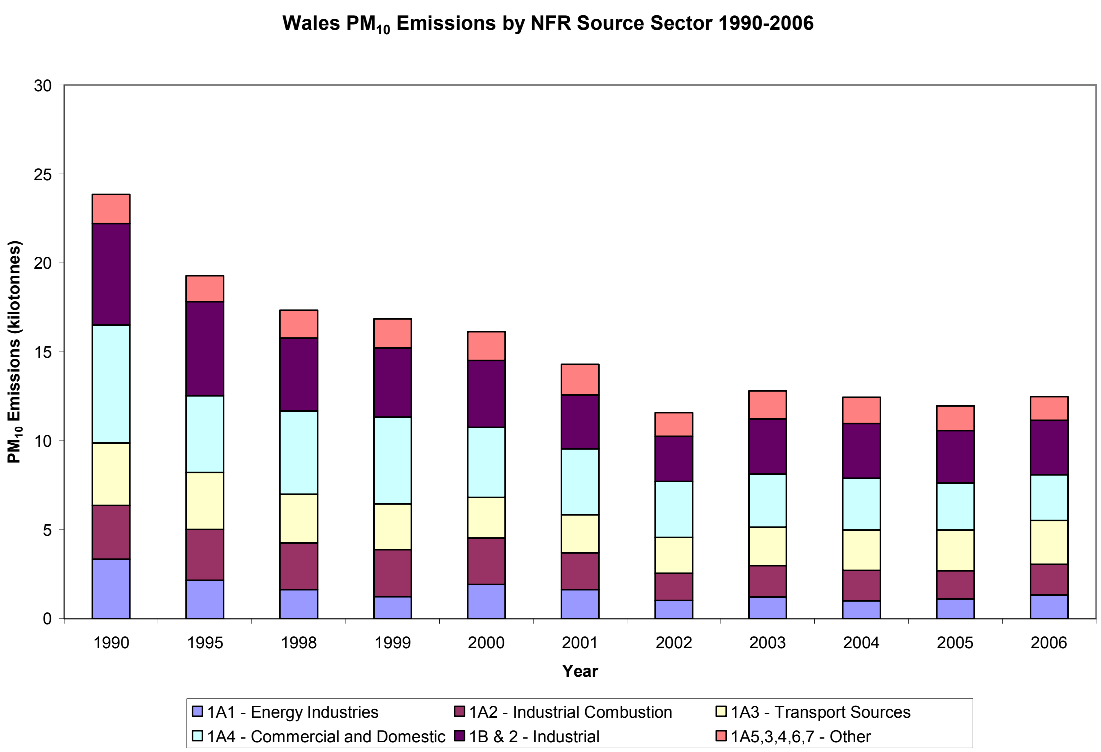
The table and graph below give a summary of the PM_{10} emissions in Wales by broad NFR sector categories. The detailed data are available in Appendix C.

Table 2-24 Wales emissions of PM_{10} by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	3.3	2.2	1.6	1.2	1.9	1.6	1.0	1.2	1.0	1.1	1.3	11%
1A2 - Industrial Combustion	3.0	2.9	2.6	2.6	2.6	2.1	1.5	1.8	1.7	1.6	1.7	14%
1A3 - Transport Sources	3.5	3.2	2.7	2.6	2.3	2.1	2.0	2.2	2.3	2.3	2.5	20%
1A4 - Commercial and Domestic	6.6	4.3	4.7	4.9	3.9	3.7	3.2	3.0	2.9	2.6	2.6	21%
1B & 2 - Industrial	5.7	5.3	4.1	3.9	3.8	3.0	2.5	3.1	3.1	2.9	3.0	24%
1A5,3,4,6,7 - Other	1.6	1.5	1.6	1.6	1.6	1.7	1.3	1.6	1.5	1.4	1.3	11%
Total	**23.9**	**19.3**	**17.3**	**16.9**	**16.1**	**14.3**	**11.6**	**12.8**	**12.4**	**12.0**	**12.5**	**100%**

Units: kilotonnes

Figure 2-24 Time series of Wales PM_{10} emissions 1990-2006



Wales's PM_{10} emissions have declined by 48% since 1990 and accounted for 8% of the UK total in 2006. 20% of PM_{10} emissions in Wales come from transport sources (down by 30% since 1990), whilst 21% stem from commercial and residential combustion (mainly of coal and solid fuels, down by 61% since 1990). Emissions from power generation (1A1a) were 11% of the

Wales total emission in 1990, but have been reduced by 67% to be just over 7% of the Wales total in 2006. It is notable that heavy industry plays a more significant role in the Wales PM_{10} inventory with key contributions to the 2006 total from refining (4%), iron & steel combustion (7%), other manufacturing combustion (7%) and 24% from Industrial Process sectors

2.5.5 Northern Ireland PM_{10} Inventory by NFR Sector, 1990-2006

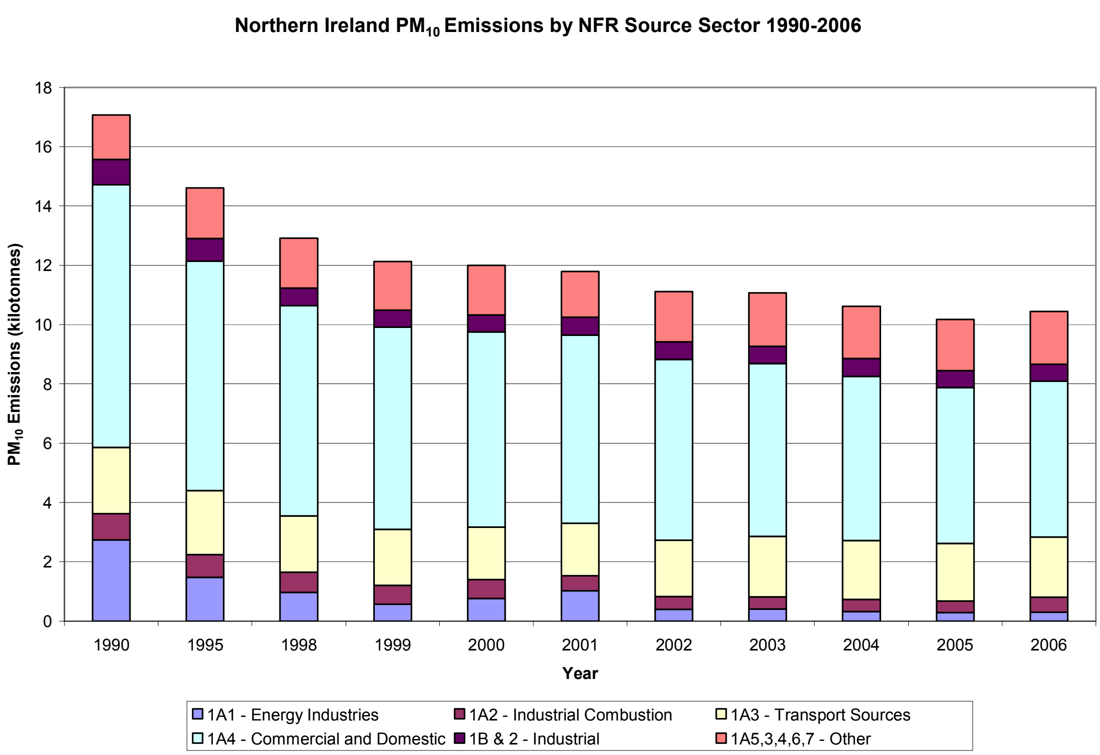
The table and graph below give a summary of the PM_{10} emissions in Northern Ireland by broad NFR sector categories. The detailed data are available in Appendix C.

Table 2-25 Northern Ireland emissions of PM_{10} by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	2.7	1.5	1.0	0.6	0.8	1.0	0.4	0.4	0.3	0.3	0.3	3%
1A2 - Industrial Combustion	0.9	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.4	0.4	0.5	5%
1A3 - Transport Sources	2.2	2.2	1.9	1.9	1.8	1.8	1.9	2.0	2.0	1.9	2.0	19%
1A4 - Commercial and Domestic	8.9	7.7	7.1	6.8	6.6	6.3	6.1	5.8	5.5	5.3	5.3	50%
1B & 2 - Industrial	0.9	0.8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	5%
1A5,3,4,6,7 - Other	1.5	1.7	1.7	1.6	1.7	1.6	1.7	1.8	1.8	1.7	1.8	17%
Total	**17.1**	**14.6**	**12.9**	**12.1**	**12.0**	**11.8**	**11.1**	**11.1**	**10.6**	**10.2**	**10.4**	**100%**

Units: kilotonnes

Figure 2-25 Time series of Wales PM_{10} emissions 1990-2006

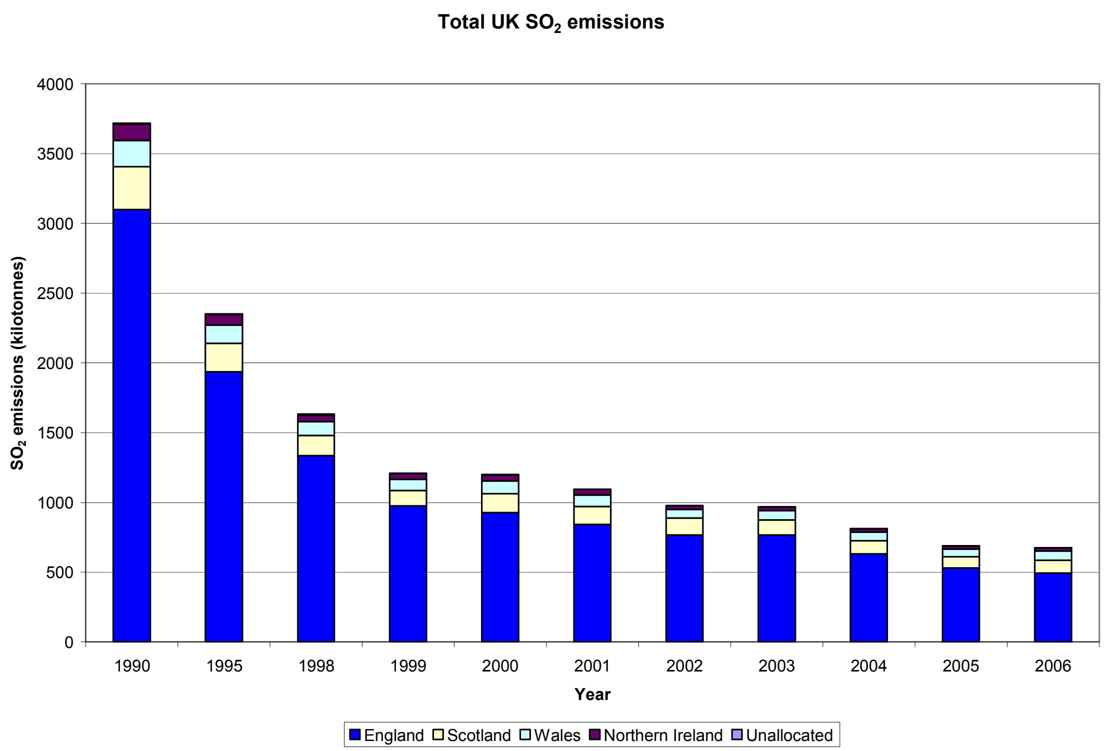


Northern Ireland's PM_{10} emissions have declined by 39% since 1990 and accounted for 7% of the UK total in 2006. 19% of PM_{10} emissions in Northern Ireland come from transport sources (down by 9% since 1990), whilst 50% stem from commercial and residential combustion (mainly of coal and solid fuels), down by 41% since 1990. Emissions from power generation (1A1a) were 16% of the total emissions in 1990, but have been reduced to 3% of the Northern Ireland total in 2006.

2.6 SULPHUR DIOXIDE EMISSION ESTIMATES

Since 1970 there has been a substantial overall reduction of more than 89% in SO_2 emissions from across the UK, mainly due to a decline in emissions from combustion of sulphur-containing solid fuels and petroleum products.

Figure 2-26 Total UK emissions of SO_2



Emissions from combustion of petroleum products have fallen significantly due to the decline in fuel oil use and the reduction in the sulphur content of gas oil and DERV (diesel fuel specifically used for road vehicles). The reduced sulphur content of gas oil is particularly significant in sectors such as domestic heating, commercial heating and off-road sources where gas oil is used extensively.

Fuel combustion accounts for more than 93% of total UK SO_2 emissions with the sulphur arising from the fuel itself. The SO_2 emission can be calculated from knowledge of the sulphur content of the fuel and from information on the amount of sulphur retained in the ash. Published fuel consumption data (DTI, 2007), published sulphur contents of liquid fuels (Watson, 2007) and data from coal producers regarding sulphur contents of coals enable reliable estimates to be produced. The main combustion sources are:

- **Power generation.** Power stations account for 53% of UK SO_2 emissions in 2006. Historically coal-fired stations have been the most important source, but the gradual change in fuel mix of UK power stations (to more nuclear and gas-fired plant) and improvements in generation efficiency and abatement has led to an 88% reduction in SO_2 emissions since 1970. It is expected that these reductions will continue in the near future as more CCGT stations are built and FGD is fitted to more coal fired power plant.

- **Industrial Combustion.** Emissions of SO_2 from industry result from the combustion of coal and oil, some refinery processes and the production of sulphuric acid and other chemicals. Between 1970 and 2006 emissions from combustion sources have fallen by 76%, primarily due to the decline in energy-intensive heavy industries such as iron & steel manufacturing. In addition, UK industry has gradually switched from coal and oil-based fuels in favour of natural gas, as it provides a cleaner, cheaper energy source.

In 2006, road transport emissions account for less than 1% of the total SO_2 emissions. Previously this source was more significant, but a tightening of fuel standards during the 1990s has lead to a significant decline in emissions due to the reduction in the sulphur content of DERV. The reduction in the sulphur content of gas oil has also reduced emissions from off-road vehicles. Emissions from domestic, commercial & institutional sectors have also declined since 1970, reflecting the major changes in fuel mix from oil and coal to gas. Emissions from waste incinerators have reduced significantly during the 1990s due to the introduction of stricter emission standards forcing the closure of old-design incinerators and their replacement with more modern plant with improved abatement.

Emissions of SO_2 for England, Wales, Scotland and Northern Ireland are summarised in the tables and graphs below, with more detailed inventory tables in Appendix F. Table 2.26 shows how total UK SO_2 emissions are split between the 4 constituent countries.

Table 2-26 Proportion of total SO_2 emissions from UK constituent countries

Year	England	Scotland	Wales	NI	Unallocated
1990	83%	8%	5%	3%	0%
2006	73%	14%	10%	3%	0%

2.6.1 England SO_2 Inventory by NFR Sector, 1990-2006

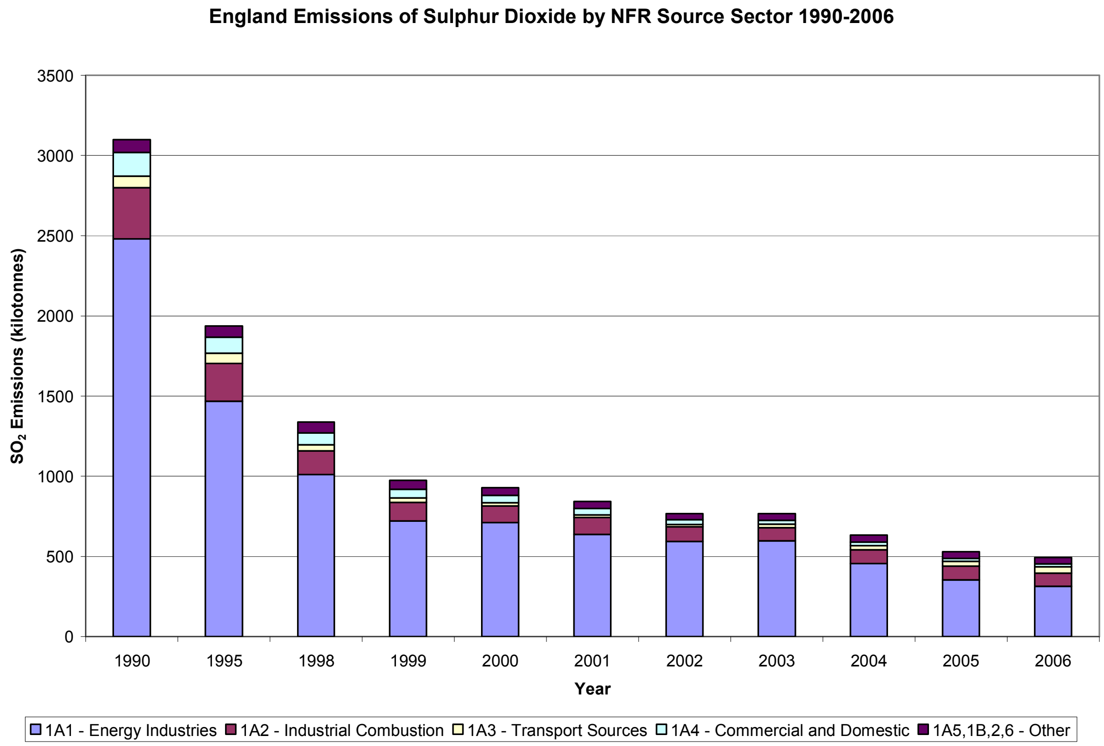
The table and graph below give a summary of the SO_2 emissions in England by broad NFR sector categories. The detailed data are available in Appendix F.

Table 2-27 - England emissions of SO_2 by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006 %
1A1 - Energy Industries	2479.3	1468.1	1011.2	722.3	712.1	637.3	593.0	597.5	455.4	354.7	314.1	64%
1A2 - Industrial Combustion	319.9	236.2	147.6	115.5	103.2	105.8	92.5	82.4	85.3	85.3	81.7	17%
1A3 - Transport Sources	72.7	63.0	37.5	27.7	20.2	16.0	14.5	21.5	25.7	29.7	39.1	8%
1A4 - Commercial and Domestic	147.6	99.9	73.5	53.3	45.5	40.5	27.8	24.3	22.7	18.3	18.6	4%
1A5,1B,2,6 - Other	80.0	70.0	67.1	55.9	47.6	43.2	38.8	41.5	43.0	41.8	41.0	8%
Total	**3099.5**	**1937.2**	**1336.8**	**974.8**	**928.5**	**842.8**	**766.6**	**767.2**	**632.0**	**529.7**	**494.5**	**100%**

Units: kilotonnes

Figure 2-27 - Time series of England SO_2 emissions 1990-2006



England's SO_2 emissions have declined by 84% since 1990 and accounted for 73% of the UK total in 2006. Power generation is by far the most significant source, accounting for 52% of the England total in 2006 (mainly from the sulphur in coal and fuel oil), but due to the growth in gas & nuclear fuel use and the installation of FGD plant at a number of coal-fired power stations, emissions from this source have reduced by 89% since 1990. 17% of SO_2 emissions in England are from industrial combustion (1A2: down by 74% since 1990), 11% from refineries (1A1b: down 42% since 1990) whilst national navigation and residential combustion contribute 7 and 3% of the total respectively. Reductions in SO_2 emissions across all sectors are also due to the progress towards production of low-sulphur petroleum-based fuels such as gas oil (diesel) and burning oil.

2.6.2 Scotland SO_2 Inventory by NFR Sector, 1990-2006

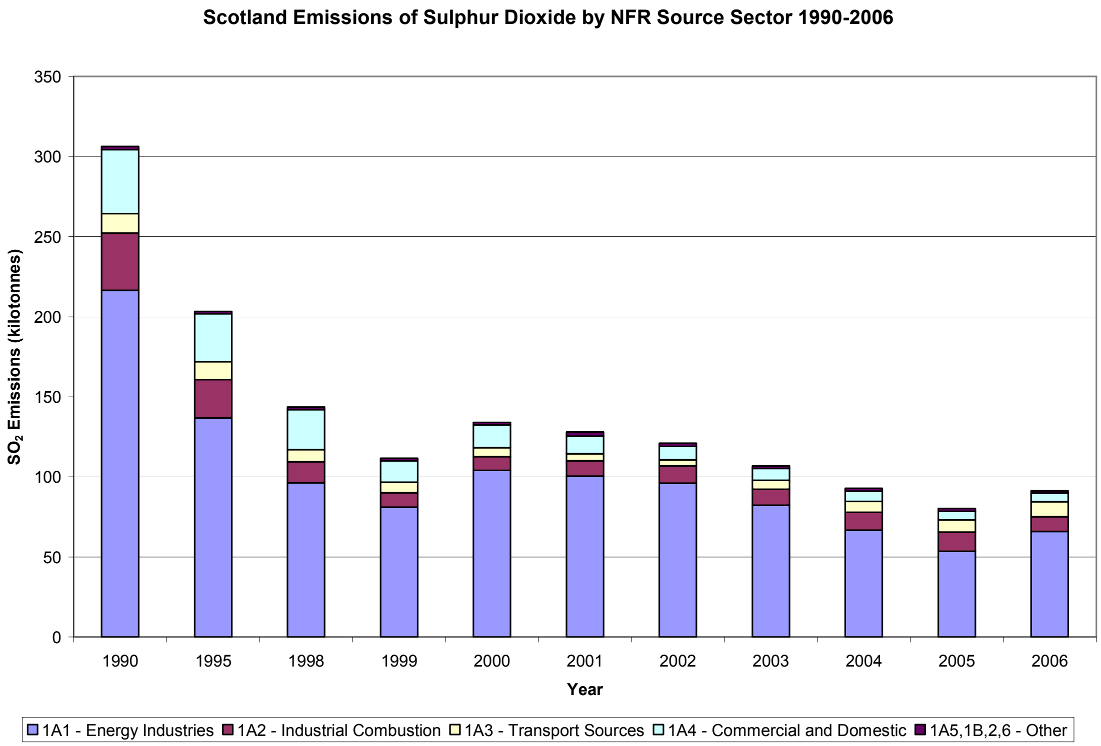
The table and graph below give a summary of the SO_2 emissions in Scotland by broad NFR sector categories. The detailed data are available in Appendix F.

Table 2-28 - Scotland emissions of SO_2 by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	216.4	136.7	96.3	81.0	104.0	100.5	96.1	82.3	66.7	53.6	65.9	72%
1A2 - Industrial Combustion	35.8	23.9	13.0	9.1	8.7	9.6	10.8	10.0	11.3	12.0	9.1	10%
1A3 - Transport Sources	12.2	11.4	7.8	6.5	5.5	4.3	3.8	5.5	6.7	7.6	9.4	10%
1A4 - Commercial and Domestic	39.9	29.8	24.9	13.4	14.1	10.9	8.5	7.4	6.5	5.4	5.5	6%
1A5,1B,2,6 - Other	2.0	1.5	1.6	1.7	1.6	2.7	2.0	1.6	1.7	1.6	1.4	2%
Total	**306.2**	**203.4**	**143.7**	**111.8**	**134.0**	**128.0**	**121.1**	**106.9**	**92.8**	**80.2**	**91.3**	**100%**

Units: kilotonnes

Figure 2-28 - Time series of Scotland SO_2 emissions 1990-2006



Scotland's SO_2 emissions have declined by 70% since 1990 and account for 14% of the UK total. Power generation is by far the most significant source, accounting for 65% of the Scotland total in 2006 (mainly from the sulphur in coal and fuel oil), but due to the growth in gas & nuclear fuel use, emissions from this source have reduced by 70% since 1990. 10% of SO_2 emissions in Scotland are from industrial combustion (1A2: down by 74% since 1990), 7% from refineries (1A1b: down 69% since 1990) whilst national navigation and residential combustion contribute 10 and 5% of the total respectively. Reductions in SO_2 emissions across all sectors are also due to the progress towards production of low-sulphur petroleum-based fuels such as gas oil (diesel) and burning oil.

2.6.3 Wales SO_2 Inventory by NFR Sector, 1990-2006

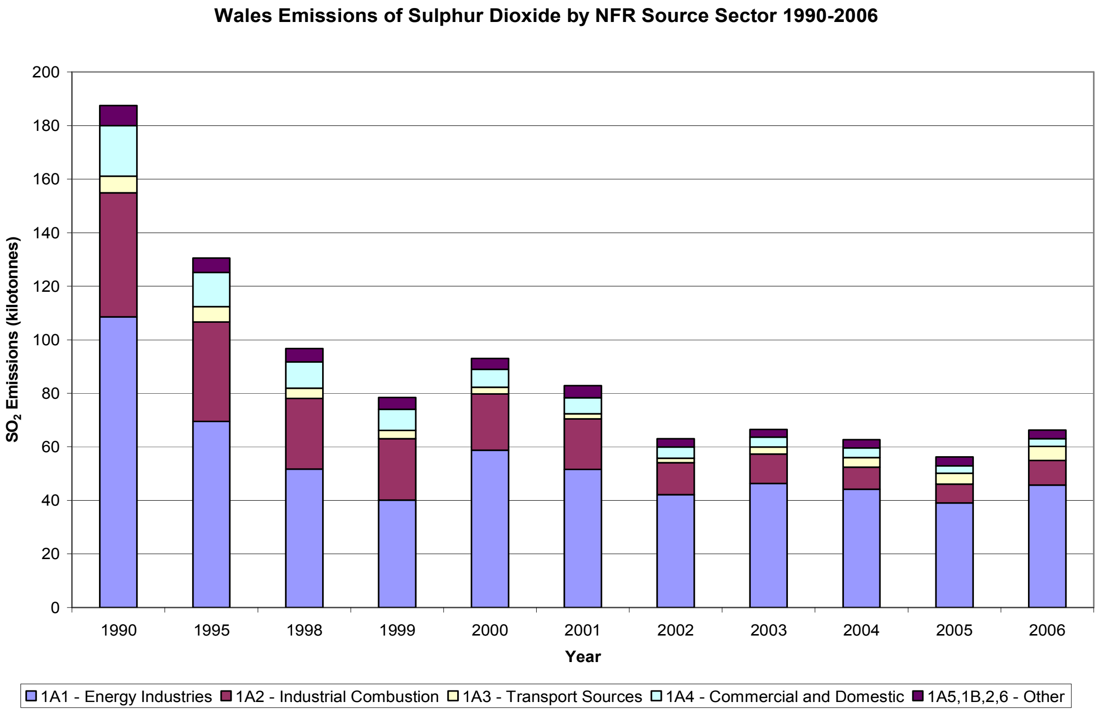
The table and graph below give a summary of the SO_2 emissions in Wales by broad NFR sector categories. The detailed data are available in Appendix F.

Table 2-29 - Wales emissions of SO_2 by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	108.5	69.6	51.7	40.1	58.7	51.6	42.2	46.3	44.1	39.0	45.7	69%
1A2 - Industrial Combustion	46.4	37.1	26.4	22.9	21.1	18.8	11.9	10.9	8.3	7.0	9.3	14%
1A3 - Transport Sources	6.3	5.7	3.8	3.1	2.6	1.9	1.7	2.7	3.6	4.1	5.2	8%
1A4 - Commercial and Domestic	18.9	12.8	9.8	8.0	6.6	5.9	4.1	3.7	3.6	2.7	2.8	4%
1A5,1B,2,6 - Other	7.5	5.4	5.1	4.3	4.0	4.6	3.2	2.9	3.1	3.4	3.2	5%
Total	**187.5**	**130.6**	**96.8**	**78.4**	**92.9**	**82.8**	**63.0**	**66.5**	**62.7**	**56.2**	**66.2**	**100%**

Units: kilotonnes

Figure 2-29 - Time series of Wales SO_2 emissions 1990-2006



Wales' SO_2 emissions have declined by 65% since 1990 and accounted for 10% of the UK total in 2006. Power generation is by far the most significant source, accounting for 47% of the Wales total in 2006 (mainly from the sulphur in coal and fuel oil), but due to the growth in gas & nuclear fuel use, emissions from this source have reduced by 63% since 1990 (although it has increased slightly between 2005 and 2006 due to increased coal use). 14% of SO_2 emissions in Wales are from industrial combustion (1A2: down by 80% since 1990 but it has increased slightly between 2005 and 2006 due to increased industrial output), 21% from refineries (1A1b: down 38% since 1990), 3% from residential combustion and 7% from national navigation (1A3dii: up 69% since 1990 due to increased port movements). Reductions in SO_2 emissions across all sectors are also due to the progress towards production of low-sulphur petroleum-based fuels such as gas oil (diesel) and burning oil.

2.6.4 Northern Ireland SO_2 Inventory by NFR Sector, 1990-2006

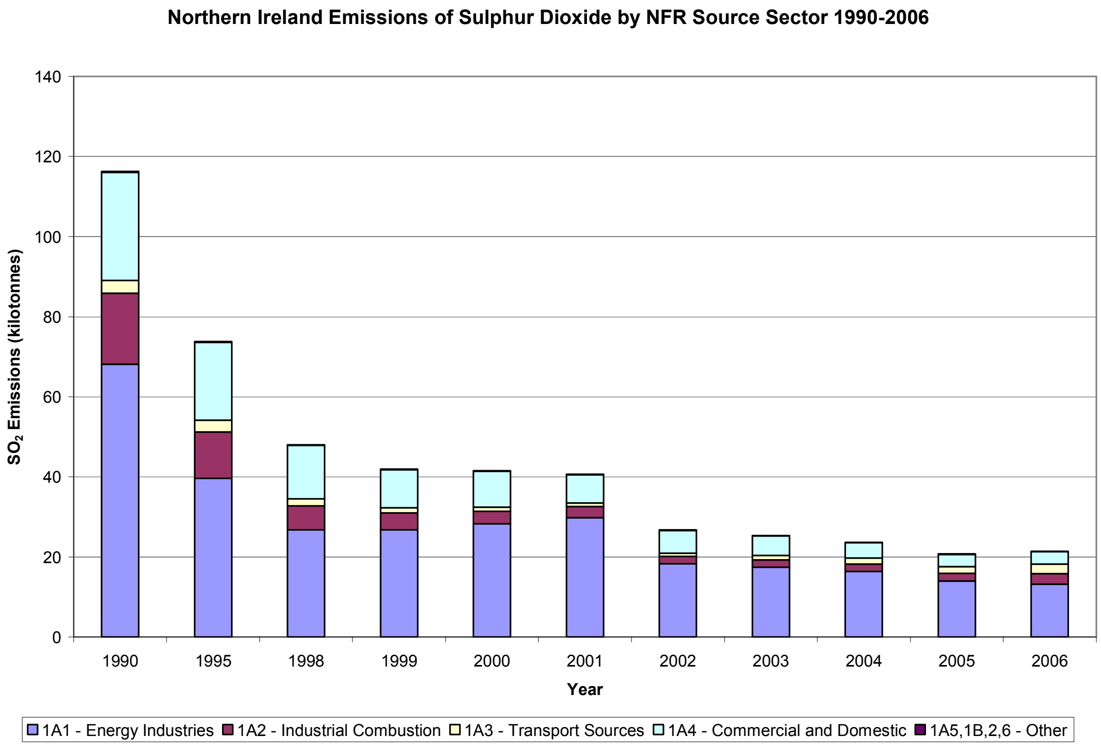
The table and graph below give a summary of the SO_2 emissions in Northern Ireland by broad NFR sector categories. The detailed data are available in Appendix F.

Table 2-30 - Northern Ireland emissions of SO_2 by NFR source sector

NFR Code	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	2006%
1A1 - Energy Industries	68.2	39.6	26.8	26.8	28.3	29.8	18.3	17.5	16.4	14.0	13.2	62%
1A2 - Industrial Combustion	17.8	11.6	6.0	4.2	3.1	2.8	1.9	1.8	1.8	1.9	2.7	12%
1A3 - Transport Sources	3.2	3.0	1.7	1.3	1.0	0.8	0.8	1.2	1.5	1.7	2.3	11%
1A4 - Commercial and Domestic	27.0	19.4	13.4	9.5	8.9	7.1	5.7	4.9	3.8	3.0	3.1	15%
1A5,1B,2,6 - Other	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	1%
Total	**116.3**	**73.8**	**48.0**	**41.9**	**41.5**	**40.7**	**26.8**	**25.4**	**23.7**	**20.8**	**21.4**	**100%**

Units: kilotonnes

Figure 2-30 - Time series of Northern Ireland SO_2 emissions 1990-2006



Northern Ireland's SO_2 emissions have declined by 82% since 1990 and they accounted for 3% of the UK total in 2006. Power generation is by far the most significant source, accounting for 62% of the Northern Irish total in 2006 (mainly from the sulphur in coal and fuel oil), but due to the growth in gas use, emissions from this source have reduced by 81% since 1990. 12% of SO_2 emissions in Northern Ireland are from industrial combustion (1A2: down by 85% since 1990), whilst 11% stems from residential combustion (1A4bi: down 88% since 1990) which is much higher than the rest of the UK, reflecting the higher use of coal and solid fuels in the domestic sector in this region. These emissions are expected to decline in the future as the gas supply network develops further and solid fuel use is reduced. Reductions in SO_2 emissions across all sectors are due to the use of low-sulphur petroleum-based fuels such as gas oil (diesel) and burning oil.

3 Accuracy of the Devolved Administration Air Quality Pollutant Inventories

As discussed in Section 1.2, the DA AQ inventories are derived using a "top-down" approach due to a lack of comprehensive local datasets, through disaggregation of the UK inventories for each pollutant.

The calculated uncertainties of the UK inventories for AQ pollutants are shown in the table below:

Table 4.1 Uncertainty calculated for the UK Emission Inventories of AQ Pollutants

Pollutant	Estimated Uncertainty %
PM_{10}	- 20 to + 30
Carbon Monoxide	- 20 to + 30
Oxides of Nitrogen	+/- 10
Sulphur Dioxide	+/- 4
Non-Methane Volatile Organic Compounds	+/- 10
Ammonia	+/- 20

(Source: *"UK Emissions of Air Pollutants 1970 to 2006"*, Dore *et al*., 2008)

Further to these uncertainties in the UK datasets, there is an additional uncertainty inherent in the methodologies of disaggregation, and in particular for earlier years in the 1990-2006 timeseries, estimates for which are frequently based on very limited historic data.

The emission estimates for the England, Scotland, Wales and Northern Ireland AQ pollutant inventories are subject to greater uncertainty than the equivalent UK estimates. It is anticipated that the quality of DA-level AQ pollutant emission estimates will be improved in future work through the integration of more rigorous local datasets are the review and improvement of disaggregation methodologies.

The key characteristics of each inventory are discussed below, by pollutant, with an indicative "Uncertainty Rating" provided in each case.

3.1 AMMONIA

Ammonia emission estimates are more uncertain than SO_2, NO_X and NMVOC inventories due largely to the nature of the major agricultural sources. Emissions depend on animal species, age, weight, diet, housing systems, waste management and storage techniques. Hence emissions are affected by a large number of factors that make the interpretation of experimental data difficult and emission estimates uncertain (DOE, 1994). Emission estimates for non-agricultural sources such as wild animals are also highly uncertain. Unlike the case of NO_X and NMVOC, a few sources dominate the inventory and there is limited potential for error compensation.

Uncertainty Rating: **HIGH**

3.2 CARBON MONOXIDE

In 2006, 90% of UK carbon monoxide emissions were derived from the combustion of fuels, with 43% of the UK total from road transport sources alone. Emission estimates for road transport are highly uncertain, as the available dataset of emission measurements is small and shows significant variability. Emissions from stationary combustion processes are also variable and depend on the technology employed and the specific combustion conditions. Emission estimates from small and medium-sized installations are derived from emission factors based on relatively few measurements of emissions from different types of boiler. As a result of the high uncertainty in major sources, emission estimates for CO are much more uncertain than other pollutants such as NO_X, CO_2 and SO_2 which are also emitted mainly from combustion processes. Unlike the case of NO_x and NMVOC, a few sources dominate the inventory and there is limited potential for error compensation.

Uncertainty Rating: **HIGH**

3.3 NITROGEN OXIDES

NO_X emission estimates are less accurate than SO_2 because they are calculated using measured emission factors, which can vary widely with combustion conditions. Hence, emission factors given in the literature for combustion sources show large variations. In the case of road transport emissions, while the inventory methodology takes into account variations in the amount of NO_X emitted as a function of speed and vehicle type, significant variations in measured emission factors have been found even when keeping these parameters constant.

From the above, one might expect the NO_X inventory to be very uncertain, however the overall uncertainty is in fact lower than any pollutant other than SO_2 for a number of reasons:

- While NO_X emission factors may be somewhat uncertain, activity data used in the NO_X inventory is very much more certain. This contrasts with inventories for pollutants such as volatile organic compounds and PM_{10}, which contain a higher degree of uncertainty.

- The NO_X inventory is made up of a large number of emission sources with many of similar size and with none dominating This leads to a large potential for error compensation, where an underestimate in emissions in one sector is very likely to be compensated by an overestimate in emissions in another sector.

- Many of the larger point-source emission sources make up the bulk of the regional estimates, and these are commonly derived from extrapolation of on-line measurement data and hence are regarded to be good quality.

Uncertainty Rating: **LOW**

3.4 NON-METHANE VOLATILE ORGANIC COMPOUNDS

The NMVOC inventory is more uncertain than SO_2 and NO_X inventories. This is due in part to the difficulty in obtaining good emission factors or emission estimates for some sectors (e.g. fugitive sources of NMVOC emissions from industrial processes, and natural sources) and partly due to the absence of good activity data for some sources. As with NO_x, there is a high potential for error compensation, and this is responsible for the relatively low level of uncertainty compared with most other pollutants in the NAEI.

Uncertainty Rating: **MODERATE**

3.5 PM_{10}

The UK emission inventory for PM_{10} has undergone considerable revision over recent years through specific research into key source sectors to improve the veracity of emission factors and improve the “bottom-up” activity data such as fuel use. Nonetheless, the uncertainties in the PM_{10} emission estimates must still be considered high, due to persisting uncertainties in some sectors regarding emission factors, activity data and particulate size distribution profiles.

Emission factors are generally based on a few measurements on an emitting source that is assumed to be representative of all similar sources. Emission estimates for PM_{10} are based whenever possible on source-specific measurements of PM_{10}, but frequently the available data is emission measurement of total particulate matter and hence conversion to PM_{10} is required based either on the size distribution of the sample collected or (more usually) on literature data on typical size distributions.

Many sources of particulate matter are diffuse or fugitive in nature, such as emissions from coke ovens, metal processing, raw material stockpiles, loading and unloading activities, construction or quarrying sites. These emissions are difficult to measure and are often dependent on conditions that vary over time and between localities such as meteorology and topography and hence are also difficult to model accurately. In many such cases it is likely that no satisfactory estimates or measurements have ever been made.

Emission estimates for combustion of fuels are generally considered more reliable than those for industrial processes, quarrying and construction. All parts of the inventory would need to be improved before the overall uncertainty could be reduced to the levels seen in the inventories for CO_2, SO_2, NO_X, or NMVOC.

Uncertainty Rating**: HIGH**

3.6 SULPHUR DIOXIDE

Sulphur dioxide emissions can be estimated with most confidence as they depend largely on the level of sulphur in fuels. Hence the DA inventories, being based upon comprehensive analysis of coals and fuel oils consumed by power stations and the agriculture, industry and domestic sectors, contain accurate emission estimates for the most important sources.

***Uncertainty Rating*:** **LOW**

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Appendices

APPENDIX A: DEFINITION OF NFR CODES

Table A1: Definition of NFR Codes

NFR Code	NFR Source Description
1A1a	1 A 1 a Public Electricity and Heat Production
1A1b	1 A 1 b Petroleum refining
1A1c	1 A 1 c Manufacture of Solid Fuels and Other Energy Industries
1A2	1 A 2 Manufacturing Industries and Construction
1A2a	1 A 2 a Iron and Steel
1A2b	1 A 2 b Non-ferrous Metals
1A2c	1 A 2 c Chemicals
1A2d	1 A 2 d Pulp, Paper and Print
1A2e	1 A 2 e Food Processing, Beverages and Tobacco
1A2f	1 A 2 f Other (to be specified)
1A3aii(i)	1 A 3 a ii Civil Aviation (Domestic, LTO)
1A3aii(ii)	1 A 3 a ii Civil Aviation (Domestic, Cruise)
1A3b	1 A 3 b Road Transportation
1A3bi	1 A 3 b i Road Transport, Passenger cars
1A3bii	1 A 3 b ii Road Transport, Light duty vehicles
1A3biii	1 A 3 b iii Road Transport, Heavy duty vehicles
1A3biv	1 A 3 b iv Road Transport, Mopeds & Motorcycles
1A3bv	1 A 3 b v Road Transport, Gasoline evaporation
1A3bvi	1 A 3 b vi Road Transport, Automobile tyre and brake wear
1A3bvii	1 A 3 b vii Road Transport, Automobile road abrasion
1A3c	1 A 3 c Railways
1A3dii	1 A 3 d ii National Navigation
1A3e	1 A 3 e Other (to be specified)
1A3ei	1 A 3 e i Pipeline compressors
1A3eii	1 A 3 e ii Other mobile sources and machinery
1A4a	1 A 4 a Commercial / Institutional
1A4b	1 A 4 b Residential
1A4bi	1 A 4 b i Residential plants
1A4bii	1 A 4 b ii Household and gardening (mobile)
1A4c	1 A 4 c Agriculture / Forestry / Fishing
1A4ci	1 A 4 c i Stationary
1A4cii	1 A 4 c ii Off-road Vehicles and Other Machinery
1A4ciii	1A 4 c iii National Fishing
1A5a	1 A 5 a Other, Stationary (including Military)
1A5b	1 A 5 b Other, Mobile (Including military)
1B1	1 B 1 Fugitive Emissions from Solid Fuels

NFR Code	NFR Source Description
1B1a	1 B 1 a Coal Mining and Handling
1B1b	1 B 1 b Solid fuel transformation
1B1c	1 B 1 c Other (to be specified)
1B2	1 B 2 Oil and natural gas
1B2a	1 B 2 a Oil
1B2ai	1 B 2 a i Exploration Production, Transport
1B2aiv	1 B 2 a iv Refining / Storage
1B2av	1 B 2 a v Distribution of oil products
1B2avi	1 B 2 a vi Other
1B2b	1 B 2 b Natural gas
1B2c	1 B 2 c Venting and flaring
2A	2 A MINERAL PRODUCTS (b)
2A1	2 A 1 Cement Production
2A2	2 A 2 Lime Production
2A3	2 A 3 Limestone and Dolomite Use
2A4	2 A 4 Soda Ash Production and use
2A5	2 A 5 Asphalt Roofing
2A6	2 A 6 Road Paving with Asphalt
2A7	2 A 7 Other including Non Fuel Mining & Construction (to be specified)
2B	2 B CHEMICAL INDUSTRY
2B1	2 B 1 Ammonia Production
2B2	2 B 2 Nitric Acid Production
2B3	2 B 3 Adipic Acid Production
2B4	2 B 4 Carbide Production
2B5	2 B 5 Other (to be specified)
2C	2 C METAL PRODUCTION
2D	2 D OTHER PRODUCTION (b)
2D1	2 D 1 Pulp and Paper
2D2	2 D 2 Food and Drink
2E	2E_Production_of_Halocarbons_and_Sulphur_Hexafluoride
2E1	2 E 1 Halocarbons production (by-product)
2E2	2 E 2 Halocarbons production (fugitive)
2F	2 F Halocarbons use
2G	2 G OTHER (to be specified)
3A	3 A PAINT APPLICATION
3B	3 B DEGREASINGsss AND DRY CLEANING
3C	3 C CHEMICAL PRODUCTS, MANUFACTURE AND PROCESSING
3D	3 D OTHER incl. products containing HMs and POPs (to be specified)
4A1	4 A 1 Enteric_Fermentation_Cows
4A10	4 A 10 Enteric_Fermentation_Deer
4A3	4 A 3 Enteric_Fermentation_Sheep
4A4	4 A 4 Enteric_Fermentation_Goats
4A6	4 A 6 Enteric_Fermentation_Horses
4A8	4 A 8 Enteric_Fermentation_Swine

NFR Code	NFR Source Description
4B	4 B MANURE MANAGEMENT (c)
4B1	4 B 1 Cattle
4B11	4 B 11 Liquid_Systems
4B12	4 B 12 Solid_Storage_and_Drylot
4B13	4 B 13 Other
4B1a	4 B 1 a Dairy
4B1b	4 B 1 b Non-Dairy
4B2	4 B 2 Buffalo
4B3	4 B 3 Sheep
4B4	4 B 4 Goats
4B5	4 B 5 Camels and Llamas
4B6	4 B 6 Horses
4B7	4 B 7 Mules and Asses
4B8	4 B 8 Swine
4B9	4 B 9 Poultry
4C	4 C RICE CULTIVATION
4D	4 D AGRICULTURAL SOILS
4D1	4 D 1 Direct Soil Emission
4F	4 F FIELD BURNING OF AGRICULTURAL WASTES
4G	4 G OTHER (d)
5B	5 B FOREST AND GRASSLAND CONVERSION
5D	5D_CO2_Emissions_From_Soils
5E	5 E Other
6A	6 A SOLID WASTE DISPOSAL ON LAND
6B	6 B WASTE-WATER HANDLING
6C	6 C WASTE INCINERATION (e)
6D	6 D OTHER WASTE (f)
7	7 OTHER
X	X (11 08 Volcanoes)

APPENDIX B: METHODS FOR CALCULATING EMISSION DISTRIBUTIONS

[For details of mapping grid data sources, see Chapter 3 of "NAEI UK Emission Mapping Methodology 2005" (Bush *et al*., 2008).]

The geographical distribution of emissions across the UK is built up from distributions of emissions in each source sector. These source sector distributions are developed using a set of statistics appropriate to that sector. For large industrial 'point' sources, emissions are compiled from a variety of official UK sources (Environment Agency, Scottish Environmental Protection Agency, Northern Ireland Department of Environment, Local Authorities). For sources that are distributed widely across the UK ('area' sources), a distribution map is generated using appropriate surrogate statistics for that sector. The method used for each source sector varies according to the data available, but is commonly based on either local activity statistics such as raw material use, energy use, industrial production and employment data, housing and population data, road vehicle and fuel sales data, periodic census or socio-economic survey data.

Table B1: Methods used to Map Emissions in each of the 11 UNECE Source Sectors

1 Combustion in energy production and transfer	points offshore IDBR employment
2 Combustion in commercial, institutions, residential and agricultural sectors	points domestic fuel use IDBR employment IDBR agriculture IDBR commercial and public fuel use
3 Combustion in industry	points IDBR employment IDBR industry fuel use
4 Production processes	points IDBR employment shipping road transport population other
5 Extraction / Distribution of fossil fuels	points offshore other domestic fuel use population
6 Solvent use	population points IDBR employment Land use
7 Road transport	road transport
8 Other transport and machinery	agriculture airports other rail shipping IDBR employment population
9 Waste Treatment and disposal	landfill Land use offshore points IDBR employment
10 Agricultural, forests and landuse change	agriculture Land use
11 Other sources and sinks	Land use population

Table B1 provides a simple overview of the different data used to map the SNAP sectors. The actual mapping is done at a considerably more disaggregated level, and a full listing of the coverages used to map the sources is given below in Table B2. This is presented using the NFR reporting structure, which is the format currently required for the LRTAP submission.

NFR Sector	Source	Disaggregation Method
0	Emissions from soils	"Arable" mapping distribution grid. (268)
	International Shipping (gas oil, fuel oil)	"Shipping" mapping distribution grids. (702, 703)
1A1a	Power stations (all fuels)	All emissions are derived from the AEA Energy & Environment point source database, which is based on annual emissions estimates reported to UK environmental regulators by IPC/IPPC-regulated industry. The data quality is considered to improve from 1998 onwards as the effects of IPC regulation increased the level and rigour of reporting by plant operators.
1A1b	Refineries (all fuels)	Point source data provided by plant operators (see 1A1a).
1A1c	Coke & SSF production (all fuels)	Point source data provided by plant operators (see 1A1a).
	Nuclear fuel production (all fuels)	All emissions are in England
	Colliery combustion (all fuels)	Deep mined coal production, data from British Coal Authority
	Gas production & gas separation plant (all fuels)	Arrivals of natural gas, BERR
	Offshore oil & gas (Natural gas use)	UKOOA point source datasets are used for NOX, SO2, VOC. CO and PM10 assumed same as SO2.
1A2a	Blast furnaces & sinter plant	Point source data provided by plant operators (see 1A1a, plus we obtain additional more detailed datasets directly from Corus).
	Iron & steel combustion plant (all fuels)	Regional fuel consumption data, ISSB

NFR Sector	Source	Disaggregation Method
	Foundries	“Foundries” mapping distribution grid. (638)
1A2b	Primary lead & zinc production, secondary copper, aluminium & lead production, copper alloy & semis production, zinc oxide and zinc alloys production, lead battery manufacture.	Point source data provided by plant operators (see 1A1a).
1A2f	Refractory & ceramic production	Population used to disaggregate emissions.
	Autogenerators (coal)	All emissions in England.
	Lime, cement, brick and ammonia production (all fuels)	Point source data provided by plant operators (see 1A1a).
	Other industrial combustion (oils)	Regional oil consumption, BERR
	Other industrial combustion (SSF, coke)	Regional energy statistics, BERR
	Other industrial combustion (coal)	Regional energy statistics, BERR
	Other industrial combustion & autogenerators (gas)	Natural gas consumption data, Transco
	Industrial off-road machinery (all fuels)	GDP data
1A3aii (i)	Aircraft – domestic take-off and landing (all fuels)	CAA database of flight information
1A3aii (ii)	Aircraft – domestic cruise (all fuels)	CAA database of flight information

NFR Sector	Source	Disaggregation Method
1A3bi to 1a3bvi	Road Transport	Road fuel sales, DTI; vehicle km, DETR / DLTR, Emission factors: COPERT III, (European Environment Agency, 2000), Barlow et al. (2001), Composition of fleet: Vehicle Licensing Statistics Report, DfT (GB), Dept of Regional Development (NI). Traffic data: National Traffic Census, DfT (GB: 1990-2006) Dept of Regional Development (NI: 1990-1999), Traffic Census Report (NI: 2000), Vehicle Kilometres of Travel Survey of Northern Ireland Annual Report (NI: 2001), Traffic and Travel Information 2004, 2005 (DRDNI: 2002- 2006), Fuel consumption: Digest of UK Energy Statistics (1990-2006), Welsh Office fuels data (WO, 1998)
1A3c	Railways: intercity, regional and freight (gas oil)	Gas oil consumption, Railtrack, Translink & NIR
1A3dii	Coastal shipping (gas oil, fuel oil)	Port movement data, DfT Maritime Statistics
1A3eii	Aircraft support vehicles (gas oil)	Regional aircraft movements, DfT
1A4a	Railways – stationary combustion	Regional fuel consumption, BERR
	Industrial & commercial combustion	Regional fuel consumption, BERR
	Public sector combustion	Regional fuel consumption, BERR
1A4bi	Domestic combustion	Regional fuel consumption, BERR and Housing Condition Survey data
1A4bii	House & garden machinery (all fuels)	Regional dwellings data, ONS
1A4ci	Agriculture – Stationary combustion	Agricultural employment data, Defra. Regional oil data, BERR.
1A4cii	Agriculture – mobile machinery	Agricultural employment data, Defra. Regional oil data, BERR.

NFR Sector	Source	Disaggregation Method
1A4ciii	Fishing vessels	All emissions unallocated.
1A5b	Military aircraft and naval shipping	All emissions unallocated.
1B1a	Deep-mined coal	Regional deep mine production, British Coal Authority
1B1b	Coke & SSF production	Point source data provided by plant operators (see 1A1a).
	Iron & steel flaring	"Ironsteelbase" mapping distribution grid.
1B2ai	Offshore oil & gas: offshore oil loading, well testing.	All emissions unallocated.
	Offshore oil & gas: process emissions, onshore oil loading, oil terminal storage	Emissions derived from the UKOOA point source dataset, with extrapolations back to cover 1990, 1995 where data gaps are evident.
1B2aiv	Refinery process emissions (drainage, tankage, general)	Point source data provided by plant operators (see 1A1a).
1B2av	Petrol terminal storage and loading, Refinery road and rail haulage emissions	Point source data provided by plant operators (see 1A1a).
	Petrol station emissions from delivery, vehicle refuelling, storage tanks and spillages	Regional road transport distributions.
1B2b	Onshore gas production (gasification process emissions)	Point source data provided by plant operators (see 1A1a).
	Gas leakage from supply infrastructure	National Grid (Transco), Northern Gas Networks, Scotia Gas Networks, Wales & West Utilities

NFR Sector	Source	Disaggregation Method
1B2c	Offshore oil & gas: flaring & venting	Emissions derived from the UKOOA point source dataset, with extrapolations back to cover 1990, 1995 where data gaps are evident.
	Refinery flaring	Point source data provided by plant operators (see 1A1a).
2A1	Cement decarbonising, concrete batching, slag cement production	Point source data provided by plant operators (see 1A1a).
2A2	Lime production decarbonising	Point source data provided by plant operators (see 1A1a).
2A3	Limestone & dolomite use in: inter plant, glass production, basic oxygen furnaces. FGD emissions from power stations.	Point source data provided by plant operators (see 1A1a).
2A4	Soda ash use in glass and chemical industries	Point source data provided by plant operators (see 1A1a).
2A6	Bitumen use in road dressings	“Road dressing” mapping distribution grid.
2A7	Construction, asphalt manufacture	Population used to disaggregate emissions.
	Quarrying (aggregates)	“Quarries” mapping distribution grid.
	Glass industry process emissions	Point source data provided by plant operators (see 1A1a).
2B1	Ammonia production	Point source data provided by plant operators (see 1A1a).
2B2	Nitric acid production	Point source data provided by plant operators (see 1A1a).
2B3	Adipic acid production	Point source data provided by plant operators (see 1A1a).

NFR Sector	Source	Disaggregation Method
2B5	Ship purging	All emissions unallocated.
	Chemical industry process emissions	Point source data provided by plant operators (see 1A1a).
2C	Industrial process emissions from SMEs, hot & cold steel rolling emissions	Population used to disaggregate emissions.
	Process emissions from: blast furnaces, EAFs, BOFs, primary aluminium production & anode baking, alumina production, non-ferrous metal processes	Point source data provided by plant operators (see 1A1a).
	Flaring & stockpile emissions at iron & steelworks	"Ironsteelbase" mapping distribution grid.
2D1	Paper production process emissions	Population used to disaggregate emissions.
	Wood product process emissions	Point source data provided by plant operators (see 1A1a).
2D2	Cider & wine manufacture	All emissions are in England.
	Brewery emissions and food & drink process industries: meat & fish, margarine, cakes & biscuits, animal feed, coffee roasting	Population used to disaggregate emissions.
	Other food & drink processes: bread baking, sugar beet, malting, spirit manufacture.	Point source data provided by plant operators (see 1A1a).

NFR Sector	Source	Disaggregation Method
3A	Trade & retail decorative paints, industrial coatings: commercial vehicles, aircraft, agricultural and construction vehicles.	Population used to disaggregate emissions.
	Industrial coatings: wood, metal, plastic, marine, vehicle refinishing.	Various coatings mapping distribution grids are used, based on surveys of locations of such processes.
	Industrial coatings: coil, metal packaging, automotive, drum.	Point source data provided by plant operators (see 1A1a).
3B	Domestic surface cleaning.	Population used to disaggregate emissions.
	Dry cleaning (solvent use)	Dry cleaning mapping distribution grid is used, based on surveys of locations of such processes.
	Industrial surface cleaning	“Industrial employment” mapping distribution grid.
3C	Rubber & plastic products	Population used to disaggregate emissions.
	Tyre manufacture and industrial coatings: textiles, film, leather	Point source data provided by plant operators (see 1A1a).
	Industrial coating manufacture: adhesives, inks, solvents and pigments	Various coatings mapping distribution grids are used, based on surveys of locations of such processes.
3D	Industrial adhesives and solvent use, printing, aerosol and non-aerosol products (cosmetics & toiletries, household products, paint thinners),	Population used to disaggregate emissions.

NFR Sector	Source	Disaggregation Method
	Agrochemical use, wood impregnation	Various agricultural mapping distribution grids are used, based on surveys of locations of such processes.
	Seed oil extraction, paper coatings, some adhesive and printing processes.	Point source data provided by plant operators (see 1A1a).
4B1	Cattle waste: manure & excreta	Defra livestock survey data
4B3	Sheep & goat waste: manure & excreta	Defra livestock survey data
4B6	Horse waste: manure & excreta	Defra livestock survey data
4B8	Pig waste: manure & excreta	Defra livestock survey data
4B9	Poultry wastes: manure & excreta	Defra livestock survey data
4B13	Domestic pets: manure & excreta	Population used to disaggregate emissions.
4D1	Use of domestic fertiliser & composting	Population used to disaggregate emissions.
	Agricultural soil emissions	IGER GHG distribution data, based on fertiliser application data and livestock surveys.
4F	Field burning	IGER GHG distribution data
5B	Deforestation	CEH GHG distribution data.
6A	Landfills, benzoles & tars	Regional landfill MSW disposal data (AEA, LQM and Golder) as used in the DA GHG inventories
6B	Sewage sludge decomposition	Population used to disaggregate emissions.

NFR Sector	Source	Disaggregation Method
6C	Clinical waste incineration, small-scale waste burning	Population used to disaggregate emissions.
	Incineration: MSW, crematoria, sewage sludge, chemical waste	Point source data provided by plant operators (see 1A1a).
	Foot & mouth pyres	Data on livestock disposal, NAO report.
6D	Nappies, accidental fires	Population used to disaggregate emissions.
7	Cigarettes, fireworks & bonfires	Population used to disaggregate emissions.

APPENDIX C: DEVOLVED ADMINISTRATION PM_{10} INVENTORIES, 1990-2006

Table C.1 PM10 Emissions Inventory for England 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	57.6	31.7	20.3	16.0	17.4	11.9	5.9	6.2	6.3	7.3	7.8	-86%	7%	69%
1A1b	1.9	2.1	2.1	2.0	1.6	1.4	1.3	1.2	1.4	1.3	1.1	-42%	1%	62%
1A1c	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-83%	0%	19%
1A2a	1.9	2.0	2.0	1.9	1.6	1.9	2.0	1.9	2.0	2.0	2.0	5%	2%	69%
1A2f	21.0	20.1	18.7	17.0	15.2	14.9	13.8	13.4	13.0	12.2	11.8	-44%	11%	83%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-21%	0%	66%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	92%	0%	59%
1A3bi	14.9	11.9	9.7	8.8	6.9	6.6	6.4	6.0	5.7	5.3	4.9	-67%	4%	82%
1A3bii	6.0	8.1	8.7	9.1	8.5	9.0	9.1	9.2	9.3	8.9	8.3	38%	7%	81%
1A3biii	22.3	17.4	11.7	10.3	8.8	7.8	7.0	6.4	5.9	5.3	4.9	-78%	4%	81%
1A3biv	0.4	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	10%	0%	84%
1A3bvi	6.5	6.8	7.2	7.3	7.3	7.4	7.5	7.5	7.7	7.7	7.7	20%	7%	81%
1A3c	0.5	0.5	0.6	0.6	0.6	0.7	0.6	0.5	0.5	0.5	0.5	5%	0%	79%
1A3dii	3.1	3.1	2.9	2.5	2.3	1.9	1.7	2.9	3.4	4.1	5.7	83%	5%	69%
1A3eii	0.3	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	12%	0%	84%
1A4a	2.6	1.6	1.1	1.0	0.8	1.1	0.7	0.6	0.7	0.7	0.7	-73%	1%	82%
1A4bi	29.9	18.6	20.6	21.0	16.8	15.7	13.0	12.3	12.2	11.3	11.5	-61%	10%	56%
1A4bii	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-73%	0%	84%
1A4ci	2.2	2.2	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.2	3%	2%	100%
1A4cii	4.9	4.9	4.9	4.8	4.6	4.5	4.3	4.0	3.6	3.1	2.7	-45%	2%	59%
1A5b	1.4	1.1	0.9	0.9	0.9	0.8	0.8	0.5	0.8	0.7	0.7	-47%	1%	86%
1B1b	0.3	0.2	0.3	0.3	0.2	0.1	0.2	0.2	0.2	0.3	0.4	12%	0%	83%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.4	0.0	-81%	0%	0%
2A1	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-8%	0%	81%
2A4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-78%	0%	100%
2A7	13.7	12.1	11.1	10.7	10.6	10.6	10.5	10.5	10.8	11.0	10.7	-22%	10%	79%
2B5	2.4	2.0	1.2	1.1	1.0	1.0	1.0	0.9	0.5	0.6	0.6	-75%	1%	92%
2C	10.8	9.1	7.2	5.9	5.3	5.2	4.7	4.8	4.7	4.6	4.7	-56%	4%	75%
2D1	0.5	0.5	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	-52%	0%	22%
3A	6.8	5.1	5.4	5.1	4.7	4.3	4.2	4.4	4.5	4.5	4.5	-34%	4%	87%
3C	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	16%	0%	95%
4B1	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	-29%	0%	56%
4B8	1.6	1.6	1.7	1.5	1.5	1.5	1.1	1.0	1.1	1.0	1.0	-35%	1%	82%
4B9	5.3	5.4	6.6	7.0	6.9	7.4	6.9	7.2	7.3	7.1	7.2	36%	6%	77%
4D1	1.7	1.6	1.6	1.4	1.7	1.3	1.6	1.5	1.5	1.6	1.5	-7%	1%	67%
4F	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
6C	5.2	4.4	3.7	3.7	3.7	6.6	3.7	3.7	3.7	3.7	3.7	-29%	3%	84%
6D	1.5	1.5	1.3	1.5	1.4	1.5	1.5	1.5	1.3	1.2	1.2	-21%	1%	84%
7	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.8	1.5	1.6	1.5	11%	1%	84%
Grand total	230.5	178.6	156.7	147.2	135.8	130.8	115.1	114.6	114.1	111.8	111.8	-51%	100%	74%

Table C.2: PM10 Emissions Inventory for Scotland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	7.4	4.1	2.7	2.3	3.1	3.1	1.9	0.8	1.6	1.5	2.4	-68%	15%	21%
1A1b	0.9	1.0	1.0	0.6	0.4	0.3	0.2	0.2	0.2	0.2	0.2	-76%	1%	12%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-5%	0%	8%
1A2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-98%	0%	0%
1A2f	2.0	1.8	1.6	1.5	1.4	1.5	1.3	1.2	1.3	1.2	1.2	-41%	7%	8%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3%	0%	24%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	131%	0%	31%
1A3bi	1.4	1.2	1.0	0.9	0.7	0.7	0.6	0.6	0.6	0.5	0.5	-65%	3%	8%
1A3bii	0.6	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	41%	6%	8%
1A3biii	2.3	1.8	1.2	1.0	0.9	0.8	0.7	0.6	0.6	0.5	0.5	-78%	3%	8%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12%	0%	8%
1A3bvi	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	20%	5%	8%
1A3c	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-9%	0%	10%
1A3dii	1.2	1.2	1.0	0.9	0.8	0.7	0.6	0.9	1.0	1.2	1.4	25%	9%	17%
1A3eii	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-3%	0%	13%
1A4a	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-74%	1%	10%
1A4bi	6.8	4.1	4.3	4.2	3.5	3.2	2.7	2.6	2.4	2.2	2.3	-67%	14%	11%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-74%	0%	8%
1A4ci	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-97%	0%	0%
1A4cii	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.1	0.9	0.8	-45%	5%	18%
1A5b	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	-52%	0%	8%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1B2c	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.1	0.1	0.0	308%	0%	3%
2A1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-23%	0%	6%
2A7	1.8	1.6	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	-24%	9%	10%
2C	0.6	0.5	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	-63%	1%	3%
2D1	0.8	0.7	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	-52%	2%	31%
3A	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-40%	2%	6%
3C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21%	0%	3%
4B1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-6%	1%	15%
4B8	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	3%	1%	9%
4B9	0.8	0.8	0.7	0.6	0.8	0.9	0.8	0.8	0.9	0.8	0.7	-1%	5%	8%
4D1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	21%	2%	13%
4F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
6C	0.4	0.4	0.4	0.4	0.4	1.1	0.4	0.4	0.4	0.4	0.4	-13%	2%	9%
6D	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	-25%	1%	8%
7	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	5%	1%	8%
Grand total	31.3	24.1	20.9	19.5	18.8	19.0	16.0	14.7	15.4	14.9	15.6	-50%	100%	10%

Table C.3: PM10 Emissions Inventory for Wales 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	2.7	1.5	1.0	0.7	1.4	1.1	0.6	0.7	0.7	0.8	0.9	-67%	7%	8%
1A1b	0.6	0.7	0.7	0.5	0.5	0.5	0.4	0.5	0.3	0.3	0.4	-25%	4%	26%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-87%	0%	1%
1A2a	1.3	1.4	1.5	1.5	1.5	1.0	0.5	0.8	0.8	0.8	0.9	-32%	7%	31%
1A2f	1.7	1.4	1.1	1.1	1.1	1.1	1.0	1.0	0.9	0.8	0.8	-51%	7%	6%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	203%	0%	1%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	879%	0%	1%
1A3bi	0.9	0.7	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	-67%	2%	5%
1A3bii	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	41%	4%	5%
1A3biii	1.3	1.0	0.7	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.3	-77%	2%	5%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14%	0%	5%
1A3bvi	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	25%	4%	5%
1A3c	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	-9%	1%	10%
1A3dii	0.5	0.5	0.4	0.4	0.4	0.3	0.2	0.4	0.5	0.6	0.8	55%	6%	10%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-16%	0%	1%
1A4a	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	-78%	0%	5%
1A4bi	5.4	3.2	3.5	3.8	2.9	2.7	2.2	2.1	2.1	1.9	2.0	-63%	16%	10%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-73%	0%	5%
1A4ci	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-89%	0%	0%
1A4cii	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.7	0.6	0.6	-45%	4%	12%
1A5b	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-53%	0%	4%
1B1b	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.1	0.1	-65%	1%	17%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2A1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17%	0%	10%
2A7	1.8	1.6	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	-35%	9%	8%
2B5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	49%	0%	8%
2C	2.8	2.6	2.3	2.1	2.0	1.2	0.8	1.3	1.3	1.2	1.3	-53%	10%	21%
2D1	0.9	0.8	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.4	-52%	3%	36%
3A	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	-39%	2%	5%
3C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16%	0%	2%
4B1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-7%	1%	13%
4B8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-75%	0%	1%
4B9	0.4	0.4	0.5	0.6	0.6	0.6	0.3	0.6	0.5	0.4	0.3	-10%	3%	4%
4D1	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.3	4%	2%	11%
4F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
6C	0.2	0.2	0.2	0.2	0.2	0.4	0.2	0.2	0.2	0.2	0.2	-3%	2%	5%
6D	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-23%	1%	5%
7	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	8%	1%	5%
Grand total	23.9	19.3	17.3	16.9	16.1	14.3	11.6	12.8	12.4	12.0	12.5	-48%	100%	8%

Table C.4: PM10 Emissions Inventory for Northern Ireland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	2.7	1.5	1.0	0.6	0.8	1.0	0.4	0.4	0.3	0.3	0.3	-89%	3%	3%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2f	0.9	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.4	0.4	0.5	-43%	5%	4%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9%	0%	9%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	103%	0%	9%
1A3bi	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-41%	3%	5%
1A3bii	0.2	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.5	0.5	116%	5%	5%
1A3biii	1.0	0.8	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	-68%	3%	5%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10%	0%	3%
1A3bvi	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	74%	5%	5%
1A3c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1%	0%	2%
1A3dii	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	89%	3%	4%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-18%	0%	2%
1A4a	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-81%	0%	4%
1A4bi	7.7	6.7	6.1	5.8	5.7	5.4	5.3	5.0	4.8	4.6	4.7	-39%	45%	23%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-72%	0%	3%
1A4ci	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-89%	0%	0%
1A4cii	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.5	-45%	5%	11%
1A5b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-42%	0%	2%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2A1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7%	0%	2%
2A7	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	-24%	4%	3%
2B5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
2C	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-9%	1%	1%
2D1	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-52%	1%	10%
3A	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-38%	1%	2%
3C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22%	0%	0%
4B1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	6%	1%	16%
4B8	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-44%	1%	8%
4B9	0.6	0.8	0.8	0.8	0.8	0.8	0.9	1.0	1.0	1.0	1.0	79%	10%	11%
4D1	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	-5%	2%	9%
4F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
6C	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	3%	1%	3%
6D	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	-19%	0%	3%
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	14%	1%	3%
Grand total	17.1	14.6	12.9	12.1	12.0	11.8	11.1	11.1	10.6	10.2	10.4	-39%	100%	7%

Table C.5: Unallocated PM10 Emissions in the UK, 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1c	0.1	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	75%	19%	71%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-87%	0%	0%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-96%	0%	0%
1B2c	1.7	1.4	1.3	1.2	1.0	1.0	0.7	0.8	0.7	0.7	1.0	-39%	81%	97%
Grand total	1.8	1.6	1.5	1.5	1.2	1.3	1.0	1.1	0.9	0.9	1.3	-31%	100%	1%

APPENDIX D: DEVOLVED ADMINISTRATION CO INVENTORIES, 1990-2006

Table D.1 Carbon Monoxide Emissions Inventory for England 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	91.7	85.4	48.3	42.9	51.6	51.3	49.4	56.5	54.4	54.6	57.2	-38%	3%	78%
1A1b	4.8	5.5	5.4	4.9	3.9	2.5	2.8	3.3	3.0	6.9	3.6	-26%	0%	65%
1A1c	2.1	1.1	1.3	1.3	1.6	1.7	1.4	2.0	1.7	2.3	1.3	-38%	0%	8%
1A2a	224.2	207.4	193.6	192.8	141.2	188.9	182.7	167.9	166.5	175.4	150.0	-33%	9%	63%
1A2f	243.1	269.3	248.3	243.1	231.8	226.0	222.9	225.0	224.6	223.5	225.3	-7%	13%	83%
1A3aii(i)	19.7	25.1	33.2	38.8	43.9	49.2	41.4	37.1	43.7	46.0	40.0	103%	2%	81%
1A3aii(ii)	1.1	0.8	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.9	0.8	-28%	0%	59%
1A3bi	3815.0	2930.0	2341.4	2126.6	1771.3	1514.5	1330.1	1141.0	979.9	797.7	695.5	-82%	40%	84%
1A3bii	563.9	409.2	301.1	238.1	182.6	138.9	100.8	74.3	57.3	44.9	39.1	-93%	2%	82%
1A3biii	117.2	96.9	78.7	71.6	64.9	57.8	52.4	48.0	45.1	41.6	39.4	-66%	2%	81%
1A3biv	112.6	75.4	83.0	91.1	80.5	75.3	70.7	71.4	60.2	56.7	48.9	-57%	3%	84%
1A3c	8.2	8.1	9.2	9.1	9.8	10.6	9.5	9.2	9.3	9.5	9.6	17%	1%	79%
1A3dii	5.8	5.2	5.2	4.6	4.5	3.7	3.1	5.6	5.4	6.3	8.6	47%	0%	69%
1A3eii	0.9	1.0	1.2	1.2	1.3	1.3	1.3	1.3	1.4	1.5	1.5	73%	0%	84%
1A4a	8.1	5.8	5.3	5.2	5.0	5.5	4.9	4.8	5.1	5.0	5.1	-36%	0%	85%
1A4bi	615.9	424.5	391.7	397.7	327.8	326.7	254.8	222.5	209.9	163.6	152.7	-75%	9%	62%
1A4bii	67.8	71.4	65.2	63.2	61.3	60.5	59.8	59.1	58.3	58.1	58.7	-13%	3%	84%
1A4ci	14.2	14.1	14.2	14.4	14.2	14.3	14.3	14.3	14.1	14.1	15.1	6%	1%	100%
1A4cii	13.9	13.9	13.9	13.6	13.2	13.0	12.9	12.8	12.4	12.0	11.6	-17%	1%	59%
1A5b	11.4	8.3	6.9	6.8	6.3	6.3	6.6	6.2	6.3	6.0	6.0	-48%	0%	86%
1B1b	14.8	11.9	11.8	9.2	9.3	5.2	3.6	5.9	3.3	3.2	3.6	-76%	0%	36%
1B2ai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1B2c	0.8	0.8	0.7	0.8	0.7	0.7	0.6	0.5	0.6	0.6	0.3	-58%	0%	3%
2A4	6.1	3.1	2.9	2.7	3.9	5.4	5.5	7.0	6.8	3.6	4.4	-28%	0%	100%
2A7	5.3	3.6	3.4	1.6	2.8	2.5	2.5	2.7	2.6	4.3	4.7	-12%	0%	100%
2B5	81.7	88.2	68.6	64.3	82.0	81.2	38.6	36.5	28.4	24.7	25.7	-69%	1%	98%
2C	121.2	120.1	118.8	146.7	130.9	135.6	139.5	56.9	61.2	60.6	85.0	-30%	5%	61%
4F	244.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
5B	3.7	2.8	3.4	4.9	6.2	7.5	6.5	6.4	5.8	5.7	5.0	35%	0%	72%
6C	19.0	17.9	18.9	18.9	18.8	34.8	18.9	18.9	18.9	18.9	18.8	-1%	1%	84%
6D	5.7	5.7	4.4	5.0	4.6	4.9	5.0	5.4	4.4	4.1	4.1	-28%	0%	84%
7	4.8	4.8	4.8	4.8	4.9	4.9	4.9	4.9	4.9	4.9	4.9	1%	0%	84%
Grand total	6449.3	4917.3	4085.4	3826.7	3281.5	3031.5	2648.1	2307.9	2096.1	1857.2	1726.6	-73%	100%	76%

Table D.2: Carbon Monoxide Emissions Inventory for Scotland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	12.4	11.8	6.8	6.3	8.3	7.9	7.6	7.1	7.3	7.1	8.9	-28%	5%	12%
1A1b	1.1	1.2	1.2	1.1	0.9	0.8	0.7	0.7	1.0	1.0	0.9	-20%	0%	16%
1A1c	0.8	0.8	0.8	0.9	0.9	0.9	0.7	0.7	0.8	1.3	1.0	21%	1%	6%
1A2a	8.7	0.7	0.4	0.4	0.1	0.2	0.2	0.2	0.2	0.2	0.2	-98%	0%	0%
1A2f	21.7	23.5	22.7	22.2	21.3	21.2	23.1	22.9	23.5	23.4	22.7	5%	12%	8%
1A3aii(i)	7.0	3.7	4.1	5.0	6.8	7.8	7.0	7.6	7.2	7.3	6.6	-6%	4%	13%
1A3aii(ii)	0.5	0.4	0.5	0.5	0.4	0.4	0.4	0.5	0.4	0.5	0.4	-13%	0%	31%
1A3bi	366.8	281.8	225.4	199.2	169.3	144.6	128.8	111.0	95.4	77.4	68.2	-81%	37%	8%
1A3bii	54.3	39.5	29.1	22.5	17.6	13.4	9.9	7.3	5.7	4.5	4.0	-93%	2%	8%
1A3biii	12.2	9.9	8.0	7.1	6.5	5.8	5.3	4.9	4.6	4.3	4.1	-66%	2%	8%
1A3biv	10.8	7.2	8.0	8.5	7.7	7.2	6.8	6.9	5.9	5.5	4.8	-56%	3%	8%
1A3c	1.2	1.2	1.4	1.4	1.5	1.4	1.1	1.2	1.2	1.2	1.3	2%	1%	10%
1A3dii	2.2	1.9	1.8	1.7	1.6	1.3	1.0	1.7	1.6	1.8	2.2	1%	1%	17%
1A3eii	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	50%	0%	13%
1A4a	0.9	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.6	-36%	0%	9%
1A4bi	171.1	114.6	102.7	93.9	82.1	76.1	63.3	54.5	48.0	37.7	35.8	-79%	20%	14%
1A4bii	7.2	7.5	6.8	6.6	6.3	6.2	6.1	6.0	5.9	5.9	5.9	-18%	3%	8%
1A4ci	0.9	0.9	0.8	0.7	0.8	0.7	0.7	0.7	0.9	0.8	0.0	-99%	0%	0%
1A4cii	4.2	4.2	4.2	4.1	4.0	3.9	3.9	3.9	3.8	3.6	3.5	-17%	2%	18%
1A5b	1.2	0.9	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	-52%	0%	8%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1B2ai	0.1	1.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1B2c	1.2	1.3	1.1	1.2	1.1	1.0	1.0	0.8	0.9	0.9	0.7	-39%	0%	7%
2A7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2C	3.9	3.2	3.5	3.4	3.4	3.3	3.4	3.4	3.4	3.5	4.8	23%	3%	3%
4F	18.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
5B	1.2	0.9	1.1	1.5	1.9	2.4	2.0	2.0	1.8	1.8	1.6	35%	1%	23%
6C	2.0	2.0	2.1	2.1	2.1	6.2	2.1	2.1	2.0	2.0	2.0	1%	1%	9%
6D	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	-32%	0%	8%
7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-5%	0%	8%
Grand total	713.2	522.5	434.7	392.7	347.2	315.0	277.5	248.3	223.6	193.9	181.9	-75%	100%	8%

Table D.3: Carbon Monoxide Emissions Inventory for Wales 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	4.7	4.4	2.5	2.0	3.6	4.4	3.5	3.6	4.5	4.3	4.8	3%	2%	7%
1A1b	1.2	1.3	1.3	1.2	0.9	0.8	0.8	1.0	1.3	1.3	1.0	-10%	0%	19%
1A1c	0.7	0.5	0.6	0.6	0.6	0.5	0.4	0.4	0.4	0.4	0.5	-28%	0%	3%
1A2a	151.7	145.1	151.6	149.3	111.5	105.0	50.0	43.8	66.2	64.2	89.3	-41%	35%	37%
1A2f	16.9	17.0	16.6	15.9	16.0	16.4	16.4	15.4	15.2	14.6	15.1	-11%	6%	6%
1A3aii(i)	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-75%	0%	0%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	269%	0%	1%
1A3bi	234.3	179.6	143.0	130.0	108.2	92.7	82.6	71.6	62.3	50.4	44.3	-81%	17%	5%
1A3bii	34.6	25.0	18.3	14.5	11.0	8.4	6.1	4.5	3.5	2.7	2.4	-93%	1%	5%
1A3biii	6.7	5.6	4.6	4.1	3.7	3.2	3.0	2.7	2.6	2.4	2.3	-65%	1%	5%
1A3biv	6.9	4.6	5.1	5.6	4.9	4.6	4.4	4.5	3.8	3.6	3.1	-55%	1%	5%
1A3c	1.1	1.1	1.3	1.3	1.4	1.0	0.9	0.9	1.1	1.1	1.2	2%	0%	10%
1A3dii	1.0	0.9	0.8	0.7	0.7	0.6	0.4	0.8	0.9	1.0	1.2	25%	0%	10%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30%	0%	1%
1A4a	0.5	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.2	0.2	-57%	0%	4%
1A4bi	110.4	74.8	68.7	72.3	57.2	58.1	43.0	36.9	35.0	26.0	24.1	-78%	9%	10%
1A4bii	4.1	4.3	3.9	3.7	3.6	3.6	3.5	3.5	3.4	3.4	3.4	-16%	1%	5%
1A4ci	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-94%	0%	0%
1A4cii	2.9	2.9	2.9	2.8	2.7	2.7	2.7	2.6	2.6	2.5	2.4	-17%	1%	12%
1A5b	0.6	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-53%	0%	4%
1B1b	23.6	19.0	19.0	14.7	15.1	8.5	3.5	4.9	3.3	2.9	6.4	-73%	3%	64%
1B2ai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	168%	0%	0%
2A7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2B5	0.2	0.2	0.3	1.4	0.5	0.3	0.5	0.5	0.6	0.6	0.5	215%	0%	2%
2C	59.1	57.1	61.0	55.8	55.1	41.9	31.4	40.5	41.0	40.7	50.4	-15%	20%	36%
4F	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
5B	0.3	0.2	0.3	0.4	0.5	0.6	0.5	0.5	0.5	0.5	0.4	35%	0%	6%
6C	0.9	0.9	1.0	1.0	1.0	2.2	1.0	1.0	1.0	1.0	1.0	6%	0%	4%
6D	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	-30%	0%	5%
7	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-2%	0%	5%
Grand total	664.9	545.9	503.9	478.6	399.5	356.8	255.8	241.1	250.4	224.7	255.0	-62%	100%	11%

Table D.4: Carbon Monoxide Emissions Inventory for Northern Ireland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	4.1	3.8	2.1	1.3	1.2	1.4	1.1	1.1	2.0	3.8	2.6	-35%	3%	4%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2f	9.0	9.2	8.9	8.9	7.6	7.1	7.1	7.0	7.1	7.0	7.6	-16%	9%	3%
1A3aii(i)	1.6	0.2	0.2	1.1	0.6	0.3	0.4	0.3	0.2	1.4	2.7	65%	3%	5%
1A3aii(ii)	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-24%	0%	9%
1A3bi	118.2	94.8	74.9	69.7	59.2	49.7	42.1	36.0	31.5	25.6	21.9	-81%	27%	3%
1A3bii	17.6	13.5	10.0	8.2	6.6	5.1	4.0	3.2	2.7	2.2	2.1	-88%	3%	4%
1A3biii	5.2	4.5	3.8	3.6	3.4	3.1	3.2	3.1	2.8	2.6	2.5	-51%	3%	5%
1A3biv	3.5	2.4	2.6	3.0	2.7	2.5	2.2	2.2	1.9	1.8	1.5	-57%	2%	3%
1A3c	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	13%	0%	2%
1A3dii	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.4	0.5	52%	1%	4%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27%	0%	2%
1A4a	0.5	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	-71%	0%	2%
1A4bi	212.4	151.7	117.0	103.3	92.5	79.9	69.1	57.1	45.0	36.5	34.8	-84%	42%	14%
1A4bii	2.3	2.4	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	-11%	2%	3%
1A4ci	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	-93%	0%	0%
1A4cii	2.6	2.6	2.6	2.5	2.5	2.4	2.4	2.4	2.3	2.2	2.2	-17%	3%	11%
1A5b	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-42%	0%	2%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2ai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2A7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
4F	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
5B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
6C	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	11%	1%	3%
6D	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	-26%	0%	3%
7	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	3%	0%	3%
Grand total	380.2	287.3	226.4	205.6	180.2	155.5	135.3	116.3	99.4	87.1	82.0	-78%	100%	4%

Table D.5: Unallocated Carbon Monoxide Emissions in the UK, 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1c	7.9	6.9	7.1	7.5	8.0	8.1	8.9	8.3	8.7	14.5	13.1	66%	58%	82%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-65%	0%	0%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-98%	0%	0%
1B2ai	5.4	5.6	2.9	1.0	0.7	0.5	0.7	0.5	0.5	0.5	0.5	-91%	2%	100%
1B2c	14.0	14.9	12.9	14.1	12.6	12.0	11.5	9.9	10.2	10.4	9.1	-35%	40%	90%
Grand Total	27.3	27.5	23.0	22.6	21.3	20.7	21.0	18.8	19.3	25.5	22.7	-17%	100%	1%

APPENDIX E: DEVOLVED ADMINISTRATION NO_X INVENTORIES, 1990-2006

Table E.1 Nitrogen Oxides (as Nitrogen Dioxide) Emissions Inventory for England 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	616.7	382.9	278.8	245.6	258.7	278.2	269.6	302.4	283.0	302.5	298.8	-52%	24%	77%
1A1b	26.7	22.7	23.9	20.2	19.5	18.9	20.4	19.5	21.5	21.3	18.8	-30%	2%	67%
1A1c	6.5	6.7	7.8	8.3	9.1	9.4	8.9	12.2	12.8	10.8	6.7	3%	1%	14%
1A2a	20.7	23.0	20.4	20.7	14.9	14.8	13.5	13.0	13.0	12.8	12.5	-39%	1%	63%
1A2f	281.2	258.0	233.3	220.7	213.5	205.0	194.3	200.4	195.5	194.6	183.4	-35%	15%	84%
1A3aii(i)	0.5	0.6	0.8	0.9	1.0	1.0	1.0	1.0	1.1	1.2	1.1	110%	0%	67%
1A3aii(ii)	2.1	2.0	2.5	2.9	3.3	3.3	3.2	3.3	3.7	4.2	4.2	100%	0%	59%
1A3bi	672.0	527.9	421.6	384.9	332.8	291.4	260.0	228.1	204.4	179.4	162.5	-76%	13%	83%
1A3bii	58.4	58.4	58.0	56.0	53.9	52.8	49.8	48.7	48.6	47.9	44.4	-24%	4%	82%
1A3biii	377.0	330.3	320.6	310.4	293.8	278.5	262.6	247.2	238.4	224.2	215.0	-43%	18%	81%
1A3biv	0.7	0.6	0.7	0.7	0.8	0.9	0.9	1.0	1.0	1.1	1.0	43%	0%	84%
1A3c	15.3	18.6	24.8	26.8	30.5	33.8	29.5	27.0	28.0	29.1	29.7	95%	2%	79%
1A3dii	57.1	50.6	50.8	45.0	43.6	36.3	30.4	54.7	53.1	61.8	83.9	47%	7%	69%
1A3eii	3.8	4.4	5.1	5.2	5.3	5.0	4.9	4.8	4.8	4.7	4.4	16%	0%	84%
1A4a	29.8	30.4	28.6	29.1	25.7	26.5	22.1	26.0	18.6	18.1	17.2	-42%	1%	86%
1A4bi	83.2	84.3	91.4	90.7	92.1	94.2	91.1	92.4	94.5	90.4	86.2	4%	7%	83%
1A4bii	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	8%	0%	84%
1A4ci	0.9	1.1	0.8	0.8	0.5	0.6	0.6	0.6	0.6	0.6	0.6	-37%	0%	82%
1A4cii	44.3	44.3	44.4	43.4	42.0	40.6	39.2	37.0	33.9	30.7	26.8	-39%	2%	59%
1A5b	35.8	28.0	22.0	23.5	22.6	21.3	20.4	15.4	20.6	19.0	18.8	-47%	2%	86%
1B1b	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	-42%	0%	73%
1B2ai	0.2	3.8	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1B2c	0.2	0.3	0.3	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.1	-76%	0%	3%
2B2	7.0	1.7	1.8	2.0	1.9	1.0	0.6	0.7	0.7	0.6	0.6	-91%	0%	100%
2B5	0.4	0.5	0.6	0.5	0.4	0.5	0.5	0.4	0.6	0.4	0.4	-4%	0%	100%
2C	1.4	1.3	1.0	1.0	0.9	0.9	0.8	1.0	1.1	1.1	1.0	-30%	0%	66%
4F	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
5B	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	35%	0%	72%
6C	5.7	3.7	1.6	1.5	1.5	2.0	1.5	1.5	1.5	1.5	1.4	-76%	0%	85%
6D	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	-30%	0%	84%
Grand total	2357.6	1887.4	1642.8	1543.1	1469.7	1418.5	1327.3	1340.1	1282.6	1259.5	1220.9	-48%	100%	77%

Table E.2 Nitrogen Oxides (as Nitrogen Dioxide) Emissions Inventory for Scotland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	86.4	55.0	39.7	37.5	44.0	38.7	37.2	36.3	35.6	35.3	48.1	-44%	29%	12%
1A1b	6.0	5.0	5.3	4.6	4.3	4.7	5.5	3.6	3.5	3.7	3.7	-37%	2%	13%
1A1c	2.6	3.3	3.8	4.5	4.4	4.1	3.8	3.7	3.7	3.5	2.6	-1%	2%	5%
1A2a	2.3	0.8	0.4	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-92%	0%	1%
1A2f	25.2	23.9	22.7	21.5	21.3	21.8	18.2	18.3	18.8	18.6	16.8	-33%	10%	8%
1A3aii(i)	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	145%	0%	23%
1A3aii(ii)	0.9	1.0	1.3	1.5	1.7	1.7	1.7	1.8	2.0	2.2	2.2	141%	1%	31%
1A3bi	64.6	50.9	40.7	36.2	31.9	27.9	25.3	22.3	20.1	17.6	16.2	-75%	10%	8%
1A3bii	5.7	5.8	5.8	5.5	5.4	5.2	5.0	4.9	4.9	4.9	4.6	-20%	3%	8%
1A3biii	39.3	33.8	32.6	30.8	29.6	27.8	26.4	25.1	24.2	23.0	22.4	-43%	14%	8%
1A3biv	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	45%	0%	8%
1A3c	2.3	2.8	3.7	4.1	4.6	4.5	3.5	3.4	3.7	3.8	3.9	69%	2%	10%
1A3dii	21.1	18.7	17.2	16.4	15.7	12.3	10.2	16.3	15.5	17.3	21.3	1%	13%	17%
1A3eii	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	1%	0%	13%
1A4a	3.3	2.8	2.8	2.9	2.5	2.6	2.2	2.5	1.8	1.8	1.9	-42%	1%	9%
1A4bi	9.5	9.7	10.0	9.7	9.7	10.2	9.6	9.6	9.8	9.6	9.2	-4%	6%	9%
1A4bii	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	2%	0%	8%
1A4ci	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-68%	0%	8%
1A4cii	13.4	13.4	13.4	13.1	12.7	12.3	11.8	11.2	10.2	9.3	8.1	-39%	5%	18%
1A5b	3.7	2.9	2.2	2.3	2.2	2.0	1.9	1.5	2.0	1.8	1.8	-52%	1%	8%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1B2ai	0.3	4.2	0.1	0.4	0.5	0.6	0.6	0.6	0.4	0.6	0.4	54%	0%	80%
1B2c	0.1	0.2	0.2	0.2	0.3	0.4	0.2	0.2	0.2	0.2	0.1	-8%	0%	7%
2C	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-96%	0%	1%
4F	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
5B	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	35%	0%	23%
6C	0.3	0.2	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1	-56%	0%	7%
6D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-34%	0%	8%
Grand total	289.1	235.8	203.5	193.3	192.5	178.8	164.8	163.3	158.1	154.8	164.9	-43%	100%	10%

Table E.3: Nitrogen Oxides (as Nitrogen Dioxide) Emissions Inventory for Wales 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	42.1	26.0	18.8	13.9	23.6	30.6	25.7	26.6	28.6	25.9	33.0	-22%	29%	8%
1A1b	5.9	5.0	5.3	5.0	4.3	4.2	4.4	3.5	4.8	5.7	5.6	-5%	5%	20%
1A1c	3.3	4.1	4.5	4.3	4.2	3.5	2.1	2.0	1.7	1.7	2.0	-40%	2%	4%
1A2a	12.0	17.4	17.3	19.2	13.1	10.2	6.0	7.5	6.8	6.5	7.1	-41%	6%	36%
1A2f	21.1	17.3	16.5	16.7	19.0	17.6	14.5	14.6	14.7	13.7	12.7	-40%	11%	6%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	628%	0%	1%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	922%	0%	1%
1A3bi	41.2	32.3	25.7	23.4	20.2	17.7	16.0	14.1	12.7	11.1	10.2	-75%	9%	5%
1A3bii	3.5	3.5	3.4	3.3	3.1	3.0	2.9	2.8	2.8	2.8	2.6	-25%	2%	5%
1A3biii	21.5	19.0	18.6	17.7	16.6	15.6	14.8	14.0	13.6	12.9	12.8	-41%	11%	5%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	48%	0%	5%
1A3c	2.1	2.6	3.5	3.8	4.3	3.3	2.9	2.8	3.4	3.4	3.6	70%	3%	10%
1A3dii	9.5	8.4	7.8	7.1	6.9	5.4	4.4	7.8	8.4	9.3	11.9	25%	10%	10%
1A3eii	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-13%	0%	1%
1A4a	1.8	1.7	1.3	1.4	1.2	1.2	1.0	1.2	0.9	0.7	0.6	-64%	1%	3%
1A4bi	5.9	5.7	6.2	6.2	6.1	6.2	5.9	6.0	6.2	5.8	5.6	-4%	5%	5%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5%	0%	5%
1A4ci	0.1	0.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-62%	0%	7%
1A4cii	9.2	9.2	9.2	9.0	8.7	8.4	8.1	7.6	7.0	6.3	5.5	-39%	5%	12%
1A5b	1.8	1.4	1.0	1.1	1.0	1.0	0.9	0.7	0.9	0.9	0.8	-53%	1%	4%
1B1b	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-67%	0%	27%
1B2ai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2C	0.8	0.8	0.6	0.6	0.6	0.5	0.3	0.4	0.5	0.5	0.5	-39%	0%	34%
4F	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
5B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35%	0%	6%
6C	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-1%	0%	6%
6D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-32%	0%	5%
Grand total	182.4	154.8	140.2	133.2	133.5	129.1	110.3	112.0	113.6	107.8	115.1	-37%	100%	7%

Table E.4: Nitrogen Oxides (as Nitrogen Dioxide) Emissions Inventory for Northern Ireland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	31.0	19.2	13.8	14.1	14.6	15.8	11.9	11.1	9.4	8.9	9.3	-70%	17%	2%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2f	11.2	9.3	8.1	7.5	6.8	6.5	6.2	5.9	6.0	5.9	6.7	-40%	12%	3%
1A3aii(i)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	184%	0%	9%
1A3aii(ii)	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.7	111%	1%	9%
1A3bi	20.9	17.3	13.8	13.0	11.6	10.1	9.1	8.3	7.7	7.0	6.5	-69%	12%	3%
1A3bii	2.0	2.3	2.4	2.5	2.6	2.6	2.8	3.0	2.9	2.9	2.8	38%	5%	5%
1A3biii	16.7	15.5	15.5	15.4	15.3	15.0	15.8	15.9	14.8	13.8	13.8	-17%	25%	5%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43%	0%	3%
1A3c	0.3	0.4	0.5	0.5	0.6	0.6	0.5	0.4	0.6	0.6	0.6	88%	1%	2%
1A3dii	3.4	3.0	2.8	2.7	2.6	2.1	1.8	3.2	3.3	3.8	5.1	52%	9%	4%
1A3eii	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-15%	0%	2%
1A4a	1.1	0.7	0.5	0.5	0.3	0.4	0.3	0.3	0.2	0.3	0.3	-76%	0%	1%
1A4bi	4.2	3.6	3.3	3.1	3.1	3.0	3.0	2.9	2.8	2.6	2.7	-37%	5%	3%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11%	0%	3%
1A4ci	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-81%	0%	3%
1A4cii	8.3	8.3	8.3	8.1	7.9	7.6	7.3	6.9	6.3	5.7	5.0	-39%	9%	11%
1A5b	0.9	0.8	0.6	0.6	0.6	0.6	0.5	0.4	0.6	0.5	0.5	-42%	1%	2%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2ai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2B2	1.1	0.3	0.1	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
2C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
4F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
5B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
6C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-24%	0%	2%
6D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-28%	0%	3%
Grand total	101.8	81.2	70.4	69.0	66.8	65.2	60.1	59.2	55.5	53.0	54.3	-47%	100%	3%

Table E.5: Unallocated Nitrogen Oxides (as Nitrogen Dioxide) Emissions in the UK, 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1c	24.5	25.2	28.4	34.1	34.5	34.5	49.4	44.2	47.5	42.7	37.9	55%	96%	77%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-68%	0%	0%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-96%	0%	0%
1B2ai	10.3	2.7	0.6	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-99%	0%	20%
1B2c	2.2	2.7	2.5	2.6	2.3	2.1	2.7	2.0	1.9	1.9	1.6	-25%	4%	90%
Grand total	36.9	30.6	31.6	37.1	36.9	36.7	52.2	46.4	49.5	44.7	39.6	7%	100%	2%

APPENDIX F: DEVOLVED ADMINISTRATION SO_2 INVENTORIES, 1990-2006

Table F.1 Sulphur Dioxide Emissions Inventory for England 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	2379.3	1383.8	934.8	656.9	657.8	579.2	542.4	545.5	395.4	293.9	255.7	-89%	52%	71%
1A1b	95.0	82.2	72.2	62.1	50.3	54.5	47.4	48.9	56.3	57.5	55.1	-42%	11%	73%
1A1c	4.9	2.1	4.1	3.4	4.1	3.5	3.2	3.1	3.6	3.3	3.3	-33%	1%	65%
1A2a	16.1	17.1	17.9	16.7	11.7	16.1	13.9	9.2	11.3	10.3	11.2	-30%	2%	71%
1A2f	303.9	219.1	129.6	98.8	91.4	89.7	78.7	73.2	74.0	75.0	70.4	-77%	14%	81%
1A3aii(i)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	165%	0%	69%
1A3aii(ii)	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	210%	0%	59%
1A3bi	20.0	17.3	10.6	10.0	4.5	2.5	2.2	2.2	2.0	1.7	1.7	-92%	0%	84%
1A3bii	5.6	6.2	2.8	0.9	0.4	0.3	0.3	0.3	0.3	0.3	0.2	-96%	0%	82%
1A3biii	27.5	19.5	6.0	1.1	0.6	0.6	0.6	0.6	0.6	0.5	0.3	-99%	0%	81%
1A3biv	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-95%	0%	84%
1A3c	1.7	1.1	1.2	1.2	1.2	1.2	1.4	1.5	1.5	1.5	1.6	-8%	0%	79%
1A3dii	17.4	18.4	16.3	14.0	12.9	10.8	9.4	16.2	20.6	24.9	34.5	99%	7%	69%
1A3eii	0.3	0.2	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	19%	0%	84%
1A4a	61.4	38.5	20.4	16.3	10.6	12.0	6.2	4.4	4.1	4.1	3.7	-94%	1%	78%
1A4bi	79.6	55.3	48.7	33.1	32.5	26.2	19.3	17.3	16.1	11.9	12.7	-84%	3%	59%
1A4bii	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-94%	0%	84%
1A4ci	2.9	3.6	1.9	1.6	0.3	0.2	0.1	0.1	0.2	0.2	0.2	-94%	0%	62%
1A4cii	3.6	2.4	2.4	2.3	2.1	1.9	2.2	2.4	2.3	2.2	2.1	-42%	0%	59%
1A5b	7.9	6.5	5.1	5.4	5.3	4.9	4.5	3.2	4.7	4.4	4.4	-45%	1%	86%
1B1b	16.9	8.8	7.2	6.1	5.9	6.6	5.2	6.6	7.9	6.9	6.5	-61%	1%	88%
1B2ai	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-37%	0%	0%
2A7	4.3	9.7	13.1	8.9	10.5	9.0	11.9	16.3	16.4	17.1	18.2	328%	4%	100%
2B5	38.6	36.2	34.3	28.6	20.0	16.1	12.8	9.8	8.7	7.1	5.7	-85%	1%	100%
2C	5.4	5.0	6.3	5.6	4.7	4.6	3.5	4.9	4.6	5.4	5.1	-5%	1%	65%
6C	6.9	3.9	1.1	1.3	1.0	1.8	0.8	0.8	0.8	0.8	1.1	-85%	0%	86%
Grand total	3099.5	1937.2	1336.8	974.8	928.5	842.8	766.6	767.2	632.0	529.7	494.5	-84%	100%	73%

Table F.2 Sulphur Dioxide Emissions Inventory for Scotland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	196.2	119.3	81.0	67.8	93.2	92.4	87.9	76.7	62.7	49.8	59.7	-70%	65%	17%
1A1b	20.1	17.4	15.3	13.1	10.8	8.1	8.1	5.6	3.9	3.8	6.2	-69%	7%	8%
1A1c	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-85%	0%	0%
1A2a	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1A2f	33.9	23.9	13.0	9.1	8.7	9.6	10.8	10.0	11.3	12.0	9.1	-73%	10%	11%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	183%	0%	22%
1A3aii(ii)	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	273%	0%	31%
1A3bi	1.9	1.7	1.0	0.9	0.4	0.2	0.2	0.2	0.2	0.2	0.2	-91%	0%	8%
1A3bii	0.6	0.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-96%	0%	8%
1A3biii	2.9	2.0	0.6	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-99%	0%	8%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-94%	0%	8%
1A3c	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-20%	0%	10%
1A3dii	6.4	6.8	5.5	5.1	4.6	3.7	3.2	4.8	6.0	7.0	8.7	36%	10%	17%
1A3eii	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3%	0%	13%
1A4a	8.2	5.3	2.8	2.2	1.4	1.6	0.8	0.6	0.5	0.5	0.5	-94%	1%	10%
1A4bi	29.9	22.7	20.9	10.0	12.0	8.6	6.9	6.0	5.2	4.2	4.3	-85%	5%	20%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-94%	0%	8%
1A4ci	0.8	1.1	0.6	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	-95%	0%	16%
1A4cii	1.1	0.7	0.7	0.7	0.6	0.6	0.7	0.7	0.7	0.6	0.6	-42%	1%	18%
1A5b	0.8	0.7	0.5	0.5	0.5	0.5	0.4	0.3	0.4	0.4	0.4	-49%	0%	8%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1B2ai	0.1	0.1	0.4	0.4	0.4	1.2	0.9	0.5	0.4	0.4	0.2	29%	0%	21%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1235%	0%	3%
2A7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2C	0.7	0.6	0.6	0.7	0.6	0.6	0.6	0.8	0.7	0.7	0.7	-1%	1%	9%
6C	0.3	0.2	0.1	0.1	0.1	0.4	0.1	0.1	0.1	0.1	0.1	-68%	0%	7%
Grand total	306.2	203.4	143.7	111.8	134.0	128.0	121.1	106.9	92.8	80.2	91.3	-70%	100%	14%

Table F.3: Sulphur Dioxide Emissions Inventory for Wales 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	85.2	49.6	33.5	24.4	46.2	41.0	31.5	37.2	33.9	26.8	31.5	-63%	47%	9%
1A1b	22.4	19.4	17.0	14.6	11.9	9.8	10.3	8.8	9.9	11.8	13.8	-38%	21%	18%
1A1c	0.8	0.6	1.2	1.0	0.7	0.8	0.3	0.3	0.4	0.4	0.4	-48%	1%	9%
1A2a	10.7	14.4	12.5	13.4	11.4	7.7	3.2	3.1	3.0	3.0	4.6	-57%	7%	29%
1A2f	35.7	22.7	13.9	9.6	9.6	11.1	8.7	7.8	5.4	4.0	4.7	-87%	7%	5%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	673%	0%	1%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1483%	0%	1%
1A3bi	1.2	1.0	0.6	0.6	0.3	0.2	0.1	0.1	0.1	0.1	0.1	-91%	0%	5%
1A3bii	0.3	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-96%	0%	5%
1A3biii	1.6	1.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-99%	0%	5%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-94%	0%	5%
1A3c	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	-20%	0%	10%
1A3dii	2.9	3.1	2.5	2.2	2.1	1.6	1.4	2.3	3.3	3.8	4.9	69%	7%	10%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-10%	0%	1%
1A4a	4.8	3.1	1.6	1.3	0.8	1.0	0.5	0.3	0.3	0.3	0.3	-94%	0%	6%
1A4bi	12.8	8.4	7.3	5.9	5.3	4.5	3.1	2.9	2.7	1.9	2.1	-84%	3%	10%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-94%	0%	5%
1A4ci	0.6	0.7	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-95%	0%	12%
1A4cii	0.7	0.5	0.5	0.5	0.4	0.4	0.5	0.5	0.5	0.4	0.4	-42%	1%	12%
1A5b	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	-51%	0%	4%
1B1b	3.8	2.0	2.3	1.9	1.4	1.5	0.6	0.7	0.7	0.8	0.9	-77%	1%	12%
1B2ai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2A7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2B5	0.5	0.5	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	-100%	0%	0%
2C	2.8	2.5	2.5	2.1	2.2	2.6	2.2	1.9	2.1	2.3	2.1	-25%	3%	26%
6C	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	-22%	0%	5%
Grand total	187.5	130.6	96.8	78.4	92.9	82.8	63.0	66.5	62.7	56.2	66.2	-65%	100%	10%

Table F.4: Sulphur Dioxide Emissions Inventory for Northern Ireland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	68.2	39.6	26.8	26.8	28.3	29.8	18.3	17.5	16.4	14.0	13.2	-81%	62%	4%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2f	17.8	11.6	6.0	4.2	3.1	2.8	1.9	1.8	1.8	1.9	2.7	-85%	12%	3%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	242%	0%	9%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	227%	0%	9%
1A3bi	0.6	0.6	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	-91%	0%	3%
1A3bii	0.2	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-94%	0%	5%
1A3biii	1.2	0.9	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-98%	0%	5%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-95%	0%	3%
1A3c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-11%	0%	2%
1A3dii	1.0	1.1	0.9	0.8	0.8	0.6	0.6	1.0	1.3	1.5	2.1	105%	10%	4%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-12%	0%	2%
1A4a	5.2	3.2	1.7	1.4	0.9	1.0	0.5	0.4	0.3	0.3	0.3	-94%	1%	6%
1A4bi	20.6	15.1	10.8	7.3	7.5	5.7	4.7	4.0	3.0	2.3	2.4	-88%	11%	11%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-94%	0%	3%
1A4ci	0.5	0.7	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-95%	0%	10%
1A4cii	0.7	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	-42%	2%	11%
1A5b	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-39%	1%	2%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2ai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2A7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
6C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-46%	0%	2%
Grand total	116.3	73.8	48.0	41.9	41.5	40.7	26.8	25.4	23.7	20.8	21.4	-82%	100%	3%

Table F.5: Unallocated Sulphur Dioxide Emissions in the UK, 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1c	0.2	0.4	0.4	0.6	0.5	0.5	0.4	0.5	0.4	0.3	1.3	673%	62%	26%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-52%	0%	0%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-93%	0%	0%
1B2ai	7.5	6.2	6.9	0.8	0.7	0.0	0.1	0.5	0.6	0.6	0.6	-92%	27%	79%
1B2c	0.1	0.3	0.3	0.5	0.3	0.4	0.2	0.2	0.2	0.2	0.2	99%	11%	97%
Grand total	7.8	6.9	7.5	1.8	1.5	0.9	0.7	1.2	1.2	1.1	2.1	-73%	100%	0%

APPENDIX G: DEVOLVED ADMINISTRATION NMVOC INVENTORIES, 1990-2006

Table G.1 Non Methane Volatile Organic Compounds (NMVOC) Emissions Inventory for England 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	5.2	5.5	3.8	4.9	5.3	4.8	5.3	4.2	3.8	3.0	3.3	-38%	1%	75%
1A1b	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.2	-6%	0%	71%
1A1c	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.4	0.3	0.1	-12%	0%	25%
1A2a	0.5	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.8	0.9	0.5	-10%	0%	65%
1A2f	22.5	23.2	23.4	22.9	22.4	22.5	21.7	21.4	20.7	20.9	20.8	-7%	3%	84%
1A3aii(i)	1.1	0.8	0.9	0.9	0.9	1.0	0.8	0.8	0.9	0.9	0.8	-29%	0%	76%
1A3aii(ii)	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-36%	0%	59%
1A3bi	412.3	299.7	212.3	183.5	146.9	119.3	98.3	78.5	63.4	50.0	42.3	-90%	7%	84%
1A3bii	32.3	24.9	19.2	16.1	13.2	11.1	9.1	7.9	7.2	6.7	6.0	-81%	1%	82%
1A3biii	69.0	47.0	34.3	30.4	27.3	24.1	21.5	19.5	18.3	16.9	16.0	-77%	2%	81%
1A3biv	22.7	11.4	10.5	11.3	10.1	9.6	9.2	9.5	7.9	7.5	6.3	-72%	1%	84%
1A3bv	192.0	149.4	89.8	74.7	56.4	44.6	37.4	30.3	23.2	17.9	14.3	-93%	2%	84%
1A3c	2.3	2.3	2.6	2.8	3.1	3.4	3.0	2.7	2.8	2.8	2.9	25%	0%	79%
1A3dii	2.8	2.5	2.5	2.2	2.1	1.8	1.5	2.7	2.6	3.0	4.1	47%	1%	69%
1A3eii	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	55%	0%	84%
1A4a	0.8	0.9	0.9	0.9	0.9	1.0	0.8	0.8	0.9	0.8	0.8	-1%	0%	86%
1A4bi	42.9	26.3	28.1	29.7	23.6	21.7	18.8	18.1	17.6	16.4	16.4	-62%	3%	55%
1A4bii	13.9	14.6	13.6	13.2	12.9	12.7	12.5	12.2	11.6	10.4	9.4	-33%	1%	84%
1A4ci	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	7%	0%	100%
1A4cii	6.2	6.2	6.2	6.1	5.9	5.7	5.6	5.4	5.1	4.8	4.4	-29%	1%	59%
1A5b	2.5	1.9	1.5	1.5	1.5	1.4	1.4	1.2	1.4	1.3	1.3	-47%	0%	86%
1B1b	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-32%	0%	72%
1B2ai	14.0	16.5	16.5	26.9	34.9	29.3	13.0	7.1	4.8	8.4	5.8	-58%	1%	12%
1B2aiv	65.9	57.4	38.6	30.5	29.0	24.9	23.4	22.6	20.8	21.3	19.7	-70%	3%	62%
1B2av	93.1	82.9	74.0	52.0	47.9	45.6	44.4	43.4	37.5	31.4	27.7	-70%	4%	83%
1B2b	35.8	33.7	55.4	55.4	52.3	54.8	54.3	39.0	40.2	38.8	35.9	0%	6%	88%
1B2c	2.4	1.9	2.3	2.4	2.7	3.0	2.4	1.1	4.3	2.5	1.4	-42%	0%	7%
2A7	3.1	2.2	2.0	0.8	1.9	1.5	1.6	1.4	1.4	2.0	3.1	-2%	0%	95%
2B5	143.7	127.9	89.1	58.7	51.4	44.7	41.9	39.1	33.3	32.9	22.8	-84%	4%	69%
2C	1.2	1.2	1.2	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.1	-11%	0%	66%
2D1	1.0	0.9	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	-95%	0%	22%
2D2	24.0	23.9	23.4	23.5	22.5	23.0	22.9	23.2	23.2	22.0	21.9	-9%	3%	28%
3A	169.5	125.6	116.6	111.1	105.8	103.4	101.5	102.5	102.1	98.8	98.8	-42%	15%	84%
3B	72.5	47.0	42.0	39.2	37.6	34.8	31.8	28.4	27.4	26.1	25.5	-65%	4%	85%
3C	37.7	32.6	27.0	21.7	16.9	14.2	13.4	13.4	13.3	12.9	13.0	-66%	2%	87%
3D	278.8	248.1	233.0	221.2	209.5	203.8	199.5	199.7	202.0	203.9	201.4	-28%	31%	84%
4F	23.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
6A	19.0	16.8	13.9	12.7	11.8	10.3	9.4	8.2	7.5	7.3	7.3	-62%	1%	78%
6C	5.4	5.3	5.4	5.4	5.4	5.3	5.3	5.3	5.4	5.5	6.3	17%	1%	86%
6D	2.0	1.9	1.5	1.7	1.5	1.7	1.7	1.8	1.5	1.4	1.4	-29%	0%	84%
Grand total	1824.8	1446.0	1195.2	1068.9	968.2	889.1	817.9	756.0	717.1	683.6	645.6	-65%	100%	71%

Table G.2 Non Methane Volatile Organic Compounds (NMVOC) Emissions Inventory for Scotland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	0.6	0.7	0.5	0.4	0.6	0.5	0.6	0.5	0.5	0.5	0.5	-16%	0%	12%
1A1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7%	0%	11%
1A1c	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-65%	0%	8%
1A2a	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-97%	0%	0%
1A2f	2.1	2.2	2.2	2.2	2.1	2.2	2.1	2.1	1.9	1.9	1.9	-8%	1%	8%
1A3aii(i)	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-50%	0%	17%
1A3aii(ii)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-23%	0%	31%
1A3bi	39.6	28.8	20.4	17.2	14.1	11.4	9.5	7.6	6.2	4.9	4.2	-90%	3%	8%
1A3bii	3.1	2.4	1.9	1.5	1.3	1.1	0.9	0.8	0.7	0.7	0.6	-80%	0%	8%
1A3biii	7.2	4.8	3.5	3.0	2.7	2.4	2.2	2.0	1.9	1.7	1.7	-77%	1%	8%
1A3biv	2.2	1.1	1.0	1.1	1.0	0.9	0.9	0.9	0.8	0.7	0.6	-72%	0%	8%
1A3bv	18.5	14.4	8.6	7.0	5.4	4.3	3.6	2.9	2.3	1.7	1.4	-92%	1%	8%
1A3c	0.3	0.3	0.4	0.4	0.5	0.5	0.4	0.3	0.4	0.4	0.4	9%	0%	10%
1A3dii	1.0	0.9	0.8	0.8	0.8	0.6	0.5	0.8	0.7	0.8	1.0	1%	1%	17%
1A3eii	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	34%	0%	13%
1A4a	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	2%	0%	9%
1A4bi	10.5	6.4	6.4	6.4	5.3	4.7	4.1	4.0	3.6	3.3	3.4	-68%	2%	11%
1A4bii	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.0	0.9	-36%	1%	8%
1A4ci	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-98%	0%	0%
1A4cii	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.5	1.4	1.3	-29%	1%	18%
1A5b	0.3	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-52%	0%	8%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1B2ai	15.6	18.6	19.1	20.6	24.3	15.3	14.4	10.4	4.0	25.5	10.4	-33%	8%	21%
1B2aiv	21.8	18.2	12.4	9.6	9.0	6.0	5.5	5.6	6.2	5.3	5.4	-75%	4%	17%
1B2av	9.0	8.0	7.1	4.9	4.6	4.3	4.2	4.2	3.6	3.0	2.7	-70%	2%	8%
1B2b	2.9	2.7	4.5	4.5	4.7	4.7	4.8	3.0	3.2	3.1	2.8	-3%	2%	7%
1B2c	2.2	1.8	2.0	2.1	2.1	3.8	9.6	2.2	2.1	2.1	1.5	-29%	1%	7%
2A7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3%	0%	1%
2B5	17.1	15.2	11.2	11.5	10.7	9.7	8.9	8.2	7.6	5.2	7.8	-55%	6%	24%
2C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-57%	0%	0%
2D1	1.3	1.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-95%	0%	31%
2D2	46.8	48.6	52.8	53.1	52.8	52.8	53.0	53.1	52.9	52.6	52.6	12%	39%	67%
3A	17.1	11.5	11.0	9.2	8.9	8.8	8.7	8.8	8.7	8.6	8.5	-50%	6%	7%
3B	7.3	4.6	4.1	3.8	3.7	3.4	3.0	2.7	2.6	2.5	2.4	-67%	2%	8%
3C	4.7	4.1	4.1	1.6	1.1	1.1	1.1	1.1	1.1	1.1	1.1	-76%	1%	8%
3D	29.4	26.6	24.6	22.8	21.7	20.7	20.1	20.1	20.3	20.4	20.0	-32%	15%	8%
4F	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
6A	2.6	2.4	1.9	1.8	1.6	1.4	1.3	1.1	1.1	1.1	1.1	-58%	1%	12%
6C	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	-2%	0%	8%
6D	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	-33%	0%	8%
Grand total	270.4	230.8	205.6	190.4	183.7	165.2	163.9	147.1	136.7	151.2	135.8	-50%	100%	15%

Table G.3: Non Methane Volatile Organic Compounds (NMVOC) Emissions Inventory for Wales 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	0.9	0.9	0.6	0.6	0.7	0.5	0.6	0.5	0.3	0.2	0.2	-74%	0%	5%
1A1b	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-6%	0%	18%
1A1c	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	-67%	0%	4%
1A2a	0.3	0.4	0.5	0.4	0.4	0.3	0.1	0.2	0.2	0.2	0.3	-24%	1%	35%
1A2f	1.6	1.6	1.6	1.7	1.8	1.8	1.7	1.7	1.5	1.4	1.5	-8%	3%	6%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-27%	0%	0%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	227%	0%	1%
1A3bi	25.3	18.4	13.0	11.2	9.0	7.3	6.1	4.9	4.0	3.1	2.7	-89%	6%	5%
1A3bii	2.0	1.5	1.2	1.0	0.8	0.7	0.5	0.5	0.4	0.4	0.4	-82%	1%	5%
1A3biii	3.9	2.7	2.0	1.7	1.5	1.3	1.2	1.1	1.0	1.0	0.9	-76%	2%	5%
1A3biv	1.4	0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.4	-71%	1%	5%
1A3bv	11.8	9.2	5.5	4.6	3.4	2.7	2.3	1.9	1.5	1.1	0.9	-92%	2%	5%
1A3c	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.4	9%	1%	10%
1A3dii	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.4	0.4	0.5	0.6	25%	1%	10%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16%	0%	1%
1A4a	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-36%	0%	3%
1A4bi	8.1	4.8	5.2	5.6	4.3	4.0	3.4	3.2	3.1	2.9	3.0	-63%	6%	10%
1A4bii	0.8	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.5	-34%	1%	5%
1A4ci	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-84%	0%	0%
1A4cii	1.3	1.3	1.3	1.3	1.2	1.2	1.1	1.1	1.0	1.0	0.9	-29%	2%	12%
1A5b	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-53%	0%	4%
1B1b	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	-81%	0%	28%
1B2ai	0.3	0.5	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1B2aiv	12.6	11.4	7.5	6.2	7.2	6.1	6.4	5.8	6.4	6.0	6.6	-48%	14%	21%
1B2av	6.6	5.7	4.9	3.4	3.6	3.0	3.0	3.0	2.5	2.1	2.0	-69%	4%	6%
1B2b	1.7	1.6	2.7	2.7	2.7	2.3	2.5	2.0	2.4	2.3	2.1	26%	4%	5%
1B2c	0.4	0.2	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.6	35%	1%	3%
2A7	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	51%	0%	4%
2B5	2.7	2.4	2.4	2.1	1.6	1.2	0.4	2.7	2.1	0.2	0.2	-91%	0%	1%
2C	0.8	0.8	0.8	0.8	0.7	0.5	0.3	0.4	0.5	0.5	0.5	-34%	1%	33%
2D1	1.6	1.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-95%	0%	36%
2D2	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.3	1.3	1.2	1.0	-8%	2%	1%
3A	17.3	11.5	9.5	8.8	7.9	7.5	7.0	7.1	7.1	6.8	7.2	-58%	15%	6%
3B	4.1	2.6	2.4	2.2	2.1	1.9	1.8	1.6	1.5	1.4	1.4	-66%	3%	5%
3C	5.0	4.1	2.9	2.6	1.5	0.5	0.5	0.5	0.5	0.5	0.5	-91%	1%	3%
3D	18.9	16.1	14.4	14.0	11.5	11.5	11.3	11.3	11.4	11.4	11.7	-38%	24%	5%
4F	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
6A	1.3	1.2	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.6	0.5	-59%	1%	6%
6C	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	10%	1%	4%
6D	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-31%	0%	5%
Grand total	133.9	104.6	84.2	76.6	67.5	59.3	55.2	54.5	52.7	47.5	48.0	-64%	100%	5%

Table G.4: Non Methane Volatile Organic Compounds (NMVOC) Emissions Inventory for Northern Ireland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	0.3	0.4	0.2	0.3	0.3	0.1	0.0	0.0	0.2	0.3	0.4	3%	1%	8%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2f	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	-10%	3%	3%
1A3aii(i)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-37%	0%	7%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-32%	0%	9%
1A3bi	12.8	9.7	6.8	6.0	4.9	4.0	3.2	2.5	2.1	1.7	1.4	-89%	5%	3%
1A3bii	1.0	0.9	0.7	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.4	-65%	1%	5%
1A3biii	3.1	2.2	1.7	1.5	1.4	1.3	1.3	1.3	1.1	1.0	1.0	-66%	4%	5%
1A3biv	0.7	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	-72%	1%	3%
1A3bv	5.9	4.8	2.9	2.4	1.9	1.5	1.2	0.9	0.7	0.6	0.4	-93%	2%	3%
1A3c	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	21%	0%	2%
1A3dii	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	52%	1%	4%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13%	0%	2%
1A4a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-35%	0%	1%
1A4bi	12.7	10.7	9.6	9.1	8.7	8.3	7.9	7.5	7.1	6.9	6.9	-46%	25%	23%
1A4bii	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.3	-31%	1%	3%
1A4ci	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-92%	0%	0%
1A4cii	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	0.9	0.9	0.8	-29%	3%	11%
1A5b	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-42%	0%	2%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2ai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2av	2.8	2.6	2.3	1.7	1.6	1.5	1.4	1.3	1.2	1.0	0.8	-70%	3%	3%
1B2b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1B2c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2A7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-15%	0%	0%
2B5	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	-75%	0%	0%
2C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-23%	0%	0%
2D1	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-95%	0%	10%
2D2	1.5	1.7	2.4	3.2	2.9	3.5	3.0	2.8	2.9	2.7	2.7	78%	10%	4%
3A	4.9	3.5	3.5	3.3	3.2	3.1	3.1	3.2	3.2	3.1	3.1	-36%	11%	3%
3B	2.3	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.8	-64%	3%	3%
3C	0.6	0.6	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	-53%	1%	2%
3D	9.1	7.9	7.2	6.9	6.8	6.6	6.5	6.5	6.5	6.6	6.4	-29%	23%	3%
4F	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
6A	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	-55%	1%	4%
6C	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	4%	1%	2%
6D	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-27%	0%	3%
Grand total	62.7	51.3	43.1	40.7	37.5	35.3	32.8	31.2	29.9	28.5	28.0	-55%	100%	3%

Table G.5: Unallocated Non Methane Volatile Organic Compounds (NMVOC) Emissions in the UK, 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1c	0.3	0.2	0.2	0.6	0.7	0.8	0.7	0.7	0.7	0.5	0.3	5%	1%	63%
1A3aii(i)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-74%	0%	0%
1A3aii(ii)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-99%	0%	0%
1B2ai	55.1	56.7	52.2	54.8	59.3	67.4	61.7	52.5	38.6	30.0	32.8	-40%	62%	67%
1B2c	38.8	37.5	28.0	25.0	19.6	18.4	23.3	19.2	24.0	17.5	17.6	-55%	33%	83%
2B5	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	0%	4%	6%
Grand total	96.1	96.3	82.3	82.3	81.5	88.5	87.7	74.3	65.2	49.9	52.7	-45%	100%	6%

APPENDIX H: DEVOLVED ADMINISTRATION NH_3 INVENTORIES, 1990-2006

Table H.1 Ammonia Emissions Inventory for England 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	0.0	0.3	0.3	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.6	2483%	0%	81%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-97%	0%	95%
1A2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
1A2f	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.4	24%	0%	74%
1A3bi	0.6	7.4	9.9	10.0	10.2	10.1	9.8	9.2	8.6	7.7	6.8	1093%	3%	84%
1A3bii	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	190%	0%	83%
1A3biii	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	17%	0%	81%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2%	0%	84%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73%	0%	84%
1A4a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54%	0%	96%
1A4bi	3.0	2.1	2.0	2.1	1.7	1.7	1.4	1.3	1.2	1.0	0.9	-69%	0%	66%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8%	0%	84%
1A4ci	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1%	0%	99%
1A4cii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-16%	0%	59%
1B1b	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-24%	0%	91%
1B2aiv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9%	0%	26%
2A7	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	15%	0%	55%
2B5	6.1	5.9	7.4	3.4	2.3	2.4	2.2	2.0	1.9	4.0	3.9	-35%	2%	99%
2D1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1%	0%	86%
2D2	0.8	0.8	1.0	1.1	0.9	0.8	1.0	0.9	0.9	0.9	0.7	-10%	0%	100%
3D	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1%	0%	84%
4B13	15.1	14.4	14.4	14.5	14.3	13.9	13.7	14.1	14.2	14.2	16.1	6%	8%	79%
4B1a	65.5	66.7	63.6	65.0	61.6	60.1	59.4	58.6	57.2	54.9	53.3	-19%	26%	63%
4B1b	41.4	37.0	35.8	35.7	34.9	32.5	31.3	32.0	33.1	32.8	31.8	-23%	15%	49%
4B3	6.7	6.6	6.6	6.7	6.3	5.4	5.2	5.3	5.4	5.2	5.2	-22%	3%	44%
4B6	2.0	2.5	3.1	2.7	2.8	2.8	3.0	2.9	3.3	3.4	3.8	93%	2%	77%
4B8	41.2	39.6	40.2	36.4	32.1	28.3	26.5	23.1	23.7	21.5	21.9	-47%	11%	82%
4B9	32.9	29.0	33.8	35.3	31.9	33.8	31.3	30.3	30.9	29.0	29.3	-11%	14%	77%
4D1	37.4	25.5	23.0	27.2	18.5	20.7	22.9	18.8	22.9	22.8	21.9	-41%	11%	63%
4F	3.4	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	-51%	1%	84%
6A	2.3	2.9	3.2	3.3	3.4	3.3	3.4	3.3	3.1	3.2	2.6	16%	1%	78%
6B	4.6	4.9	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	1%	2%	84%
6C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-60%	0%	84%
6D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1%	0%	84%
7	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-9%	0%	84%
Grand total	265.0	249.5	252.9	252.3	230.1	225.0	220.2	210.7	215.4	209.6	207.6	-22%	100%	66%

Table H.2 Ammonia Emissions Inventory for Scotland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	2689%	0%	11%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	0%
1A2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100%	0%	NA
1A2f	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44%	0%	7%
1A3bi	0.1	0.7	1.0	0.9	1.0	1.0	1.0	0.9	0.8	0.7	0.7	1115%	2%	8%
1A3bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	196%	0%	8%
1A3biii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18%	0%	8%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	8%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50%	0%	13%
1A4a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52%	0%	4%
1A4bi	0.7	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	-73%	0%	13%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2%	0%	8%
1A4ci	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-95%	0%	0%
1A4cii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-16%	0%	18%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2A7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24%	0%	5%
2B5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-57%	0%	0%
2D1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-8%	0%	8%
3D	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-5%	0%	8%
4B13	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.5	1.5	1.7	14%	4%	8%
4B1a	7.9	8.2	8.2	8.3	8.0	7.8	8.0	8.1	8.1	8.2	8.1	2%	20%	10%
4B1b	13.9	12.8	13.1	12.8	12.8	11.9	12.3	12.4	12.5	12.8	13.7	-2%	34%	21%
4B3	3.3	3.3	3.3	3.3	3.1	2.8	2.8	2.8	2.8	2.8	2.6	-22%	7%	22%
4B6	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	120%	1%	8%
4B8	2.9	3.5	4.0	3.2	3.3	3.5	3.0	2.8	2.6	2.7	2.5	-15%	6%	9%
4B9	4.7	4.2	3.7	3.1	3.6	4.0	3.8	3.3	3.7	3.2	3.1	-35%	8%	8%
4D1	9.6	6.7	5.7	6.7	4.5	5.5	6.0	4.9	5.8	5.5	5.7	-41%	14%	16%
4F	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-51%	0%	9%
6A	0.3	0.4	0.4	0.5	0.5	0.4	0.5	0.4	0.4	0.5	0.4	27%	1%	12%
6B	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-4%	1%	8%
6C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-29%	0%	8%
6D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5%	0%	8%
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-14%	0%	8%
Grand total	46.2	43.0	42.6	42.0	39.9	40.0	40.3	38.8	39.8	39.3	40.0	-14%	100%	13%

Table H.3: Ammonia Emissions Inventory for Wales 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	2709%	0%	6%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-97%	0%	5%
1A2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	NA
1A2f	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.1	82%	0%	9%
1A3bi	0.0	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.4	1139%	1%	5%
1A3bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	199%	0%	5%
1A3biii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22%	0%	5%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2%	0%	5%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30%	0%	1%
1A4a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-88%	0%	0%
1A4bi	0.6	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	-69%	1%	14%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5%	0%	5%
1A4ci	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-83%	0%	0%
1A4cii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-16%	0%	12%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-77%	0%	9%
1B2aiv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16%	0%	74%
2A7	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	-14%	1%	40%
2B5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	156%	0%	1%
2C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-33%	0%	100%
2D1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-10%	0%	4%
3D	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-2%	0%	5%
4B13	2.0	1.9	1.6	1.8	1.8	1.8	1.8	1.9	1.6	1.7	2.1	2%	6%	10%
4B1a	10.6	10.7	10.5	10.8	10.4	10.8	10.8	10.9	11.2	11.0	11.5	8%	35%	14%
4B1b	8.2	7.7	7.8	7.8	7.5	7.6	7.0	7.6	7.6	7.6	8.0	-2%	25%	12%
4B3	3.7	3.9	3.9	4.1	3.9	3.5	3.6	3.5	3.4	3.4	3.3	-11%	10%	28%
4B6	0.3	0.4	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.6	84%	2%	13%
4B8	0.7	0.6	0.6	0.5	0.4	0.2	0.3	0.3	0.2	0.2	0.1	-79%	0%	1%
4B9	2.3	2.0	2.5	2.9	2.6	2.5	1.5	2.4	2.0	1.6	1.4	-41%	4%	4%
4D1	6.3	4.6	4.4	5.1	3.3	3.8	4.0	3.4	4.0	4.1	3.9	-37%	12%	11%
4F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-51%	0%	1%
6A	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	25%	1%	6%
6B	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-1%	1%	5%
6C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2%	0%	5%
6D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2%	0%	5%
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-11%	0%	5%
Grand total	35.6	33.6	33.7	35.4	32.3	32.6	31.3	32.2	32.3	31.7	32.5	-9%	100%	10%

Table H.4: Ammonia Emissions Inventory for Northern Ireland 1990-2006 (ktonnes)

NFRCode	1990	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change (1990-2006)	% of DA Total (2006)	% UK Sector (2006)
1A1a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2709%	0%	2%
1A1c	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
1A2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	NA
1A2f	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	181%	0%	10%
1A3bi	0.0	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	1101%	1%	3%
1A3bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	254%	0%	3%
1A3biii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71%	0%	5%
1A3biv	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2%	0%	3%
1A3eii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27%	0%	2%
1A4a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-87%	0%	0%
1A4bi	1.0	0.7	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.1	-88%	0%	8%
1A4bii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11%	0%	3%
1A4ci	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-81%	0%	0%
1A4cii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-16%	0%	11%
1B1b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2B5	0.0	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	NA	0%	0%
2D1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11%	0%	2%
3D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3%	0%	3%
4B13	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.6	-17%	2%	3%
4B1a	9.0	9.9	10.9	11.1	11.0	11.8	12.0	11.8	11.9	12.0	12.1	35%	35%	14%
4B1b	10.8	10.5	10.8	10.5	10.2	10.1	10.2	10.5	10.4	10.5	10.9	1%	31%	17%
4B3	0.9	0.9	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.7	-26%	2%	6%
4B6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	33%	0%	3%
4B8	4.5	4.0	3.9	2.9	2.4	2.3	2.2	2.5	2.4	2.3	2.1	-54%	6%	8%
4B9	3.5	4.5	4.1	4.2	3.9	3.6	4.1	4.2	4.2	3.9	4.2	17%	12%	11%
4D1	4.7	3.5	3.4	3.9	2.6	3.2	3.5	2.8	3.3	3.1	3.2	-31%	9%	9%
4F	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-51%	0%	6%
6A	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	37%	0%	4%
6B	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	4%	0%	3%
6C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16%	0%	3%
6D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3%	0%	3%
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7%	0%	3%
Grand total	35.8	35.7	36.3	35.8	33.1	33.8	34.6	34.3	34.5	34.1	34.7	-3%	100%	11%

Table H.5: Unallocated Ammonia Emissions in the UK, 1990-2006 (ktonnes)

This page intentionally left blank; there are no reported “Unallocated” (i.e. offshore) ammonia emission sources in the UK inventory.