Department for Environment, Food & Rural Affairs

Emissions of Air Quality Pollutants

1990 – 2013

The Scottish Government

DOE

Llywodraeth Cymru
Welsh Government

Contents

1 Introduction

This report provides a summary of the 2015 Air Quality Pollution Inventory (AQPI), covering the years 1990 - 2013. Emission inventories are important in assessing the impact of human activity on atmospheric pollution, and provide policy makers and the public with a valuable understanding of the sources and trends (past and future) of key pollutants. This report is updated annually, providing an overview of the key pollutants contributing to air pollution in the UK, along with information on the sources of pollution and trends in emissions – in particular the progress towards achieving international targets on reducing air pollutant emissions.

Information on the full range of air pollutants is available from the pages of the National Atmospheric Emissions Inventory (NAEI) website. **http://naei.defra.gov.uk/index.php**

1.1 Air Quality

When released into the atmosphere air quality pollutants can have a transboundary and/or local impact. Transboundary impacts occur when a pollutant from one area (or country) impacts on another after being transported by weather systems. Examples of transboundary pollutants are acidifying pollutants such as nitrogen oxides (NOx) and sulphur dioxide (SO_2) as well as ozone (O_3) which is not emitted directly into the atmosphere but may be formed over a large distance by reactions of emitted non-methane volatile organic compounds (NMVOC). Acidifying pollutants can adversely affect buildings, vegetation and aquatic systems, whilst ozone formed in the lower atmosphere (the troposphere) can be damaging to human health, materials, crops and plants. Particulate matter (PM) is formed from chemical reactions in the atmosphere involving NOx, SO_2 and ammonia (NH_3), as well as being directly emitted from human activities, and is damaging to health.

Atmospheric pollution can also impact on local air quality. Where high concentrations occur, there can be a wide range of negative impacts to human health or ecosystems[1]

Table 1.1 highlights the key pollutant-source combinations for the five main air quality pollutants as identified in the latest update of the Gothenburg Protocol. The emissions of NOx, SO_2, and particulate matter ($PM_{2.5}$) are all strongly linked to the burning of fuels, which occurs in electricity generation, transport, and industry. These are collectively referred to as fuel combustion sources. NMVOCs are emitted from many sources, including domestic use of products that contain solvents. In comparison, NH_3 emissions are dominated by the agricultural sector. These pollutants are each considered in greater detail in Section 2 of this report.

Table 1.1: Key Pollutant-Source Combinations

	NOx	SO_2	NMVOC	NH_3	$PM_{2.5}$
Electricity generation	key	key	minimal	minimal	moderate
Industrial combustion	moderate	moderate	moderate	minimal	moderate
Residential & commercial	moderate	moderate	moderate	minimal	key
Industrial processes	minimal	moderate	moderate	minimal	moderate
Extraction & distribution of fossil fuels	minimal	moderate	moderate	minimal	minimal
Solvents	minimal	minimal	key	minimal	minimal
Road transport	key	minimal	moderate	minimal	key
Other transport & mobile machinery	moderate	moderate	minimal	minimal	moderate
Agriculture	minimal	minimal	minimal	key	minimal
Waste	minimal	minimal	moderate	moderate	minimal

Key: key emission source (red); moderate emission source (yellow); minimal /no emissions (green)

[1] For further information on impacts, visit: http://uk-air.defra.gov.uk/air-pollution/effects

1.2 The UK Inventory

The UK inventory is compiled annually to report emissions totals by pollutant and source sector in a well-defined format. This allows emissions to be easily compared across different countries. National emission estimates for air quality pollutants are submitted to both the European Commission under the National Emissions Ceilings Directive (NECD, 2001/81/EC) and the United Nations Economic Commission for Europe (UN/ECE) under the Convention on Long-Range Transboundary Air Pollution (CLRTAP).

The CLRTAP submissions are available online at: http://www.ceip.at/overview-of-submissions-under-clrtap/.

The emissions data are supported by an Informative Inventory Report (IIR), which details the inventory methodology and documents emission factors and other data used in the inventory. All pollutants covered by the UK's air quality pollutant inventory are listed below, and those included in this summary report are underlined.

Air Quality Pollutants

- <u>particulate matter, PM*</u>
- black smoke, BS
- carbon monoxide, CO
- benzene
- 1,3-butadiene
- polycyclic aromatic hydrocarbons, PAH
- <u>nitrogen oxides, NOx</u>
- <u>sulphur dioxide, SO_2</u>
- <u>non-methane volatile organic compounds, NMVOC</u>
- <u>ammonia, NH_3</u>
- hydrogen chloride, HCl
- hydrogen fluoride, HF

* Particulate matter emissions are given as PM_{10}, $PM_{2.5}$, $PM_{1.0}$ and $PM_{0.1}$ and black carbon (BC)

Heavy Metals

- arsenic, As
- beryllium, Be
- cadmium, Cd
- chromium, Cr
- copper, Cu
- lead, Pb
- manganese, Mn
- mercury, Hg
- nickel, Ni
- tin, Sn
- selenium, Se
- vanadium, V
- zinc, Zn

Persistent Organic Compounds (POPs)

- polycyclic aromatic hydrocarbons, PAHs
- dioxins and furans, PCDD/Fs
- polychlorinated biphenyls, PCBs
- pesticides: lindane, hexachlorobenzene (HCB), pentachlorophenol (PCP)
- short-chain chlorinated paraffins, SCCPs
- polychlorinated napthalenes, PCNs
- polybrominated diphenyl ethers, PBDEs

The methodology for calculating air quality pollutant emissions is consistent with the greenhouse gas inventory methodology.

Emission estimates for historic years are typically calculated by combining an emission factor (for example, tonnes of a pollutant per million tonnes of fuel consumed) with an activity statistic (for example, million tonnes of fuel consumed). Commonly, activity data will consist of official national datasets such as fuel use data from the Department of Energy and Climate Change, population, or GDP.

Emission estimates for future years are called emission projections, and are also produced and reported as part of the inventory process. Emission projections are typically estimated by considering how emissions in the most recent year of the historic emissions inventory are likely to change in the future. For example: Are the existing trends expected to continue? Is there new legislation that will be introduced that will affect the emissions? Will the use of new technology help to reduce emissions? This assessment is done at a detailed level, although there can still be substantial uncertainty associated with estimating data that relate to future years.

1.3 Current Issues and Legislation

Generally, the quality of air in the UK has greatly improved over the last couple of decades. However air quality is still an important issue at a political level whilst the potential for harm to human health and environmental systems remains. Recently, political and legislative focus has surrounded emissions of PM and its precursors in the atmosphere and the formation of tropospheric ozone (O_3). Both can have severe health impacts to humans, as well as damaging environmental processes e.g. reducing crop yields. In addition, recent evidence suggests that exposure to increased NO_2 concentrations arising from emissions of NOx, may give rise to human health impacts that are as large (or indeed larger) than those from PM[2].

In the UK, air quality is managed at both the local and national levels. Part IV of the Environment Act 1995 establishes the system of Local Air Quality Management (LAQM), which requires local authorities to carry out regular 'Review and Assessments' of a number of statutory pollutants such as NO_2 and PM in their area and take action to address exceedances of these objectives. At the national level, the Department for the Environment, Food and Rural Affairs is responsible for the national programme of policies and measures that help to ensure that air quality standards are met. Meeting the air quality standards can be achieved in different ways, and controlling emissions is one of several options.

At the international scale, legislation on transboundary pollution requires total annual emissions to meet ceilings under the EU's National Emissions Ceilings Directive (NECD), and to meet emission reduction commitments under the Gothenburg Protocol (UN/ECE legislation).

The 2010 emission ceilings, and new 2020 emission reduction commitments (ERC) under the Gothenburg Protocol are shown in Table 1.3.

Further information on local air quality legislation and both the Gothenburg Protocol and the NECD can be found by exploring the links at the end of this report.

Table 1.3: UK annual emissions and targets 2010 – 2020 (ktonnes)

	NOx	SO_2	NH_3	NMVOC	$PM_{2.5}$
2013 emissions	1020	393	271	803	80
2010 Gothenburg Protocol ceiling	1181	625	297	1200	n/a
2020 Gothenburg Protocol ERC[3]	714	291	280	773	67

UK Government has implemented measures to decrease emissions across the key air quality pollutants. Section 2 of this report reviews trends in these pollutants, highlighting the impact of UK Government policies / actions in meeting the necessary agreements and targets. The new 2020 Gothenburg Protocol emission reduction commitments are placed within the context of the historical emissions so that the scale of emission reductions required can be appreciated.

[2] Faustini A, Rapp R, Forastiere F. Nitrogen dioxide and mortality: review and meta-analysis of long-term studies. Eur Respir J 2014;44:744-753

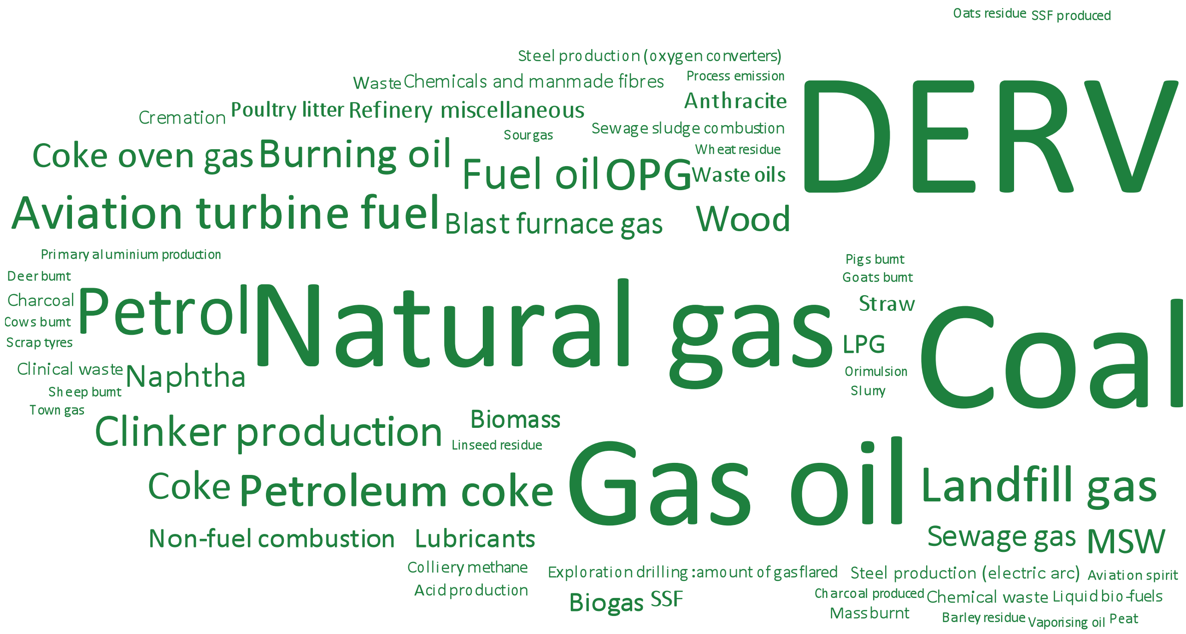
[3] Emission reduction commitments for 2020 under the Gothenburg Protocol are declared as a percentage reduction. The figures given in this table have been calculated for illustrative purposes and may change if the 2005 base year emissions change due to future inventory revisions.

2 Air Quality Pollutants

2.1 Nitrogen Oxides (NOx)

NOx emissions consist of both nitrogen oxide (NO) and nitrogen dioxide (NO_2). Short-term exposure to high NOx concentrations is damaging to human health, causing airway inflammation and respiratory symptoms. In the presence of sunlight, NOx can react to produce photochemical smog. NOx is also an acidifying pollutant, and can cause damage to buildings and ecosystems by altering the chemical make-up of minerals, soils and aquatic systems. The main sources of NOx in the UK are power stations and road transport through the combustion of fossil fuels (see Figure 2.1.1). Road transport has accounted for approximately a third of UK emissions in recent years.

Figure 2.1.1: Fuels and activities responsible for emissions (2013)



As well as being a pollutant included under the legislative frameworks of the Gothenburg Protocol and NECD, there are many EU and UK regulations that address key sources of NOx, including: EURO vehicle emission standards, the Industrial Emissions Directive and the Large Combustion Plant Directive. These regulations are supplemented by detailed technology-specific guidance that set out the NOx abatement options and expected levels of emissions.

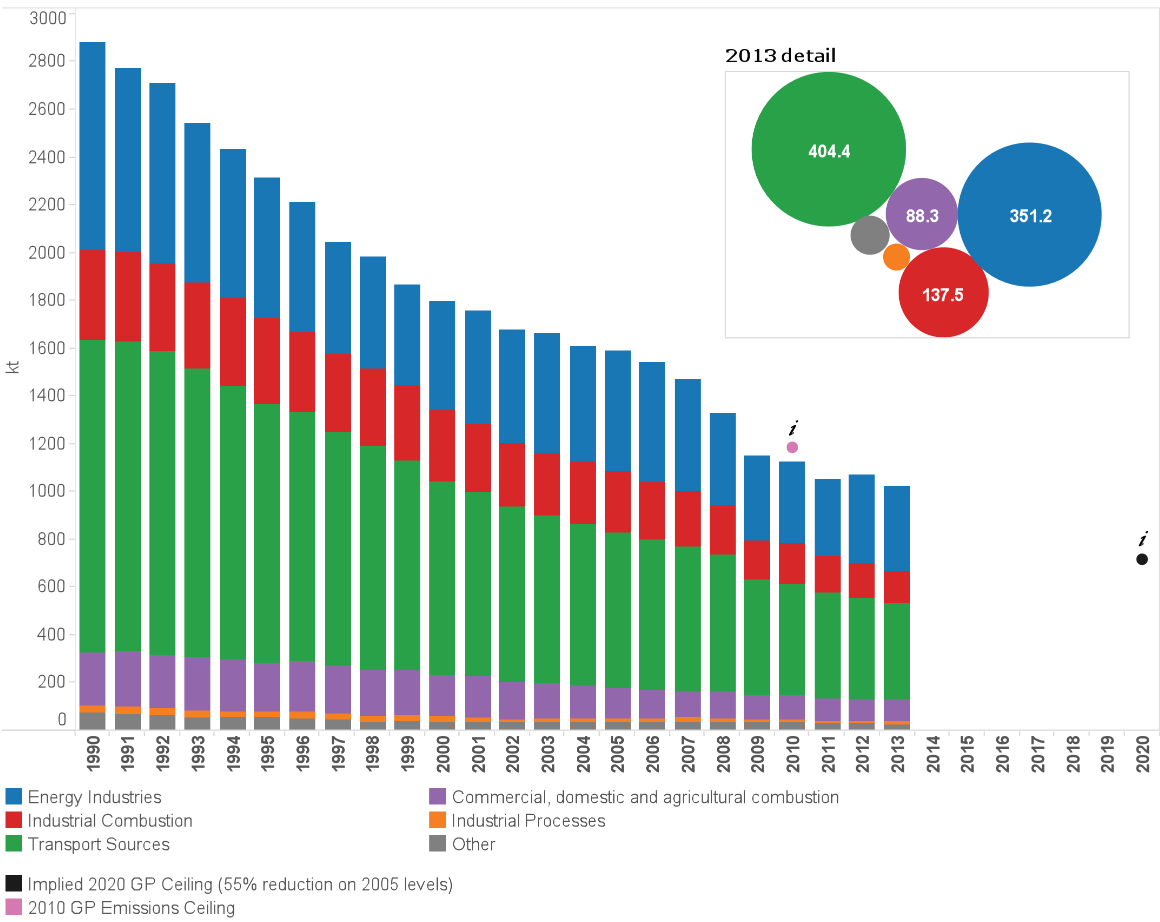
Figure 2.1.2 shows that inventory emission estimates for the transport sector have decreased significantly since 1990, due to the gradual tightening of vehicle emission performance through the introduction of increasingly stringent Euro Standards, and their subsequent penetration into the UK fleet.

Historically, annual emissions from power stations were fairly consistent during the 1970s, with a small decrease through the 1980s mainly attributable to increased efficiency of power plants and the increased use of nuclear power. This period also incorporated the miners' strike in 1984, during which considerably less coal was used for electricity generation.

Emission reductions across the time series from the Energy sector are primarily due to changes in the electricity generation fuel mix and the installation of NOx abatement at coal-fired power stations. Changes in the electricity generation fuel mix in the early 1990s from coal to natural gas led to notable reductions. Since 2008, the installation of new technology in coal power stations to ensure compliance with the Large Combustion Plant Directive has led to further reductions of NOx emissions.

However, the falling emission trend indicated by the inventory reversed in 2012, with coal consumption in power stations rising above that of natural gas for the first time since 2007. This upward trend was then reversed again in 2013. Year to year variations in fuel prices are considered to be a major influence on the emission trends in recent years.

Figure 2.1.2: UK NOx emissions, 1990-2013 with Gothenburg Protocol Ceilings (2010 and 2020)

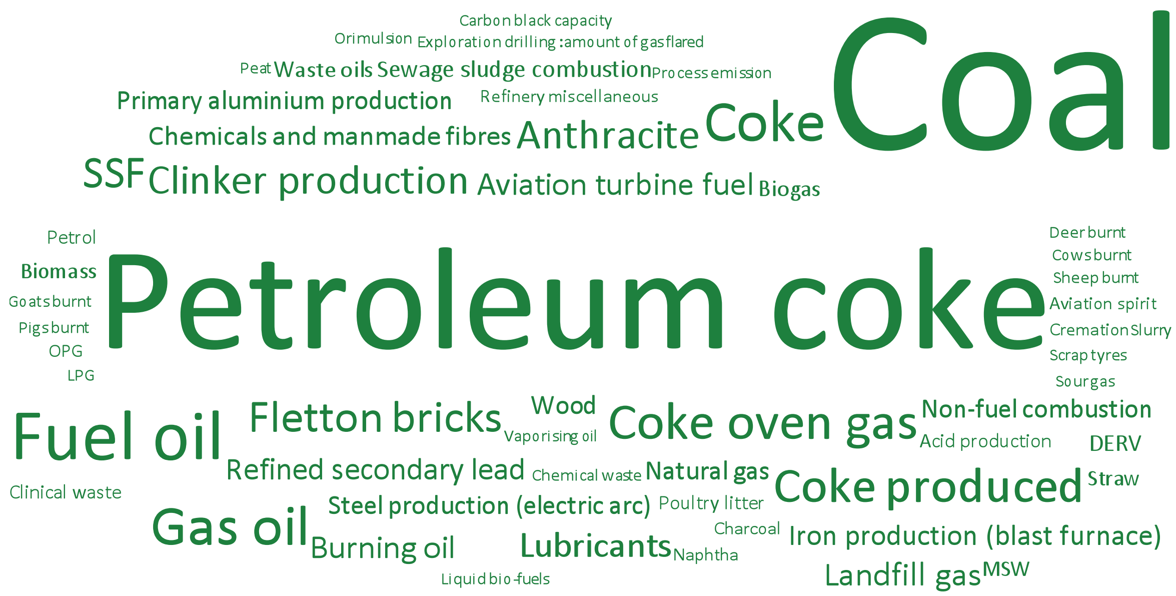


2.2 Sulphur Dioxide (SO_2)

SO_2 emissions are formed by the oxidation of sulphur contained in fuels during combustion processes. Combustion for energy and industry are the most significant sources for SO_2 emissions, contributing to 80% of the 2013 total. Combustion in commercial, residential and agricultural sectors are also important sources, summing to a 12.2% contribution. Figure 2.2.1 highlights the significance for the UK inventory of the combustion of sulphur-containing fuels, most notably coal and petroleum coke, and to a lesser extent fuel oil and gas oil. Natural gas contains little or no sulphur.

The adverse impacts of SO_2 have long been realised due to its contribution to low level winter smogs, in particular the severe impacts of the London smogs in the 1950s. As with NOx, major impacts to buildings and ecosystems are associated with its acidifying properties. SO_2 can damage lung functionality in humans and also contributes to secondary particulate matter as a result of reactions with other pollutants in the air.

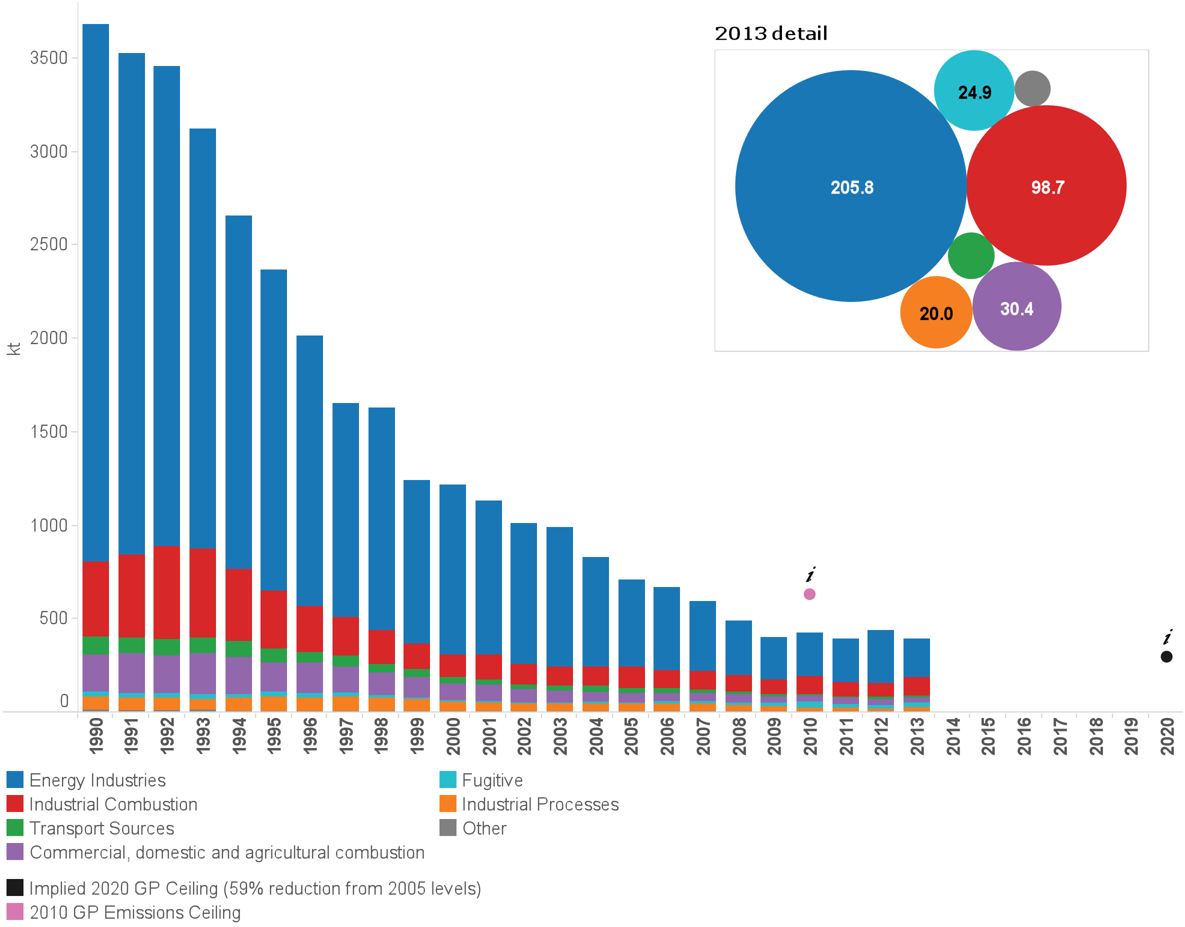
Figure 2.2.1: Fuels and activities responsible for emissions (2013)



Of all of the air quality pollutants that are governed under the NECD and Gothenburg Protocol, the UK emissions of SO_2 show the most marked decrease in emissions over time; since 1990 emissions have declined by 89% and this is directly linked to an economy-wide shift away from sulphur-containing fuels, as natural gas has largely replaced coal as the main fuel across energy, industry and in residential heating. Where coal use is still prevalent, such as in electricity generation, the introduction of emissions abatement (such as flue gas desulphurisation) has reduced emissions further. In addition, several high-emitting industry sectors (such as iron and steel, oil refining) have been in decline in the UK as production has increasingly moved overseas during the 1990s and 2000s.

Figure 2.2.2 shows trends in SO_2 emissions by source sector since 1990. Until this point, emissions from electricity generation were fairly static at around 3,000 ktonnes per year. Improved abatement at power plants and legislation such as the Environmental Protection Act (1990), the Large Combustion Plant Directive (2001) and the Industrial Emissions Directive (2010) have all contributed to the regulation and mitigation of SO_2 emissions across energy and industrial sources. Road transport emissions have declined due to tightening of fuel standards during the 1990s and more recently due to the EU Fuel Quality Directive and its amendments leading to a reduction in the sulphur content of diesel.

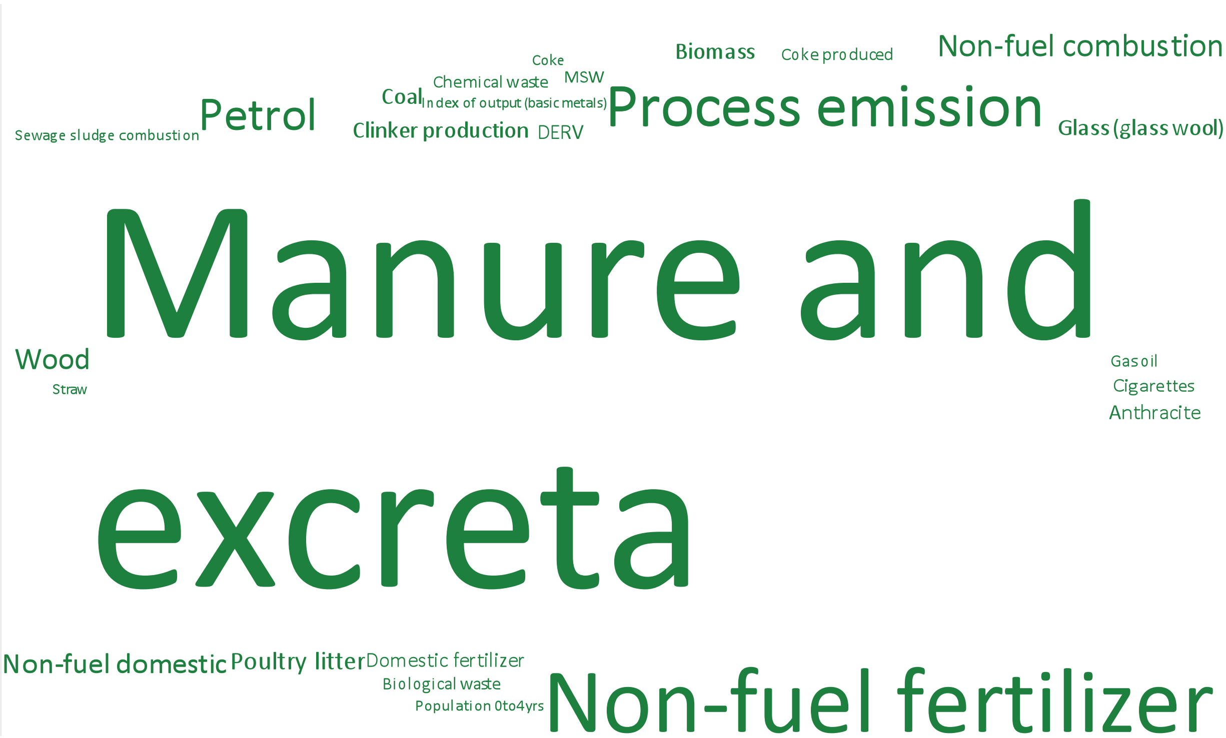
Figure 2.2.2: UK SO_2 emissions, 1990-2013 with Gothenburg Protocol Ceilings (2010 and 2020)



2.3 Ammonia (NH_3)

NH_3 emissions can cause damage to terrestrial and aquatic ecosystems through acidification and eutrophication. As with SO_2, it is also a precursor to secondary particulate matter. The chemistry of NH_3 means that it contributes to both localised and transboundary pollution.

Figure 2.3.1: Fuels and activities responsible for emissions (2013)



Agriculture is the dominant source for emissions of NH_3, the largest component being emissions from livestock, specifically the decomposition of urea in animal wastes (and uric acid in poultry wastes). Of the livestock classes, cattle are the largest emitters of NH_3, accounting for more than half of all emissions from livestock. The application of synthetic fertiliser to soils is also a major source of NH_3 emissions at approximately 13% in 2013.

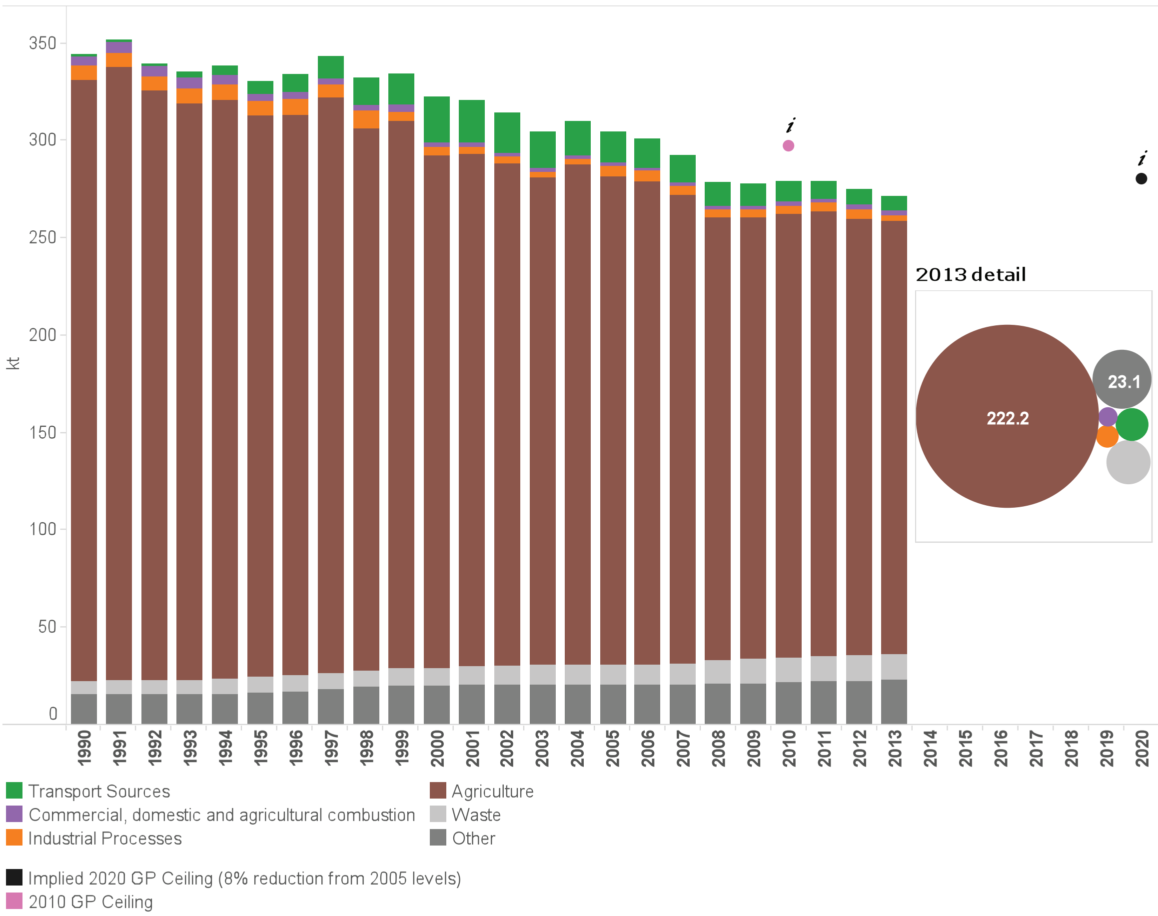
NH_3 emissions are difficult to measure because they are dominated by "diffuse" sources (e.g. livestock), rather than point sources (e.g. power stations and industrial installations). Uncertainty in the UK inventory estimates are greater for NH_3 than for many other air quality pollutants (such as SO_2, NOx) due to:

- The dependency on highly variable factors such as the species, age and diet of animals in determining livestock emission levels.
- The complexities of the behaviour of nitrogen compounds in the natural environment. For example, after the application of fertiliser to crops, the chemical processes that result in the release of NH_3 to air depend on a range of factors such as soil type, climatic conditions, crop species and the type of fertiliser applied.

Reliable source data for NH_3 is only available since 1980. Compared to other air quality pollutants, there has been relatively little reduction in total emissions over the time series (Figure 2.3.2). The reduction of NH_3 emissions that has been achieved in the UK is largely due to a decrease in UK cattle numbers, where better farming practices have improved efficiencies (generating the same amount of products with fewer animals, for example increasing milk yields). The implementation of regulations such as the Nitrate Sensitive Areas Order (1990), and subsequent designation of Nitrate Vulnerable Zones where use of manufactured nitrogen fertilisers and organic manures is controlled, have led to a reduction in fertiliser use and resultant NH_3 emissions since the late 1990s.

Since 2008, a rise in the use of anaerobic digestion and composting for organic waste treatment has led to increased NH_3 emissions from the waste sector. However the trend in total NH_3 emissions continues to be dominated by trends in livestock numbers.

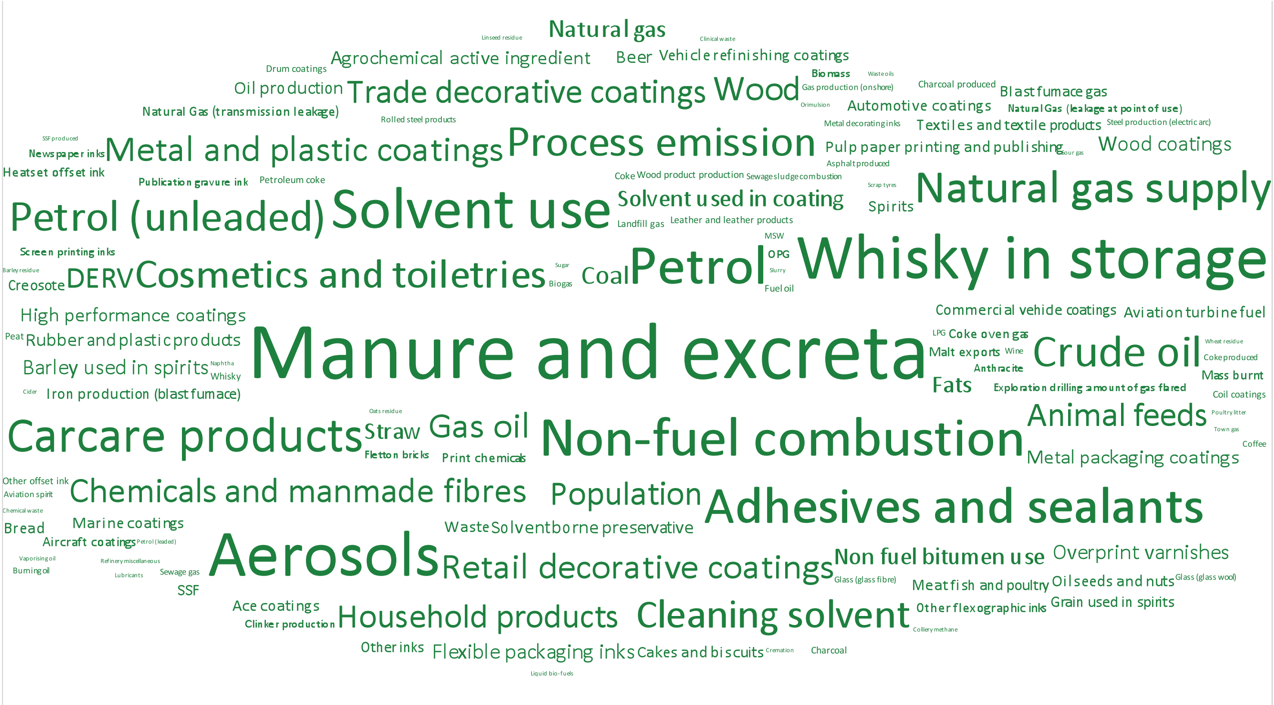
Figure 2.3.2: UK NH_3 emissions, 1990-2013 with Gothenburg Protocol Ceilings (2010 and 2020)



2.4 Non-Methane Volatile Organic Compounds (NMVOCs)

NMVOCs are a group of organic compounds. They are formed either as combustion products, or more commonly as vapour emitted from a wide range of industrial processes, solvent use and fossil fuel extraction and distribution.

Figure 2.4.1: Fuels and activities responsible for emissions (2013)

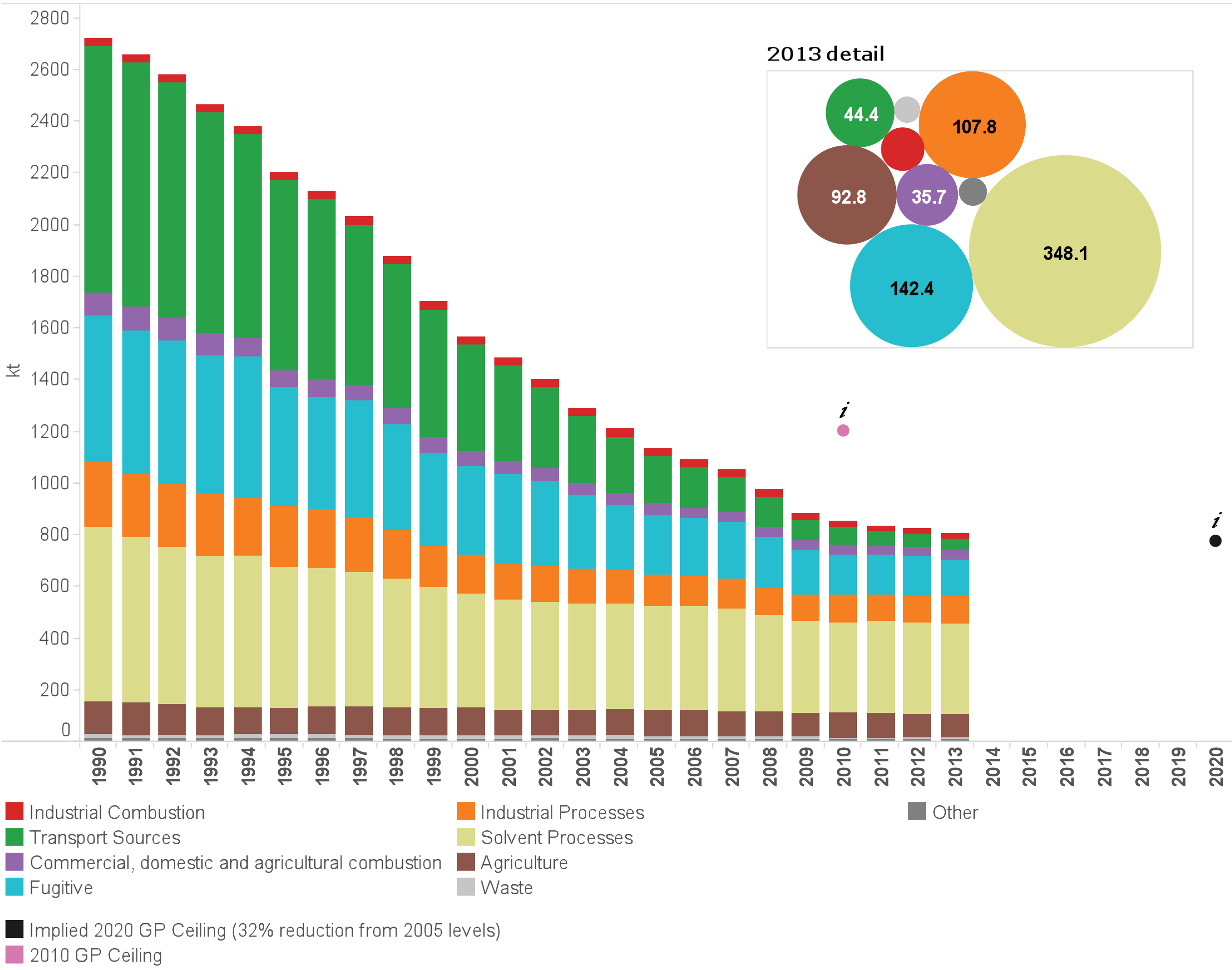


Emissions of NMVOC from some sources are challenging to estimate, and are therefore high in uncertainty. This is particularly the case for fugitive emissions - emissions that are released either accidentally or e.g. through the use of products, rather than emissions arising from sources such as fuel combustion. Emissions due to solvents and other products are an example of a fugitive source that is challenging to estimate, and make up over 44% of NMVOC emissions in 2013.

Interest in NMVOC emissions has grown since its role in photochemical ozone creation was realised during the 1980s. Ozone gas acts as an irritant on the surface tissues of the body, including the eyes, nose and lungs making it harmful to human health at low levels in the atmosphere. It can also damage materials, and be toxic to crop species, reducing yields and decreasing biodiversity. Some NMVOCs such as benzene are also directly harmful to human health.

As a result of increasing road traffic and industrial activity, there was steady increase in total NMVOC emissions until around 1990. Since then (Figure 2.4.2), emissions have rapidly decreased to well below the Gothenburg Protocol Ceiling in 2010. Decreases in emissions have occurred in all major source sectors, which is generally attributed to the introduction of wide ranging legislative controls. The inventory data indicates that emissions from transport have seen the most dramatic decreases due to the introduction of three-way catalytic converters, and to a lesser degree, fuel switching from petrol to diesel cars. Emissions from the transport sector represented only 6% of UK NMVOC emissions in 2013 compared to 37% in 1990.

Figure 2.4.2: UK NMVOC emissions, 1990-2013 with Gothenburg Protocol Ceilings (2010 and 2020)



2.5 Particulate Matter (PM)

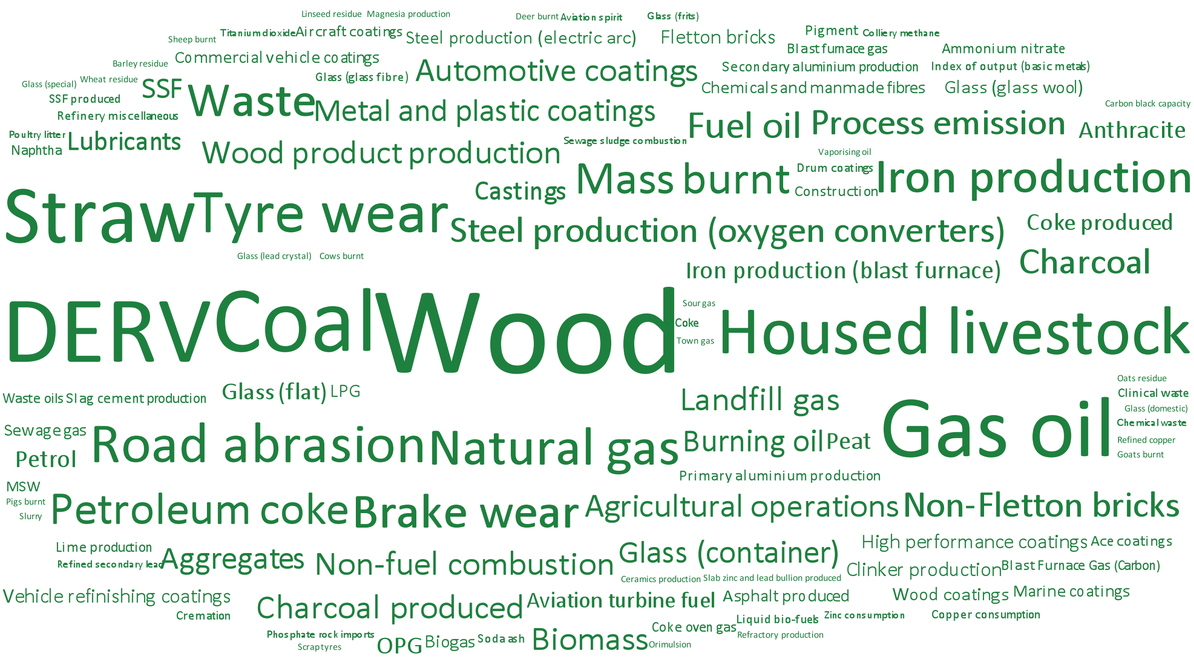
As a result of the extensive use of coal during the 1950s, PM emissions were mostly thought of in terms of smoke due to the very severe impacts that resulted, most notably the heavy smogs in London during this period. Since the Clean Air Act however, and the resultant reduction of coal burning in urban areas, the focus has switched to finer particles – those arising from various other sectors such as combustion of diesel fuels in road transport. As well as road transport, the inventory indicates that main sources of PM are stationary combustion (electricity generation, industrial combustion, and commercial and residential combustion) and industrial processes. Road transport becomes an increasingly important source as particle sizes decrease. In comparison, some industrial processes, particularly quarrying, are more important for emissions of larger particles. PM_{10} refers to particles with a diameter smaller than 10μm and $PM_{2.5}$ to particles with a diameter smaller than 2.5μm.

Stationary combustion sources contribute 35% of 2013 $PM_{2.5}$ emissions. Emissions from the transport sector (road transport, rail, domestic aviation and domestic shipping) make a contribution of 23% to the total $PM_{2.5}$ emissions. The ban on field burning in the UK causes a small decline in emissions of $PM_{2.5}$ from agriculture between 1992 and 1993.

As well as impacting upon air quality, PM emissions have a cross-cutting effect, as emissions of black carbon (a specific element of fine PM emissions) act as a short-term climate forcer. In terms of health hazards, studies show that PM emissions are more significant than those of other pollutants. The complex mixture of particles gives rise to a range of problems including lung cancer and cardiovascular disease from chronic exposure. A significant proportion of the particulate matter in the atmosphere are inorganic aerosols created through chemical processes involving SO_2, NOx and NH_3. These aerosols, which directly affect human health are also the main drivers through which these species damage ecosystems through acidification and eutrophication. However, with increasing concern over the damaging nature of PM, the direct emission of $PM_{2.5}$ has now been added to the list of regulated pollutants under the Gothenburg Protocol.

PM emissions occur from a broad range of sources. The time series (Figure 2.5.2) shows steady

Figure 2.5.1: Fuels and activities responsible for emissions (2013)

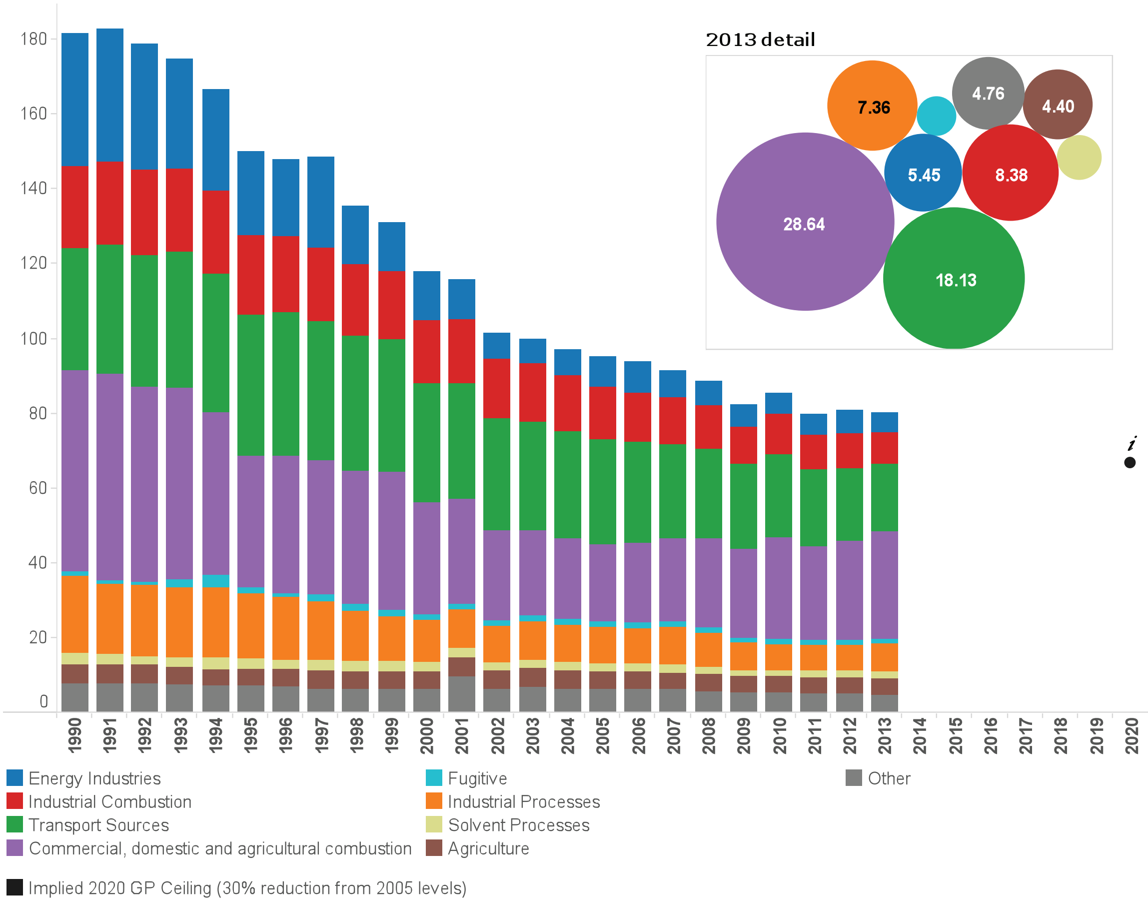


reductions in total $PM_{2.5}$ emissions since 1990. Over time, transport has become an increasingly important source. Whilst emissions from the transport sector have generally been decreasing since the 1980s, other sectors have achieved a much greater emission reduction in comparison, leaving the transport sector with a greater total share. The trend for transport is influenced by several different factors. Better vehicle regulations such as the introduction of EURO Standards have contributed to emissions reductions. However, these have been countered by the fuel switch to diesel engines, which despite contributing to fewer emissions for many other pollutants actually contribute more PM and NOx emissions per vehicle kilometre than petrol vehicles. Furthermore, as vehicle emission regulations have succeeded in reducing exhaust emissions from diesel vehicles, there is now an increasing influence from non-exhaust emissions of PM from mechanical wear of tyre and brake material and road abrasion.

The trend for emissions from electricity generation follows that of SO_2, where reduced coal use has been a major factor in reducing PM emissions, as well as more stringent emissions legislation. A combination of stricter regulations and the decline of heavy industry have also made a substantial contribution to emissions reductions, for both industrial combustion and process emissions.

Emissions from other stationary combustion sources, such as domestic heating, have also decreased significantly over the time series. This is most commonly due to the declining use of solid fuel use (particularly coal) in favour of natural gas. Emissions from the use of wood in the domestic sector has come under increased scrutiny in recent years – its importance increasing as other sources have decreased. However, emissions from domestic wood use are particularly challenging to estimate for several reasons. For example, much of the wood consumption is not captured in sales figures, the emissions vary greatly depending on the type of equipment used, and even the experience of the operator can influence the resulting emissions.

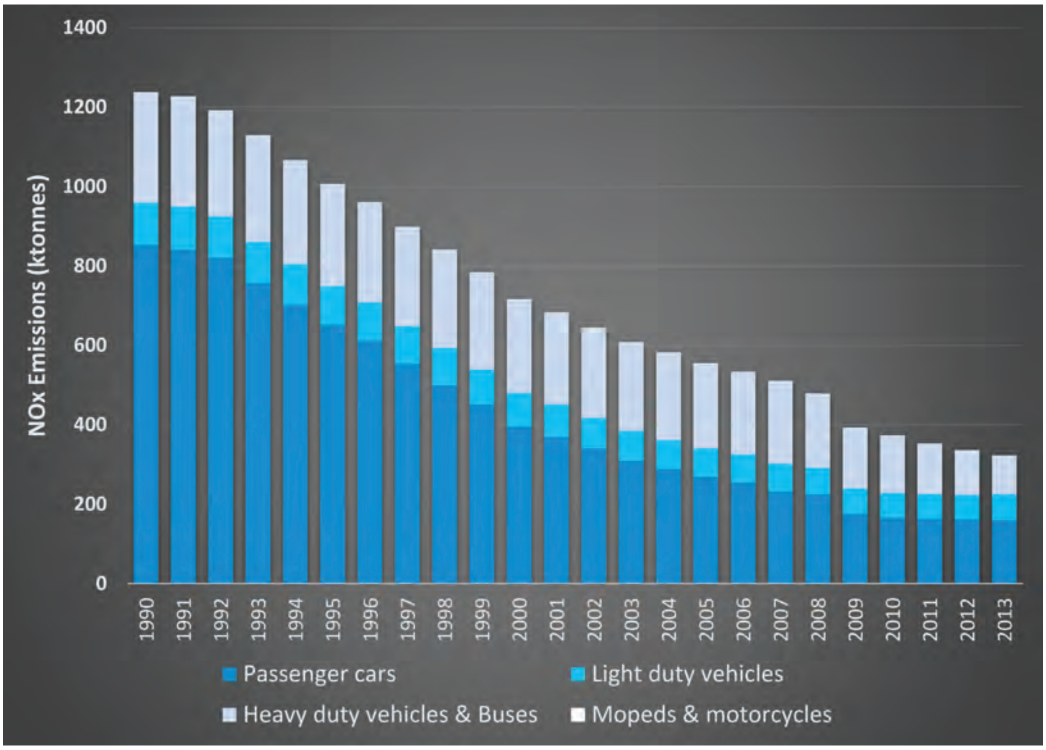
Figure 2.5.2: UK $PM_{2.5}$ emissions, 1990-2013 with 2020 Gothenburg Protocol Ceiling



3 Road Transport and NOx Emissions

Road transport is a major source of NOx emissions in the UK and in 2013 road vehicles were estimated to contribute 32% to total UK NOx emissions. Figure 3.1 shows the estimated emissions by vehicle class from 1990 to 2013, illustrating the trends in emissions and the relative significance of NOx emissions from the different vehicle classes: cars, LGVs, HGVs/buses and mopeds/motorcycles.

Figure 3.1: Emissions of NOx from Road transport in the UK, 1990-2013[4]



According to the trends shown by the inventory, emissions of NOx have steadily declined since 1990, across all of the major vehicle classes, with passenger cars showing the most substantial reduction.

Figure 3.2 below shows the estimated average NOx emissions per vehicle kilometre for different vehicle types between 1990 and 2013. Various emission regulations on new petrol cars, which have come into effect in stages since 1976, have led to the gradual reduction in emissions per vehicle kilometre from petrol cars. In particular, the decline in emissions from 1992 is due to the increasing number of cars fitted with three-way catalysts. Limits on emissions from diesel cars and light goods vehicles (LGVs) did not come into effect until 1993/4 and since then there has been a significant growth in diesel vehicle activity in the UK.

Limits on emissions from HGVs first came into effect in 1988 leading to a gradual reduction in emission rates as new HGVs penetrated the fleet. Recent vehicle emissions standards for diesel vehicles, including cars and vans, have not delivered the emission reductions originally expected under real world driving conditions. However, with the introduction of Euro 6/VI standards, emissions are expected to continue to decline.

[4] Note: the contribution from mopeds and motorcycles is negligible and therefore difficult to see in this Figure.

Between 2008 and 2009 there was a noticeable reduction in NOx emissions from the road transport sector. This was primarily due to improvements to catalyst repair rates for cars and LGVs from mid-2009 onwards, which reduces NOx emissions per vehicle kilometre[5].

Figure 3.2: Average NOx emissions per vehicle kilometre, by vehicle type 1990-2013[6].

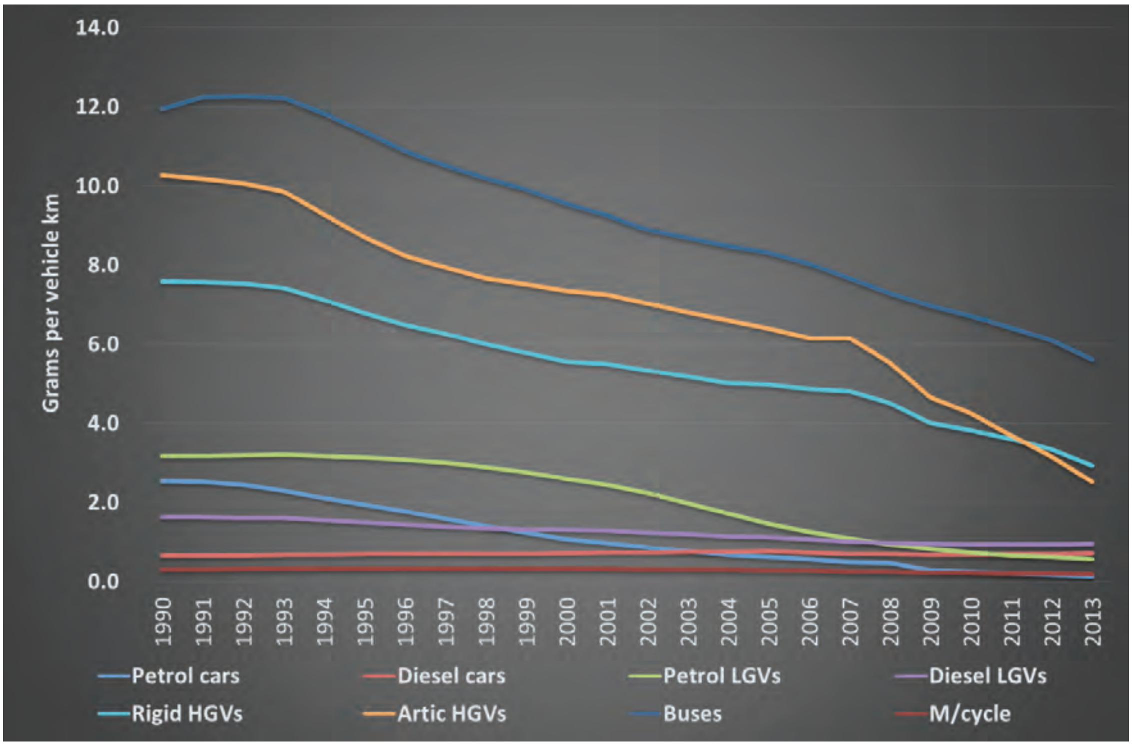


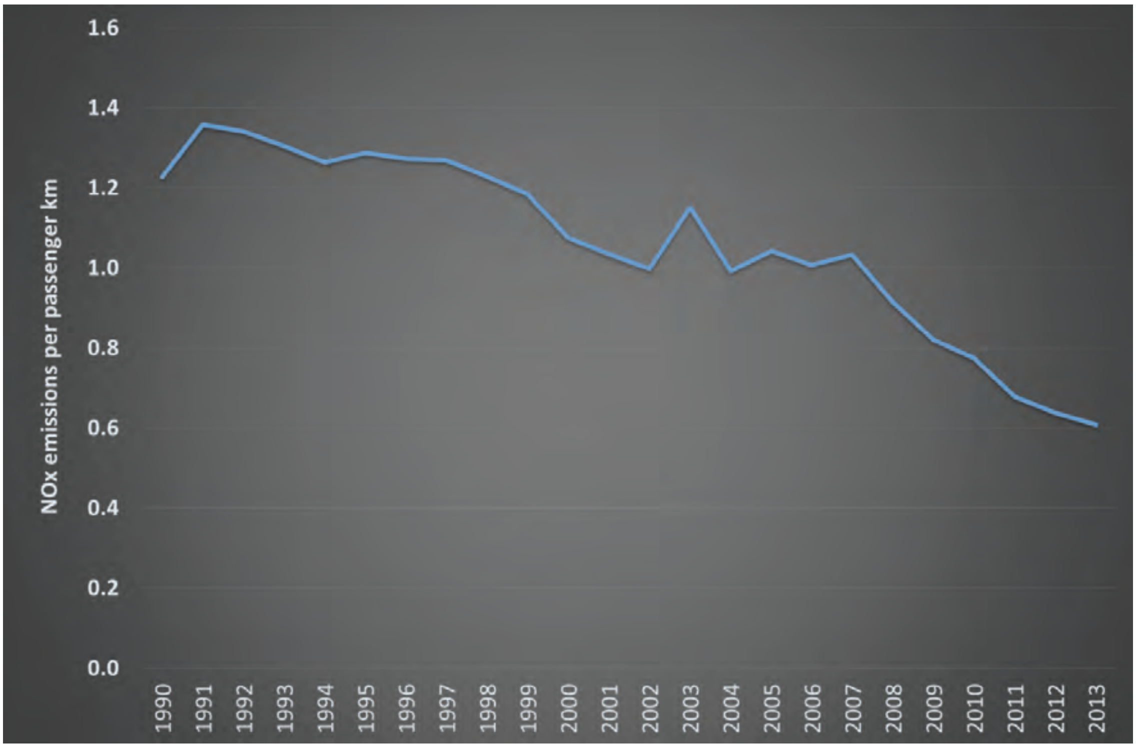
Figure 3.3 below shows emissions of NOx per passenger kilometre for buses since 1990. Emission rates have declined over the period due to the penetration of buses meeting tighter emission standards.

Note that care needs to be taken when interpreting these data as the emission rates presented are significantly influenced by the assumptions of bus passenger loading. The data provided here is based on estimated average Great Britain occupancy rates, but this may well vary substantially across the country.

[5] According to the Department for Transport, there is evidence that (prior to 2009) a high proportion of replacement catalysts were not Type Approved and did not restore the emission performance of the vehicle to its original level. This is being addressed through the Regulations Controlling Sale and Installation of Replacement Catalytic Converters and Particle Filters for Light Vehicles for Euro 3 (or above) after June 2009. Therefore a change in the repair rate is taken into account for Euro 3 and above petrol LDVs from mid-2009 assuming all failed vehicles are rectified properly.

[6] Data are derived from total NOx emissions calculated in the NAEI and the total vehicle km travelled by each vehicle type, taking account of vehicle emissions for a range of driving conditions (e.g. urban, motorway, rural).

Figure 3.3: NOx emissions per passenger kilometre for buses, 1990-2013[7].



Emissions from road transport are a significant source of NOx emissions and are particularly problematic in urban areas where high density traffic volumes often contribute to exceedences of local air quality targets. Local Authorities around the UK have responded by declaring almost 600 Air Quality Management Areas (AQMAs) in this regard[8]. Where an AQMA has been declared the Local Authority must produce an Air Quality Action Plan that sets out measures to improve air quality.

[7] DfT National Travel Survey. Published in Transport Statistics Great Britain. Table TSGB0101

[8] http://uk-air.defra.gov.uk/aqma/summary

Glossary

AQPI	Air Quality Pollutant Inventory
CEIP	Centre on Emission Inventories and Projections
CLRTAP	Convention on Long-Range Transboundary Air Pollution
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
NAEI	National Air Emissions Inventory
Spatial disaggregation	The process by which information at a coarse spatial scale is translated to finer scales while maintaining consistency with the original dataset
Transboundary pollution	Transboundary pollution is pollution that originates in one country but, by crossing the border through pathways of water or air, is able to cause damage to the environment in another country.
UN/ECE	United Nations Economic Commission for Europe

Finding out more information...

There is a lot of information available on all of the pollutants covered in the UK air quality pollution inventory, along with what is being done to improve air quality in the UK and across Europe. The following web pages provide an excellent starting point for those wanting to explore air quality issues further:

NAEI website, giving information on the UK inventory:
http://naei.defra.gov.uk/index.php

Defra air quality pages, providing background information and details on UK air quality legislation: **http://uk-air.defra.gov.uk/air-pollution/**

European Environment Agency air pollution pages:
http://www.eea.europa.eu/themes/air

Further information on CLRTAP: **http://www.unece.org/env/lrtap/welcome.html**

CEIP website, providing links to international inventories: **http://www.ceip.at/**

The UK inventory for air quality is compiled by the UK inventory team at Ricardo Energy & Environment with contributions from Aether, AMEC and SKM Enviros on behalf of Defra.

Department for Environment Food & Rural Affairs

Aether

RICARDO

Ricardo Energy & Environment