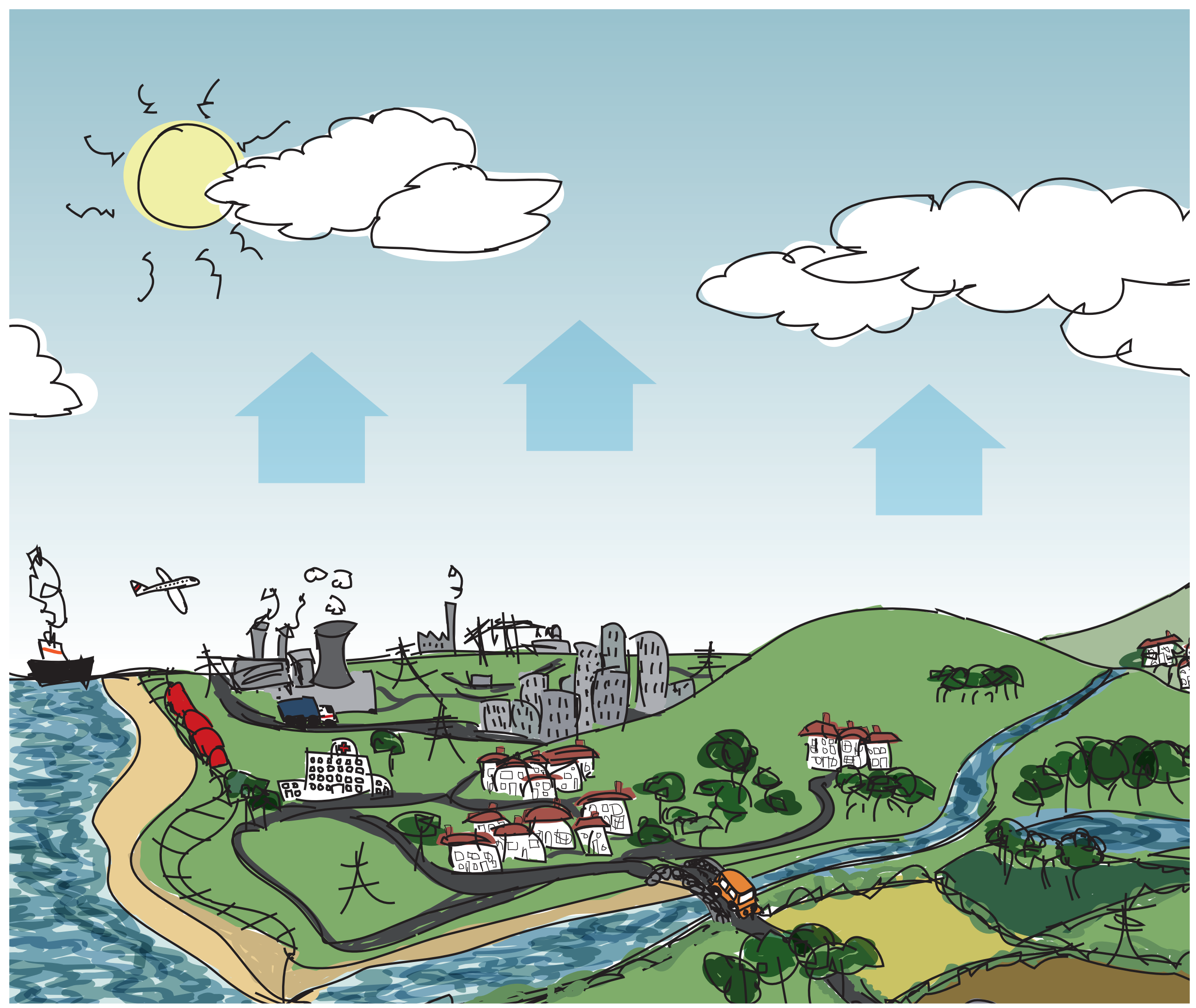
Department for Environment, Food & Rural Affairs

Emissions of Air Quality Pollutants

1990 – 2012



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Contents

1 Introduction

This report provides a summary of the 2014 Air Quality Pollution Inventory (AQPI), covering the years 1990 - 2012. 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 emission source	key emission source	minimal /no emissions	minimal /no emissions	moderate emission source
Industrial combustion	moderate emission source	moderate emission source	moderate emission source	minimal /no emissions	moderate emission source
Residential & commercial	moderate emission source	moderate emission source	moderate emission source	minimal /no emissions	key emission source
Industrial processes	minimal /no emissions	moderate emission source	moderate emission source	minimal /no emissions	moderate emission source
Extraction & distribution of fossil fuels	minimal /no emissions	moderate emission source	moderate emission source	minimal /no emissions	minimal /no emissions
Solvents	minimal /no emissions	minimal /no emissions	key emission source	minimal /no emissions	minimal /no emissions
Road transport	key emission source	minimal /no emissions	moderate emission source	minimal /no emissions	key emission source
Other transport & mobile machinery	moderate emission source	moderate emission source	minimal /no emissions	minimal /no emissions	moderate emission source
Agriculture	minimal /no emissions	minimal /no emissions	minimal /no emissions	key emission source	minimal /no emissions
Waste	minimal /no emissions	minimal /no emissions	moderate emission source	moderate emission source	minimal /no emissions

Key: key emission source · moderate emission source · minimal /no emissions

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

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 $PM_{0.1}$

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

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 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	$PM_{2.5}$
2012 emissions	1062	427	277	832	77
2010 Gothenburg Protocol ceiling	1181	625	297	1200	n/a
2020 Gothenburg Protocol ERC[3]	716	291	278	789	65

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.

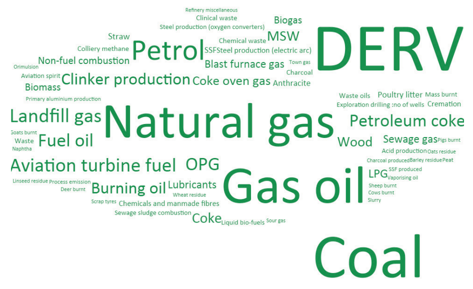
[2] Faustini A, Rapp R, Forastiere F. Nitrogen dioxide and mortality: review and meta-analysis of long-term studies. Eur Respir J 2014;44:744-753

[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)

Figure 2.1.1: Fuels and activites responsible for emissions (2012)



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.

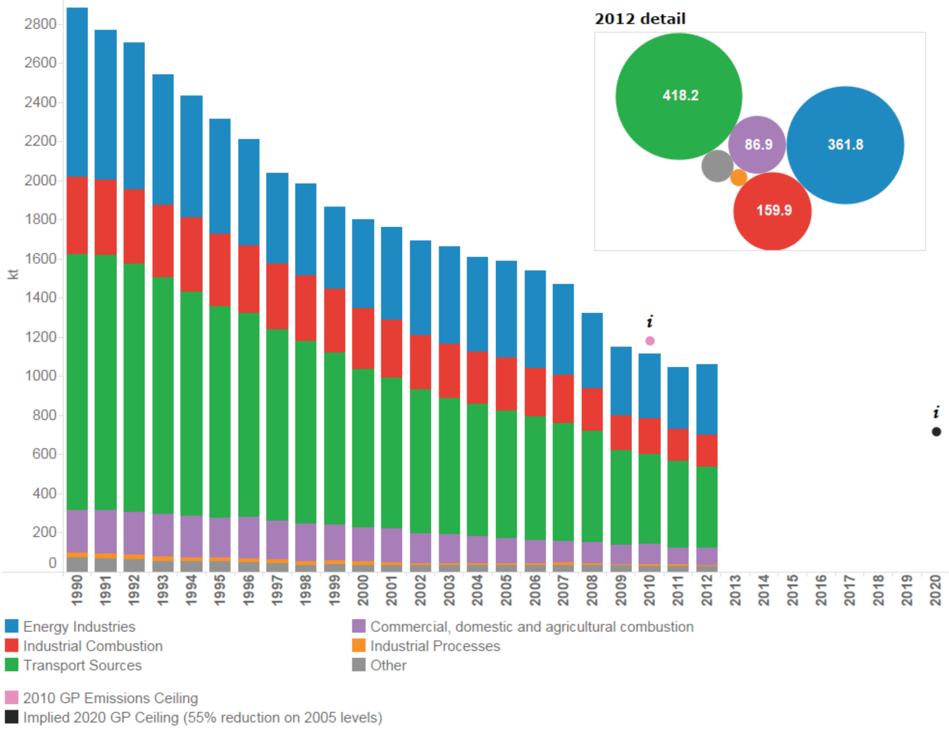
As well as being a pollutant regulated under the Gothenburg Protocol and NECD, there is a great deal of legislation specific to key sources of NOx emissions such as electricity generation (e.g. the Large Combustion Plant Directive, LCPD) and transport (e.g. EURO Standards in vehicle regulation).

The time series (Figure 2.1.2) shows how inventory emission estimates for the transport sector have decreased significantly since 1990, with vehicle regulations coming into force in the form of Euro Standards, and important technological improvements such as the three-way catalytic converter. The impacts of these are discussed in greater detail in Section 3.

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.

A greater decrease since 1988 has been due to factors such as the fitting of low NOx burners and other NOx reduction technology to power stations along with a general decline in coal consumption in favour of natural gas. 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, contributing to an increase in emissions from the sector.

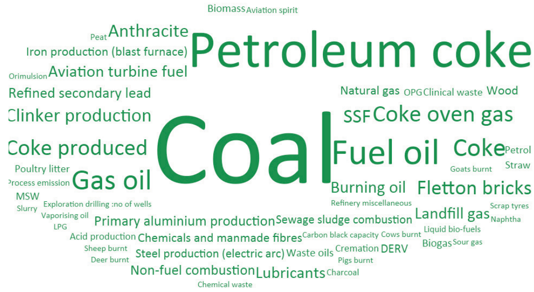
Figure 2.1.2: UK NOx emissions, 1990-2012 with Gothenburg Protocol Ceilings (2010 and 2020)



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 over 80% of the 2012 total. Residential and commercial combustion is another important source, contributing just over 10%, with the transport sector a smaller contributor. Figure 2.2.1 highlights strongly the main sulphur-containing fuels, predominantly coal, petroleum coke and heavy fuel oil, while lighter petroleum products such as gas oil and petrol have lower sulphur contents. Natural gas contains little or no sulphur.

Figure 2.2.1: Fuels and activities responsible for emissions (2012)

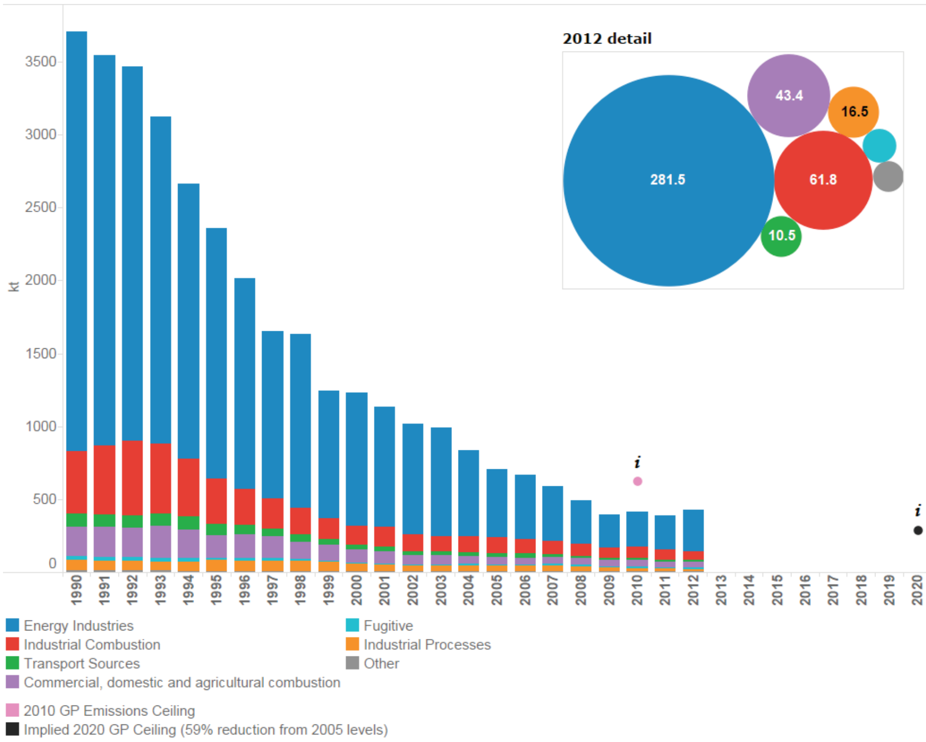


The adverse impacts of SO_2 have long been realised due to its contribution to low level winter smogs, in particular the severe impacts of the London smogs in the 1950s. As with NOx, major impacts to buildings and ecosystems are associated with its acidifying properties. SO_2 can damage lung functionality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

Historically, SO_2 emissions have seen the most dramatic decrease in the UK out of all air quality pollutants regulated under the NECD and Gothenburg Protocol, at over 94% since 1970 and 66% since 1990. Apart from the harsh winters in 1973 and 1979, there was a steady decline in emissions from both industrial and residential combustion sources, with the most significant decreases during the 1970s and 1980s. The reduction in industrial emissions was mainly a result of significantly decreased activity of 'heavy industries' such as steel and iron production, which are large consumers of sulphur containing fuels. Similarly, a decline in use of solid fuels for domestic heating gave rise to lower emissions from residential combustion. Reduced sulphur content of gas oil has also been an important factor.

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 3,000kt per year. Improved abatement at power plants and legislation such as the LCPD then had a major impact in reducing emissions, as well as the switch from coal to gas for electricity generation. SO_2 emissions from transport have also decreased significantly over the time series, due mainly to the reduction in sulphur content of petroleum products, specifically DERV (diesel fuel specifically used for road vehicles) and petrol.

Figure 2.2.2: UK SO_2 emissions, 1990-2012 with Gothenburg Protocol Ceilings (2010 and 2020)

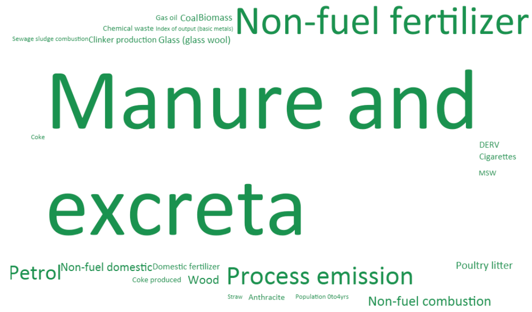


2.3 Ammonia (NH_3)

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.

Agriculture is the dominant source for emissions of NH_3 with the vast majority coming from livestock, specifically the decomposition of urea in animal wastes (and uric acid in poultry wastes). Cattle alone contribute well over half of all emissions from livestock. The application of fertiliser to soils is also a major source of NH_3 emissions at approximately 14% in 2012 (see Figure 2.3.1). 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 (2012)

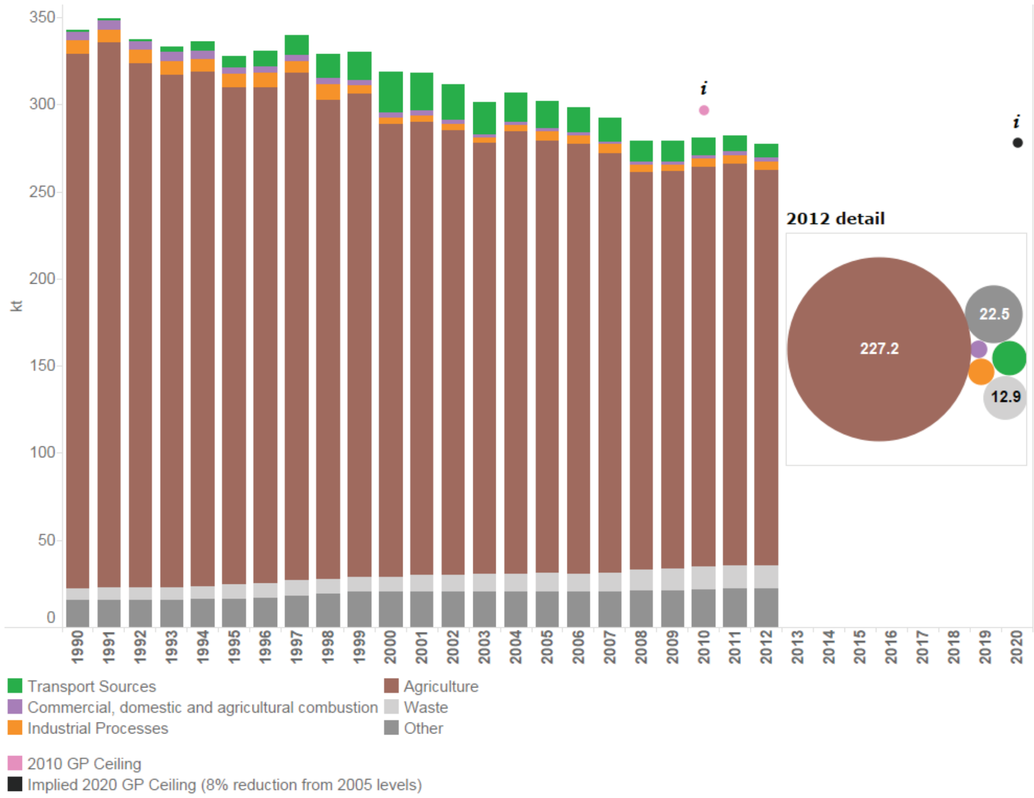


NH_3 emissions are difficult to measure because they are dominated by "diffuse" sources (e.g. livestock), rather than point sources (power stations and industrial installations). Uncertainty in estimates are greater due to:

- The dependency on highly variable factors such as the species, age and diet of animals in determining livestock emission levels.
- The way fertiliser use impacts on crops and decomposition of nitrates, which is extremely complex and varies by e.g. soil type and crop species.

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 down to a decrease in UK cattle numbers, where better farming practices have improved efficiencies (generating the same productivity with fewer animals, for example increasing milk yields). Decreases in fertiliser use as a result of stricter regulations on their application, such as the implementation of Nitrate Sensitive Areas, have also led to a reduction in NH_3 emissions since the late 1990s. Since 2008, a rise in the practice of anaerobic digestion for organic waste treatment, and to a lesser degree small scale composting, has started to increase NH_3 emissions from the waste sector.

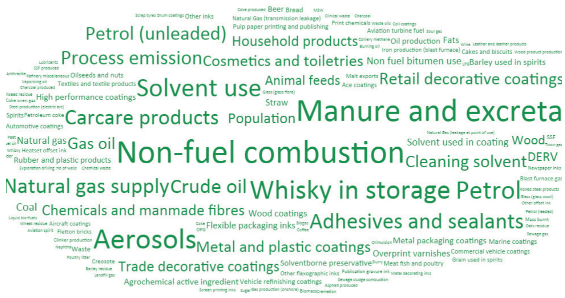
Figure 2.3.2: UK NH3 emissions, 1990-2012 with Gothenburg Protocol Ceilings (2010 and 2020)



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. Emissions due to solvents and other products make up over 40% of NMVOC emissions in 2012.

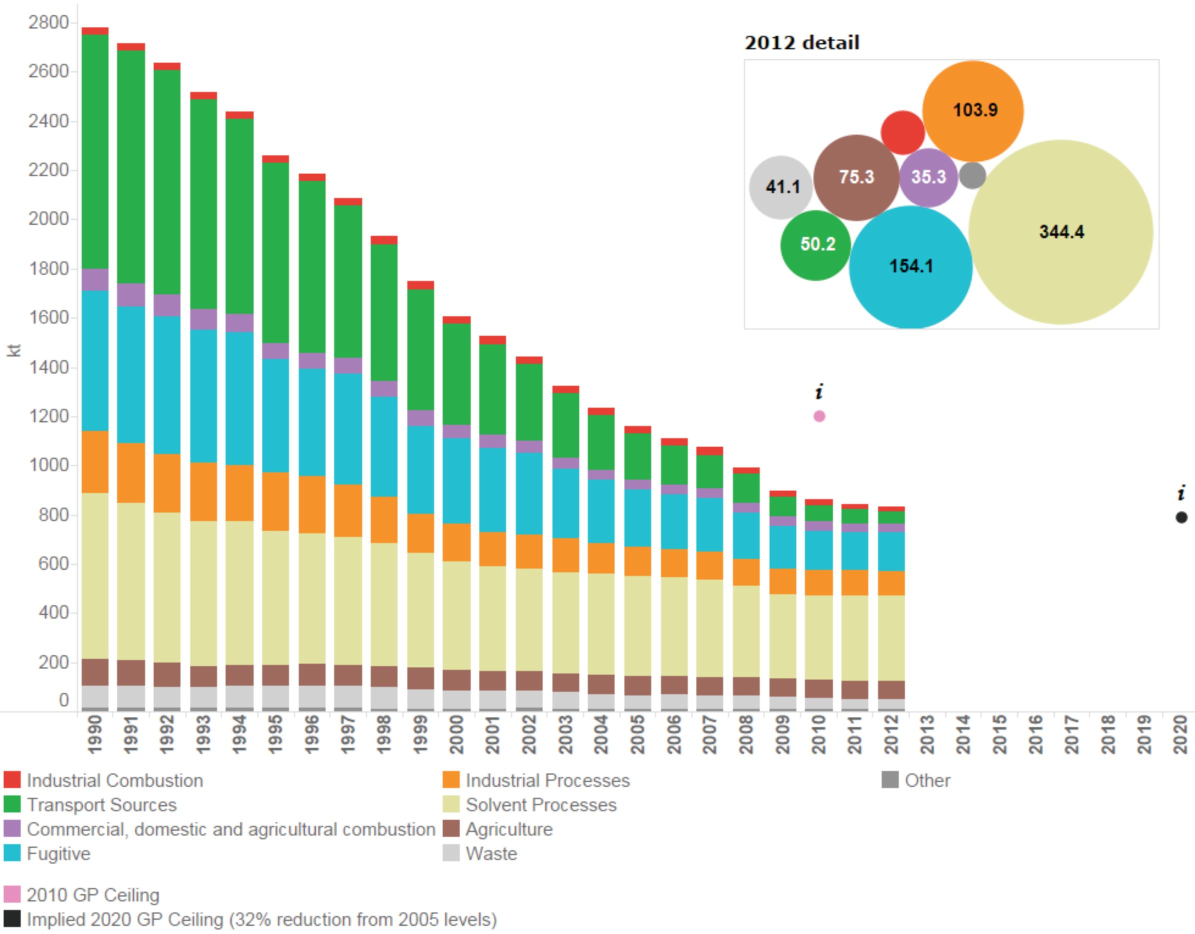
Figure 2.4.1: Fuels and activities responsible for emissions (2012)



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 2012 compared to 34% in 1990.

Figure 2.4.2: UK NMVOC emissions, 1990-2012 with Gothenburg Protocol Ceilings (2010 and 2020)



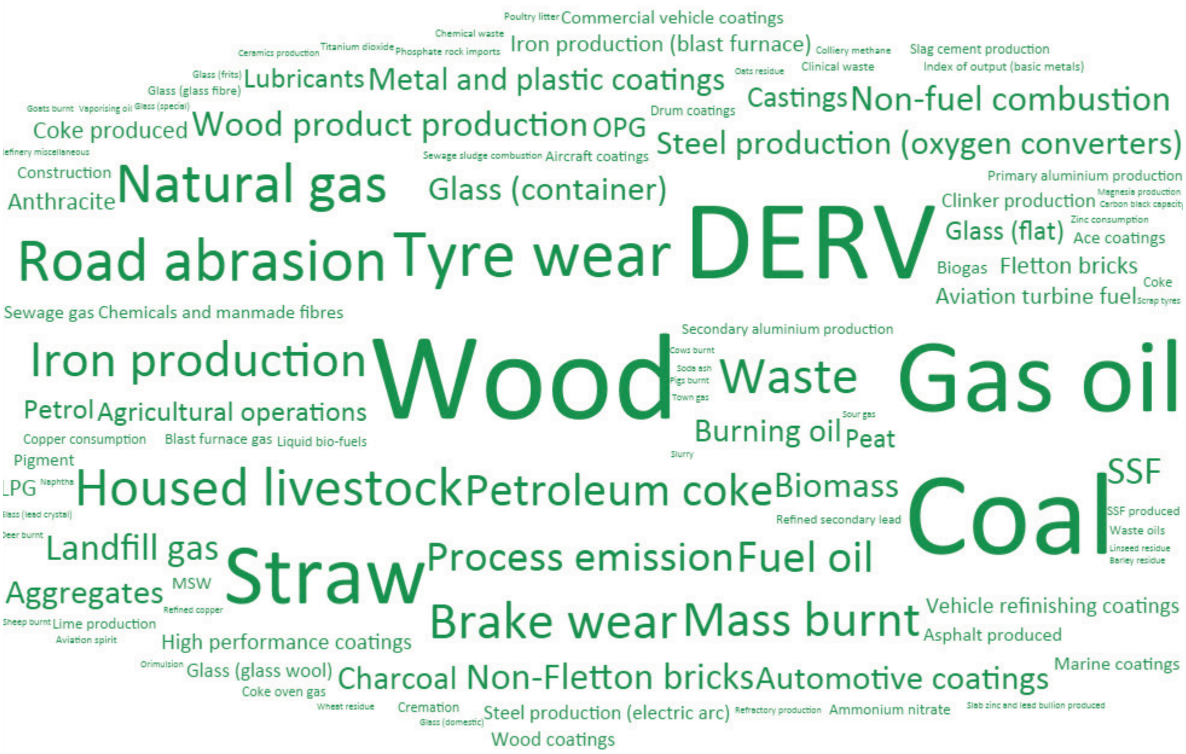
2.5 Particulate Matter (PM)

As a result of intense coal burning 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 the main sources of PM are stationary 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. Figures 2.5.1 and 2.5.2 present data for emissions of $PM_{2.5}$. Stationary combustion sources such as residential heating contribute a third of 2012 emissions, with another third a result of the transport sector.

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 can give 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 emissions of $PM_{2.5}$ have 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 reductions in total PM 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.

Figure 2.5.1: Fuels and activities responsible for emissions (2012)

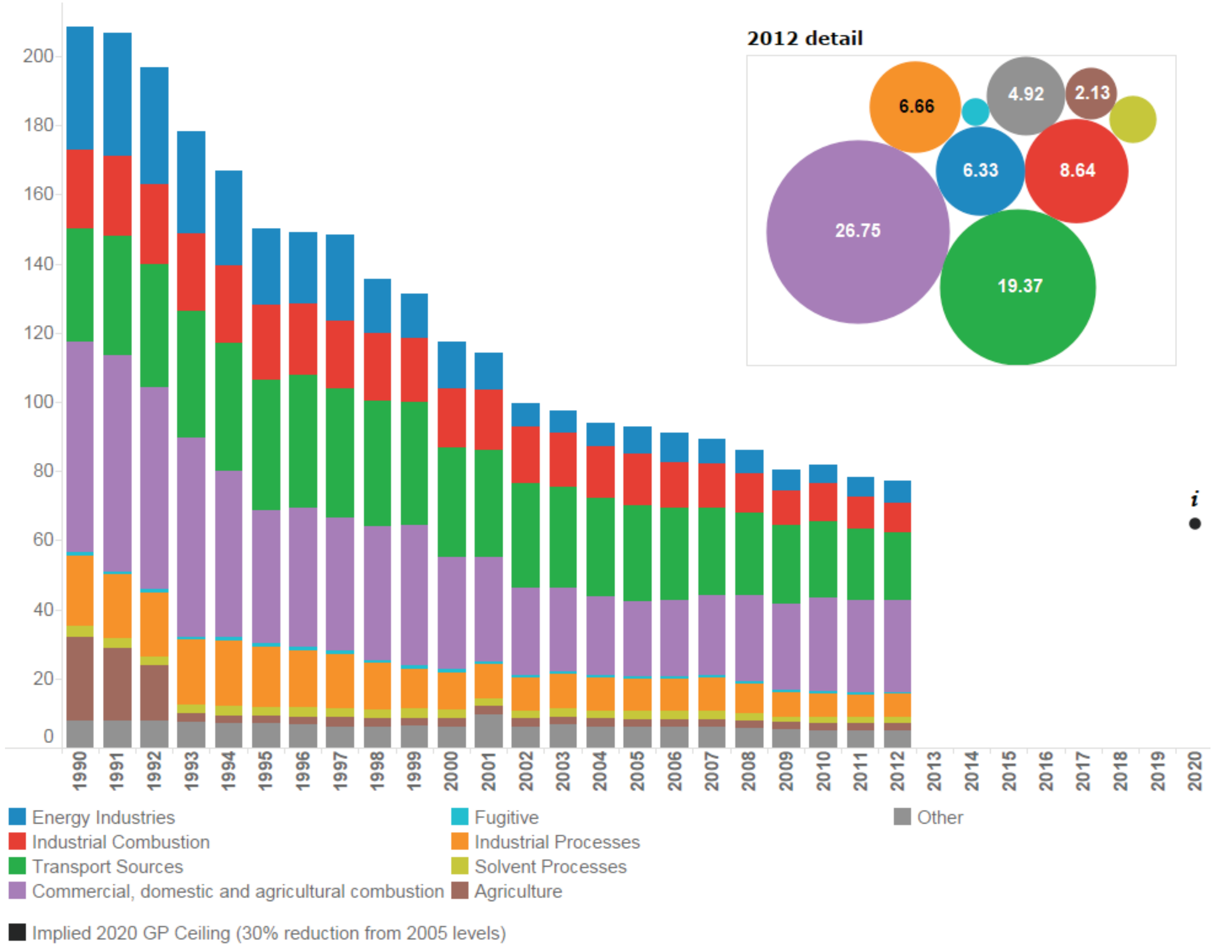


The trend in emissions from transport is fairly complex. Better vehicle regulations such as the introduction of Euro Standards have contributed to emissions reductions. However, these have been countered by the fuel switch to diesel engines, which despite contributing to fewer emissions for many other pollutants actually contribute more PM and NOx emissions per vehicle kilometre than petrol-engined 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.

For production processes, a combination of stricter regulations and the decline of heavy industry have contributed to emissions reductions. The trend for emissions from electricity generation follows that of SO_2, where reduced coal use has also decreased PM emissions. Importantly, emissions from other stationary combustion sources have decreased significantly over the time series. The majority of these emissions are from domestic heating, which initially accounted for the vast majority of PM emissions. Over the time series, the impact of declining solid fuel use (particularly coal) in favour of natural gas has been particularly important in emissions reductions.

It is also interesting to note the decline in emissions of $PM_{2.5}$ from agriculture between 1992 and 1993, caused by the ban on field burning in the UK.

Figure 2.5.2: UK $PM_{2.5}$ emissions, 1990-2012 with 2020 Gothenburg Protocol Ceiling



3 Emissions from Road Vehicles

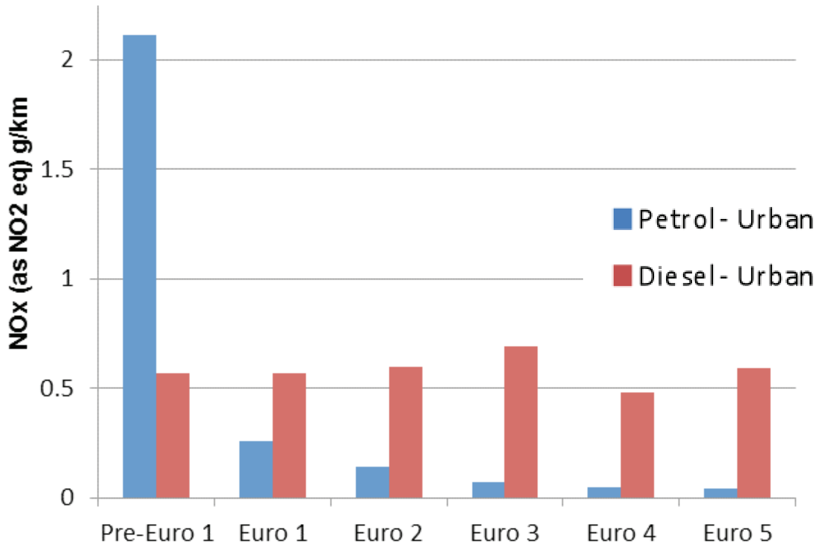
3.1 Emissions of NOx and PM_{10}

Road traffic is one of the largest sources of air pollution in the UK, and is estimated to be responsible for the premature deaths of 5,000 people a year[4]. Of these, nearly half are estimated to occur in greater London, and about twenty five percent in the West Midlands and Greater Manchester combined.

In order to reduce the harmful emissions, road vehicles are regulated under various European Union Directives and amendments, progressively becoming more stringent over time. The allowed levels of emission are referred to as "Euro standards". For petrol vehicles, Euro 1 was introduced in 1989, and has progressed to Euro 6 in 2014. For diesel vehicles, Euro 1/I was introduced in 1992 and has progressed to VI in 2014.

The variation in NOx and PM_{10} emissions by Euro standard for petrol and diesel cars is shown in Figures 3.1.1 and 3.1.2 below[5]. These figures show the emissions of NOx and PM_{10} per km driven for petrol and diesel cars and are based on tests done on in-service vehicles under real-world conditions.

Figure 3.1.1: NOx emission factors in grams per kilometre for petrol and diesel cars at an average urban speed.



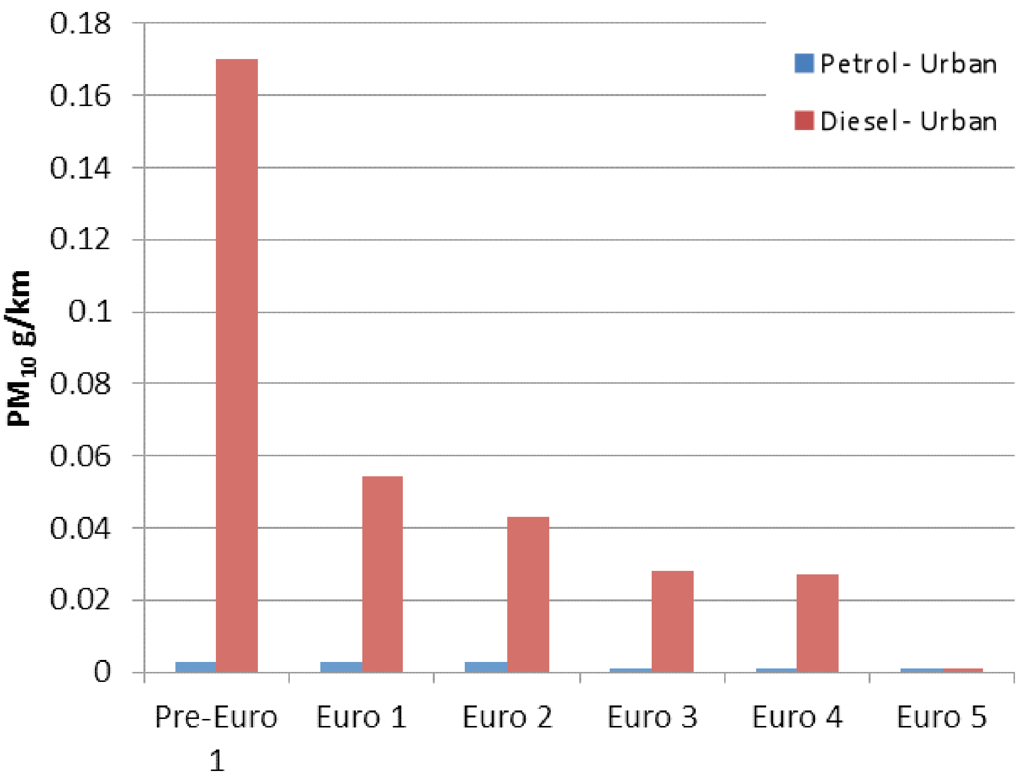
As Figure 3.1.1 shows, there was a substantial reduction in NOx emissions from petrol cars with the introduction of Euro 1, which required new petrol cars to be fitted with three-way catalysts. This then led to NOx emissions from petrol vehicles being substantially lower than those from diesel. Further tightening of standards on petrol vehicles since then has led to further decreases in NOx emissions per kilometre. The fitting of catalysts also reduced emissions of CO and NMVOCs. However, the fitting of this abatement equipment led to an increase in NH_3 emissions – although the impact on the national total was relatively small. Emissions of NH_3 from road transport are now expected to fall across the next few years as the second generation of catalysts, which emit less NH_3 than first generation catalysts, penetrate the vehicle fleet.

In spite of tighter regulations on NOx emissions from diesel cars introduced through a succession of Euro standards, emissions under real-world conditions have not been declining as rapidly as petrol cars. Real-world emissions for a modern Euro 5 diesel car are now around 15 times higher than a Euro 5 petrol car.

[4] Steve Yim and Steven Barrett, MIT, USA. Journal of Environmental Science and Technology. Public Health Impacts of combustion emissions in the UK. 2012. 46 (8) pp4291 – 4296.

[5] UK Informative Inventory Report (1980 – 2011). March 2013.

Figure 3.1.2: PM_{10} emission factors in grams per kilometre for petrol and diesel cars at an average urban speed.



As shown in Figure 3.1.2, diesel engine vehicles emit a greater mass of particulate matter per vehicle kilometre than petrol vehicles. However, since around 1992 the emissions per kilometre from diesel vehicles have been decreasing due to the penetration of new vehicles meeting tighter PM emission regulations. So, whilst there has been an increase in the total number of kilometres driven by diesel vehicles in the UK, the reduced emissions per kilometre of more modern vehicles has meant that the total PM_{10} emission from diesel vehicles has been decreasing. The PM emission factors for modern Euro 5 diesel cars are now comparable with those from Euro 5 petrol cars. This has been mainly achieved through the fitting of diesel particulate filters.

3.2 Revisions to Emission Factors

As pollutant emissions decrease, it is expected that roadside concentrations also decrease. However, in 2011 research studies concluded that roadside NOx concentration trends were not decreasing as quickly as road transport NOx emissions in the UK emissions inventory. It became evident that this was also the case in other European countries. This has been partly addressed through recent updates to the emission factors used in the inventory from published sources which take into account the real-world performance of modern diesel vehicles, although the number of vehicles tested in Europe remains quite limited. This has helped to partly close the gap between trends in NOx emissions implied by the inventory and roadside concentrations and further research is continuing across Europe to obtain more robust emission factors for inventories in order to close this gap further.

As a direct consequence of using emission factors that were not representative of real-world conditions, NOx concentrations in urban areas had not reduced by as much as originally predicted.

It is common practice for the emissions inventory input data to be continually reviewed and improved as new data become available. The UK's inventory keeps abreast of the latest evidence on vehicle emission factors in Europe and methods for quantifying them in different traffic situations. This ensures that the inventory is kept as up-to-date with published information as is possible.

It is expected that the introduction of the Euro 6/VI standard will bring further substantial reductions in NOx emissions - the new vehicle technologies having been tested more rigorously over a wide range of conditions to ensure that they perform well in the real world. However, it will take time for these vehicles to penetrate the UK fleet in substantial numbers to have a marked impact on the UK total emissions of NOx.

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