

Article

Road transport and air emissions

Contribution of road transport to greenhouse gas and air pollutant emissions – further analysis of the UK Environmental Accounts data.

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1 . Main points

- Reducing emissions from road transport remains a significant challenge as the UK looks to reach net zero emissions by 2050; at the end of 2018, 0.5% of all vehicles registered in the UK were ultra-low emission vehicles.
- Road traffic in Great Britain increased from 255 billion miles travelled in 1990 to 328 billion miles in 2018, an increase of 29%.
- Total fuel used for road transport in the UK remained relatively stable from 1990 to 2017 as the fuel efficiency of newer vehicles has improved; whilst petrol use declined over this period, diesel use has increased.
- Greenhouse gas (GHG) emissions from road transport in the UK have increased more slowly than the increase in road traffic, increasing by 6% from 1990 to 2017.
- In 2017, GHG emissions from road transport made up around a fifth of the UK's total GHG emissions.
- Emissions of many pollutants that are particularly damaging to health (carbon monoxide, particulate matter and nitrogen oxides) have reduced following increasingly stringent exhaust emission limits.

2 . 0.5% of all licensed vehicles in the UK in 2018 were ultra-low emissions vehicles

Road transport is an important source of both greenhouse gases and air pollutants, being responsible for significant contributions to emissions of carbon dioxide, nitrogen oxides, particulate matter (PM)₁₀ and PM_{2.5}.

The extent to which the population and environment are exposed to harmful levels of air pollution is dependent upon various factors. However, as road transport emissions tend to occur in areas frequented by people, they are, relatively, more harmful than those from other sources^{1,2}. The environmental and social impacts of road transport are relevant to those monitored under several of the United Nations [Sustainable Development Goals](#) (SDGs). In particular within Goal 9: Industry, innovation and infrastructure, and Goal 11: Sustainable cities and communities³.

Emissions from road transport are likely to be significantly impacted by the adoption of the [net zero target by 2050](#). As the UK looks to move towards this, the [government's Road to Zero transport strategy](#) includes the ambition that by 2050 almost every car and van will be zero emission. The Committee on Climate Change (CCC)'s [net zero technical report](#) notes that, in order to achieve the net zero target, sales of non-zero emission cars, vans and motorcycles are likely to need to end by 2035. The government's [clean air strategy](#) further examines how air pollution by not just greenhouse gas emissions but other air pollutants such as nitrogen oxides (see the [Air quality plan for nitrogen dioxide](#)) and particulate matter can be reduced.

Data from the Department for Transport (DfT) highlight the scale of the challenge associated with the net zero by 2050 target and the clean air strategy. Out of approximately 39.4 million licensed vehicles in the UK at the end of 2018, around 0.2 million (0.5%) were ultra-low emission vehicles (ULEVs).

Patterns in the fuel used by newly registered cars are changing. In 2018, 64,000 ULEVs were registered for the first time in the UK, an increase of 20% on those registered in 2017 and making up 2.1% of all new vehicle registrations. New registrations of petrol-fuelled cars continued to increase in 2018, whilst those of diesel continued to decrease, leading to the proportion of all licensed cars that were diesel falling for the first time in 20 years.

Notes for: 0.5% of all licensed vehicles in the UK in 2018 were ultra-low emissions vehicles

1. For more information see page 7 of [European Environment Advisory: Explaining road transport emissions](#).
2. Vehicle registrations, road traffic, fuel use and air emissions will likely vary by geographical location within the UK. [Vehicle registration](#) and [road traffic estimates](#) are available at lower geographical levels. Data for air emissions and petrol and diesel use on a residency basis are not available below UK level.
3. Sustainable Development Goals (SDGs) were introduced in 2015 and are a universal set of 17 Goals designed to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. [More information about SDGs](#) can be found on the UN website. The [UK data for SDGs](#) are available on the online reporting platform.
4. Ultra low emission vehicles (ULEVs) are vehicles that emit less than 75 grams of carbon dioxide (CO₂) from the exhaust for every kilometre travelled and typically refer to battery electric, plug-in hybrid electric and fuel cell electric vehicles.
5. [Department for Transport: Vehicle licensing statistics](#)

3 . Road traffic increased by 29% from 1990 to 2018

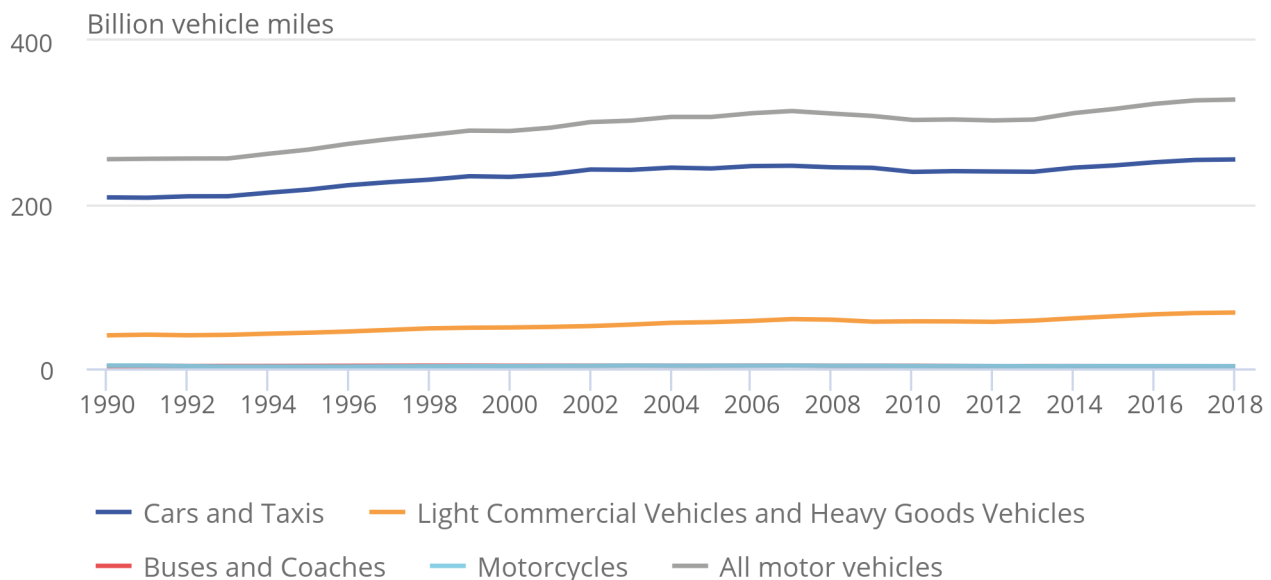
[Data from the Department for Transport \(DfT\)](#) show that road traffic in Great Britain, measured in vehicle miles, increased by 29% from 1990 to 2018, to stand at 328 billion miles in 2018 (Figure 1). Just over three-quarters of road traffic in 2018 was from cars and taxis.

Figure 1: Road traffic increased by 29% from 1990 to 2018

Road traffic by vehicle type, Great Britain, 1990 to 2018

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Road traffic by vehicle type, Great Britain, 1990 to 2018



Source: Department for Transport - National Road Traffic Survey

Notes:

1. Data for 1993 onwards are not directly comparable with the figures for 1992 and earlier.

4 . Diesel use for road transport overtook petrol use from 2005

Total fuel use for road transport has remained relatively stable between 1990 and 2017 as the fuel efficiency of new vehicles has improved^{1,2}. However, which fuel is used (predominantly petrol or diesel^{3,4}) has changed significantly.

Figure 2 shows that petrol use in the UK has fallen from 27 million tonnes of oil equivalent (Mtoe) in 1990 to 13 Mtoe in 2017, while the use of diesel has increased from 11 Mtoe in 1990 to 27 Mtoe in 2017. Diesel use exceeded petrol use from 2005 onwards.

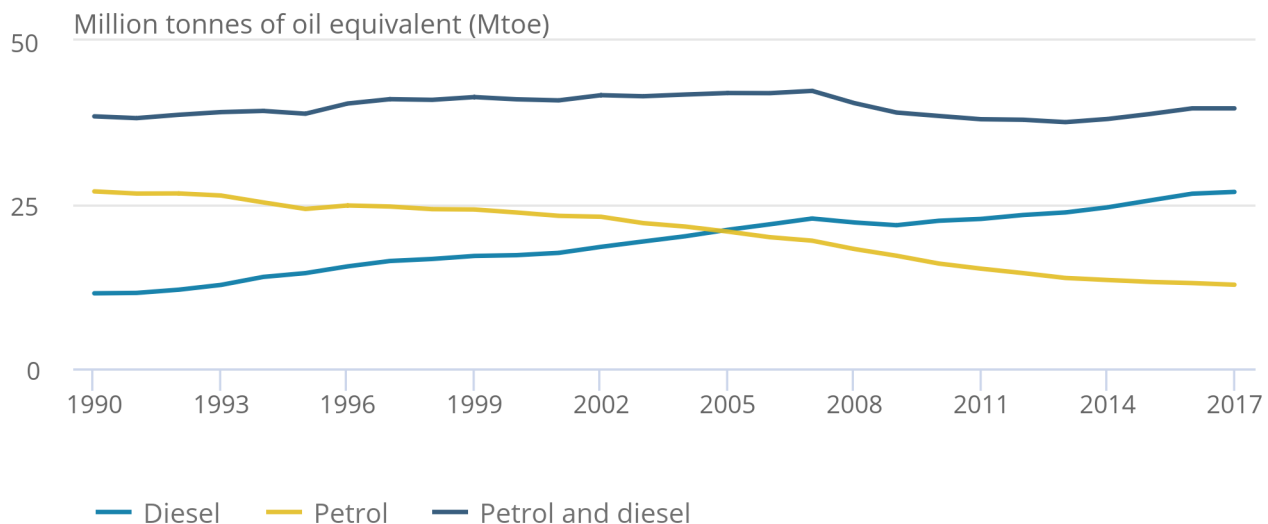
These changes can be influenced by taxes, for example, reduced Vehicle Registration Tax for all cars with low carbon dioxide (CO₂) emissions and a tax cut on diesel fuel duty in 2001⁵, was likely to have encouraged motorists to trade in their petrol cars for diesel vehicles, which tend to produce less CO₂.

Figure 2: Diesel use for road transport overtook petrol use from 2005

Petrol and diesel use for road transport, UK (residency basis), 1990 to 2017

Figure 2: Diesel use for road transport overtook petrol use from 2005

Petrol and diesel use for road transport, UK (residency basis), 1990 to 2017



Source: Office for National Statistics – UK Environmental Accounts, Energy Use datasets

Notes:

1. Diesel for diesel engine road vehicles (DERV) is referred to as diesel for simplicity. This does not include red diesel.
2. Environmental accounts estimates are produced on a residency basis in line with the United Nations System of Environmental-Economic Accounting and may differ from other estimates in the public domain. Differences are explained in the Quality and Methodology Information reports.

Trends in petrol and diesel use are different depending on the type of vehicle considered. Figure 3 shows that for cars, petrol use in the UK remained slightly higher than diesel use in 2017. Petrol use by cars fell from 24.2 Mtoe in 1990 to 12.3 Mtoe in 2017 whereas diesel use by cars rose from 1.1 Mtoe to 12.1 Mtoe over this period.

For light goods vehicles (LGVs), the use of diesel overtook that of petrol in 1994 and continued to rise. In 2017, diesel use by LGVs was 6.5 Mtoe compared with 0.2 Mtoe of petrol use.

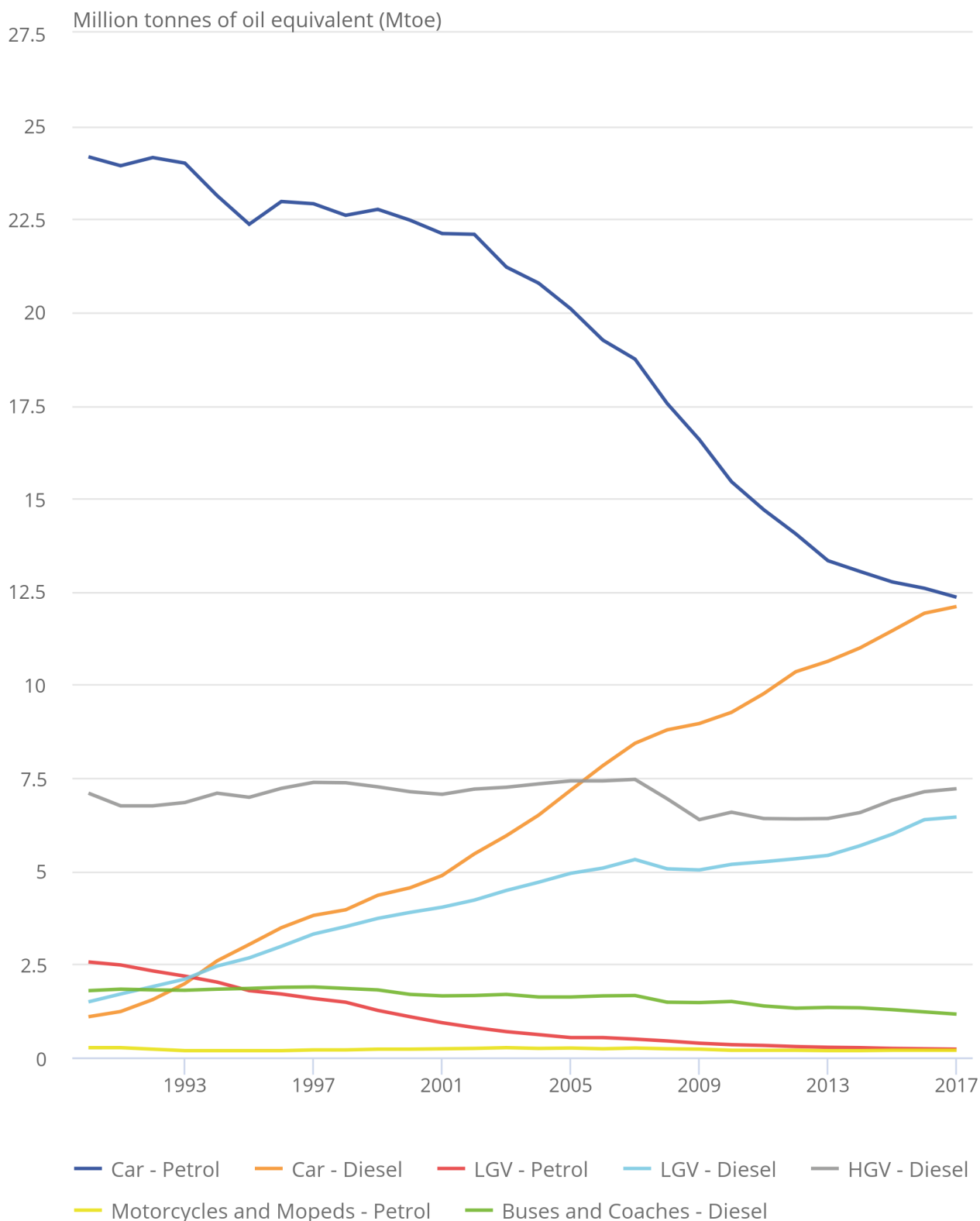
By contrast, the use of diesel by buses and coaches (1.2 Mtoe in 2017) and heavy goods vehicles (7.2 Mtoe), and of petrol by mopeds and motorcycles (0.2 Mtoe) remained relatively stable between 1990 and 2017.

Figure 3: Petrol use by cars fell from 24.2 million tonnes of oil equivalent (Mtoe) in 1990 to 12.3 Mtoe in 2017

Petrol and diesel use for road transport by type of vehicle, UK (residency basis), 1990 to 2017

Figure 3: Petrol use by cars fell from 24.2 million tonnes of oil equivalent (Mtoe) in 1990 to 12.3 Mtoe in 2017

Petrol and diesel use for road transport by type of vehicle, UK (residency basis), 1990 to 2017



Notes:

1. Diesel for diesel engine road vehicles (DERV) is referred to as diesel for simplicity. This does not include red diesel.
2. LGV = light goods vehicle. HGV = heavy goods vehicle.
3. Environmental accounts estimates are produced on a residency basis in line with the United Nations System of Environmental-Economic Accounting and may differ from other estimates in the public domain. Differences are explained in the Quality and Methodology Information reports.

In 2017, 89% of all petrol and 40% of all diesel use for road transport in the UK came from households. A larger proportion of all diesel use for road transport comes from industry due to its use of heavy goods vehicles almost entirely fuelled by diesel.

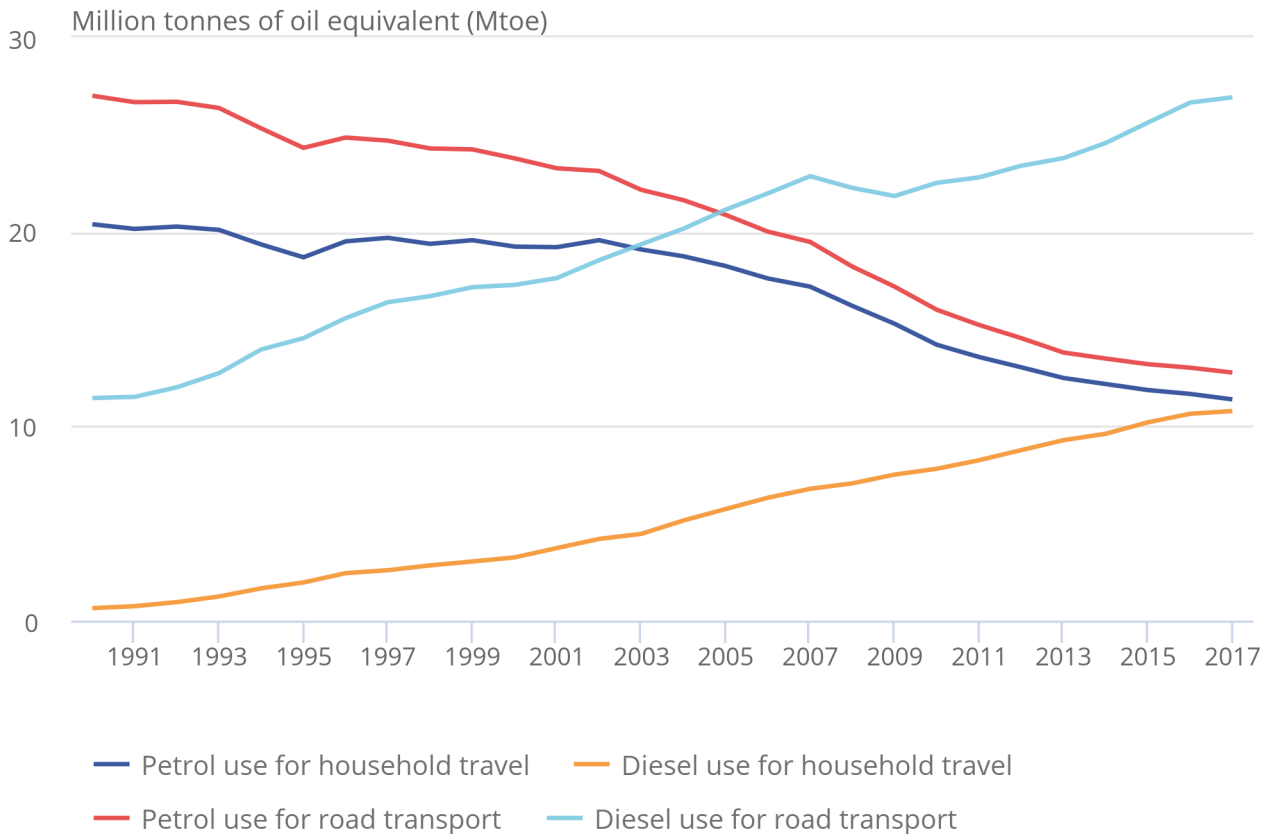
Similar to the trend observed in petrol and diesel use for all road transport, petrol use by households has declined and diesel use by households has increased from 1990 to 2017 (Figure 4).

Figure 4: In 2017, 89% of all petrol use for road transport was by households

Petrol and diesel use for road transport and by households for travel, UK (residency basis), 1990 to 2017

Figure 4: In 2017, 89% of all petrol use for road transport was by households

Petrol and diesel use for road transport and by households for travel, UK (residency basis), 1990 to 2017



Source: Office for National Statistics – UK Environmental Accounts, Energy Use datasets

Notes:

1. Diesel for diesel engine road vehicles (DERV) is referred to as diesel for simplicity. This does not include red diesel.
2. Environmental accounts estimates are produced on a residency basis in line with the United Nations System of Environmental-Economic Accounting and may differ from other estimates in the public domain. Differences are explained in the Quality and Methodology Information reports.

Notes for: Diesel use for road transport overtook petrol use from 2005

1. Further information on the fuel efficiency of vehicles in the UK is available: [Average new car fuel consumption figures \(ENV0103\)](#) and [Cars registered for the first time by CO2 emission and Vehicle Excise Duty \(VED\) bands \(VEH0256\)](#).
2. Fuel use is affected by both mileage and the fuel efficiency of vehicles. Fuel efficiency can vary by type of driving. Data on [fuel use by rural, urban and motorway driving](#) is available in the dataset.
3. Diesel for Diesel engine road vehicles (DERV) is referred to as diesel in this article for simplicity. This does not include red diesel.
4. Liquefied petroleum gas (LPG) use for road transport is not shown in Figure 2 due to confidentiality issues. However, this table shows [total use of LPG](#) for all purposes has remained consistently relatively low between 1990 and 2017.
5. The fuel duty rate on standard petrol and diesel has been frozen since 2011 at 57.95 pence per litre.

5 . Greenhouse gas emissions from road transport make up around a fifth of UK greenhouse gas emissions

Figure 5 shows that although the UK's total greenhouse gas (GHG) emissions have fallen by 32% from 1990 to 2017, GHG emissions from road transport have increased by 6% over the same period. Around a fifth (21%) of UK greenhouse gas emissions¹ came from road transport in 2017.

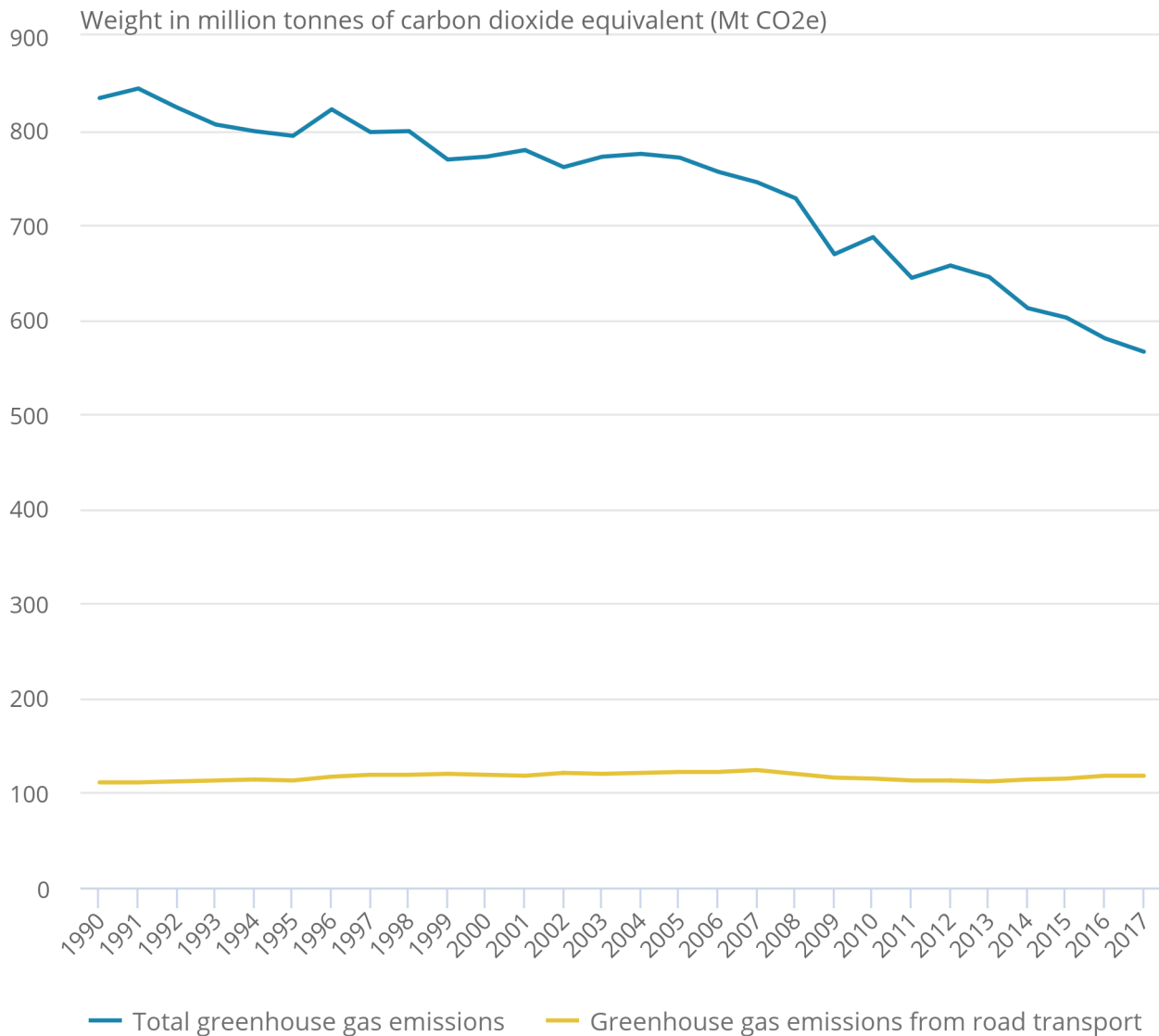
While road traffic has increased by 28% between 1990 and 2017, GHG emissions from road transport have increased by only 6%; this is likely to have been due to improvements in the fuel efficiency and emissions from newer vehicles. GHG (mainly CO₂) emissions from new [passenger cars](#) and [light commercial vehicles](#) have been subject to European regulation from 2009 and 2011 respectively. From 2017, [increasingly strong emissions testing procedures have also been introduced](#).

Figure 5: From 1990 to 2017, total greenhouse gas emissions (GHG) have fallen by 32% but GHG emissions from road transport have increased by 6%

Greenhouse gas emissions, total and road transport, UK (residency basis), 1990 to 2017

Figure 5: From 1990 to 2017, total greenhouse gas emissions (GHG) have fallen by 32% but GHG emissions from road transport have increased by 6%

Greenhouse gas emissions, total and road transport, UK (residency basis), 1990 to 2017



Source: Office for National Statistics – UK Environmental Accounts, Atmospheric emissions datasets

Notes:

1. Greenhouse gas emissions from road transport include those from road vehicle use across all industries and households in the UK.
2. Environmental accounts estimates of total greenhouse gas emissions are produced on a residency basis in line with the United Nations System of Environmental-Economic Accounting and may differ from other estimates in the public domain. Differences are explained in the Air Emissions Quality and Methodology Information report.

Emissions of other pollutants from road transport have fallen from 1990 to 2017. Emissions of nitrogen oxides (as nitrogen dioxide), the main component of acid rain precursor emissions, have fallen by 77% between 1990 and 2017. Carbon monoxide (CO) emissions fell from 4.8 million tonnes in 1990 to 0.3 million tonnes in 2017. Particulate matter (PM)₁₀ emissions fell from 35,000 tonnes to 19,000 tonnes and PM_{2.5} emissions fell from 30,000 tonnes to 13,000 tonnes over this same period. CO, PM₁₀ and PM_{2.5} emissions, even at low levels, are associated with negative health outcomes².

Reductions in emissions of these pollutants are likely to have been influenced by regulations, particularly the Euro exhaust emission limits, which were implemented with the aim of improving air quality³. Non-exhaust related emissions of pollutants, for example, from tyre, brake wear and road abrasion are less controlled by regulation and tend to follow the trend of traffic activity growth.

All data for the figures shown in this section are presented in this [dataset](#).

Notes for: Greenhouse gas emissions from road transport make up around a fifth of UK greenhouse gas emissions

1. The greenhouse gases included in the atmospheric emissions accounts are those covered by the Kyoto Protocol: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride.
2. The damage costs associated with these pollutants are discussed in the [Ricardo Energy & Environment: Air Quality damage cost update 2019 commissioned by the Department for Environment, Food and Rural Affairs \(PDF, 0.98MB\)](#) and the [European Environment Agency: Costs of air pollution report](#).
3. Euro exhaust emission limits have been successively introduced over several years, see pages 15 to 17 of [European Environment Agency: Explaining road transport emissions](#).