



Emission factors 2009: Report 6 – deterioration factors and other modelling assumptions for road vehicles





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Emission factors 2009: Report 6 - deterioration factors and other modelling assumptions for road vehicles

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Prepared for: Department for Transport, Cleaner Fuels & Vehicles 3
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Executive Summary

TRL Limited was commissioned by the Department for Transport to review the methodology used in the National Atmospheric Emissions Inventory (NAEI) for estimating emissions from road vehicles. Various aspects of the methodology were addressed.

In the NAEI, scaling factors are applied to the basic emission factors to enable the modelling of emissions in different years. These scaling factors cover to the following:

- The changes in emissions associated with vehicle age ('degradation' or 'deterioration').
- The effects of the penetration of improved fuels and other technologies.

The current assumptions concerning vehicle age are rather simplistic, and do not take into account the characteristics of the vehicle samples used to derive emission factors. Similarly, the fuel and technology scaling factors were devised several years ago, and many were assumed to stabilise after 2005. There are some doubts as to their relevance to emission factors now being derived from more recent test programmes.

The Report describes the emission factors currently used in the NAEI, including the deterioration functions and the fuel and technology scaling factors. It also provides a brief review of the mileage, fuel and technology effects given in the literature.

The derivation of new emission factors for UK road vehicles is described in a separate Report. This Report describes how the scaling factors to be applied to the new emission factors were derived. Scaling factors for different years were developed to account for the following:

- Mileage effects relating to vehicle samples.
- Fuel composition effects.
- Increased market penetration of biofuels for use in existing petrol and diesel-engined vehicles.
- Effects of future technologies.

In the case of the mileage scaling factors, some examples of values are presented in the Report. However, these are not definitive. Users of the emission factors must calculate their own mileage scaling factors based on appropriate vehicle age and mileage distributions for each vehicle category and year.

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1 Introduction

1.1 Background

Emissions of air pollutants in the United Kingdom are reported in the National Atmospheric Emissions Inventory (NAEI)¹. Estimates of emissions are made for the full range of sectors, including agriculture, domestic activity, industry and transport. The results are submitted by the UK under various international Conventions and Protocols, and are used to assess the need for, and effectiveness of, policy measures to reduce UK emissions. Projections from the road transport model in the NAEI are used to assess the potential benefits of policies and future emission standards for new vehicles. It is therefore essential that the model is as robust as possible and based on sound data.

TRL Limited has been commissioned by the Department for Transport (DfT) to review the methodology currently used in the NAEI to estimate emissions from road vehicles. The overall purpose of the project is to propose complete methodologies for modelling UK road transport emissions. The project includes an extensive and detailed review of the current methodology. It will identify where approaches could improve the quality of the emission estimates, and will show where existing methodologies give good quality estimates and should be retained.

The specific objectives of the project take the form of a list of Tasks. These Tasks, which are self-explanatory, are:

- Task 1: Review of the methods used to measure hot exhaust emission factors, including test cycles and data collection methods (Boulter *et al.*, 2009a).
- Task 2: Review of the use of average vehicle speed to characterise hot exhaust emissions (Barlow and Boulter, 2009).
- Task 3: Development of new emission factors for regulated and non-regulated pollutants (Boulter *et al.*, 2009b).
- Task 4: Review of cold-start emissions modelling (Boulter and Latham, 2009a).
- Task 5: Reviewing the effects of fuel quality on vehicle emissions (Boulter and Latham, 2009b).
- Task 6: Review of deterioration factors and other modelling assumptions (this Report).
- Task 7: Review of evaporative emissions modelling (Latham and Boulter, 2009).
- Task 8: Demonstration of new modelling methodologies (Boulter et al., 2009c).
- Task 9: Final report (Boulter *et al.*, 2009c).

Task 1 also included the compilation of a Reference Book of driving cycles (Barlow et al., 2009).

This Report presents the findings of Task 6, the overall aim of which was to review the deterioration factors for road vehicle emissions and other modelling assumptions in the NAEI.

In the measurement and modelling of vehicle emissions, various abbreviations and terms are used to describe the concepts and activities involved. Appendix A provides a list of abbreviations and a glossary which explains how specific terms are used in the context of this series of Reports.

It should also be noted that, in accordance with the legislation, a slightly different notation is used in the Report to refer to the emission standards for light-duty vehicles (LDVs)², heavy-duty vehicles (HDVs)³ and two-wheel vehicles. For LDVs and two-wheel vehicles, Arabic numerals are used (*e.g.* Euro 1, Euro 2...*etc.*), whereas for HDVs Roman numerals are used (*e.g.* Euro I, Euro II...*etc.*).

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¹ http://www.naei.org.uk/

² Light-duty vehicles are vehicles weighing less than or equal to 3.5 tonnes, including cars and light goods vehicles (LGVs). LGVs are sometimes also referred to as 'light commercial vehicles', 'light trucks' or 'vans' in the literature. The term LGV is used in this Report.

³ Heavy-duty vehicles are all vehicles heavier than 3.5 tonnes, including heavy goods vehicles (HGVs), buses and coaches.

1.2 The current NAEI approach for hot exhaust emissions

During 2002, an updated database of vehicle emission functions for CO, HC, NO_x, PM₁₀, benzene, 1,3-butadiene, CO₂ and fuel consumption was prepared by TRL and NETCEN for use in the NAEI. These algorithms expressed emission factors (in g km⁻¹) as a function of average vehicle speed. The database included existing measurements from an earlier 1998 TRL database, data from the EC MEET⁴ project, and a new set of measurements reported by TRL (Barlow *et al.*, 2001). The new TRL measurements were drawn from programmes conducted on behalf of DfT between 1997 and 2000.

After a period of public consultation on the new emission data and functions, discussions were held between TRL and NETCEN, during which a more complete set of functions were agreed. These agreed functions are still used in the NAEI, as well as in a number of other models and applications in the UK.

The vehicle classification system used in the NAEI is shown in Table 1. This is a modified version of the system of classification used in legislation. An emission function is assigned to each of the classes of vehicle in Table 1.

Vehicle category	Regulation
	ECE 15.01
Petrol car	ECE 15.02
2 2 12 2 2 2 112	ECE 15.03
by engine size:	ECE 15.04 + failed
<1.4 litres	Euro 1
1.4-2.0 litres	Euro 2
>2.0 litres	Euro 3
	Euro 4
	Pre-Euro 1
Diesel car	Euro 1
	Euro 2
by engine size:	Euro 3
<2.0 litres	Euro 3 + particulate
>2.0 litres	Euro 4
	Euro 4 + particulate
	Pre-Euro 1
	Euro 1 (93/59/EEC)
Petrol LGV	Euro 2
	Euro 3
	Euro 4
	Pre-Euro 1
	Euro 1 (93/59/EEC)
Diesel LGV	Euro 2
	Euro 3
	Euro 4

Table 1: The road vehicle classification used in the NAEI.

Vehicle category	Regulation
Rigid HGV	Pre-1988 Pre-Euro I (88/77EEC) Euro I (91/542/EEC) Euro II Euro III Euro IV Euro IV+
Articulated HGV	Pre-1988 Pre-Euro I (88/77EEC) Euro I (91/542/EEC) Euro II Euro III Euro IV Euro IV+
Bus	Pre-1988 Pre-Euro I (88/77EEC) Euro I (91/542/EEC) Euro II Euro III Euro IV Euro IV+
2-wheel vehicle: Moped (2-stroke) <250cc 2-stroke <250cc 4-stroke 250-750cc 4-stroke >750cc 4-stroke	Pre-2000 97/24/EC

[†] No separate emission functions are provided for failed catalyst vehicles.

In Table 1 LGVs are defined as any light-duty vehicle less than 3.5 tonnes GVW, capable of carrying goods. HGVs are defined as goods vehicles with a GVW in excess of 3.5 tonnes.

With the exception of CO₂, the emission functions for the pollutants covered in the NAEI are identical to those used in the Design Manual for Roads and Bridges (DMRB) procedure for air pollution estimation (Highways Agency *et al.*, 2003). Prior to 2002, the road transport emission functions contained within the DMRB and the

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⁴ MEET = Methodologies for estimating emissions from transport.

NAEI were different, but as part of the development of the supporting material and guidance for the DEFRA Air Quality Review and Assessment process, these databases were standardised.

In addition to the emission functions, in the NAEI a number of assumptions are made to enable the modelling of emissions in different years. These assumptions relate to the following:

- The changes in emissions associated with vehicle age ('degradation' or 'deterioration').
- The effects of the penetration of improved fuels and other technologies.

The current assumptions concerning vehicle mileage are rather simplistic, and do not take into account the characteristics of the vehicle samples used to derive emission factors. Similarly, the fuel and technology scaling factors were devised several years ago, and many were assumed to stabilise after 2005. There are some doubts as to their relevance to emission factors now being derived from more recent test programmes.

This Report examines the validity of the current assumption in the light of recent test data. The analysis is limited to the assumptions which relate directly to the emission factors, and do not extend to the UK vehicle fleet model.

1.3 Report structure

The derivation of 'basic' 2009 emission factors for UK road vehicles was described in Task Report 3 (Boulter and Barlow, 2009). The term 'basic' is used here to indicate that the emission factors are either normalised for mileage or reflect current vehicle and fuel technologies, and should be used in conjunction with scaling factors when estimating actual emissions. Scaling factors for different years were therefore required to account for the following:

- Mileage effects relating to vehicle samples.
- Fuel composition effects.
- Increased market penetration of biofuels for use in existing petrol and diesel-engined vehicles.
- Effects of future technologies.

Chapter 2 of this Report describes the emission factors currently used in the NAEI, including the deterioration functions and the fuel and technology scaling factors. Chapter 3 provides a brief review of mileage, fuel and technology effects in the literature, and in Chapter 4 scaling factors to be applied to the 2009 emission factors are presented. In the case of the mileage scaling factors, some examples of values are presented in the Report. However, these are not definitive, and users must calculate their own values based on appropriate vehicle age and mileage distributions.

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2 NAEI emission functions and assumptions

This Chapter of the Report describes the basic emission functions currently used in the NAEI, including the deterioration functions and the fuel and technology scaling factors. The full NAEI methodology does not appear to be publicly available. However, a methodology is available for the UK Greenhouse Gas Inventory for submission under the Framework Convention on Climate Change (Choudrie *et al.*, 2008). It is assumed that this methodology is, in fact, the same as that used in the NAEI.

2.1 Emission functions for CO, HC, NO_x and PM

2.1.1 Petrol cars

Pre-Euro 1 cars

The emission factors for CO, HC and NO_x for pre-Euro 1 petrol cars were based on data from the 1998 TRL database (unpublished) and the COPERT II model produced by the European Topic Centre on Air Emissions for the European Environment Agency (Ahlvik *et al.*, 1997). Both these sources provided emission functions and coefficients relating emission factors (in g/km) to average speed for each vehicle type and emission standard. These functions were derived by fitting polynomial functions to experimental measurements. No PM data were available for pre-Euro 1 petrol cars. An average value (independent of speed) of 0.02 g/km was assumed, and the relative speed dependence around this value was taken to be the same as that for CO.

Euro 1 and Euro 2 cars

The emission factors for Euro 1 and Euro 2 cars were based on speed-emission factor relationships derived by TRL (Barlow *et al.*, 2001). The tests were carried out on in-service vehicles on dynamometer facilities using real-world driving cycles.

Euro 3 and Euro 4 cars

Due to the lack of measurements, the emission factors for Euro 3 and Euro 4 cars were estimated by applying emission-reduction factors to the equations for Euro 2 vehicles. These scaling factors were based partly on factors given in MEET (European Commission, 1999) and partly on a judgement of the extent that emissions from Euro 2 vehicles would need to be reduced to meet the Euro 3 and 4 limit values, calculated from the coefficients at the average speed of the regulatory Extra Urban Drive Cycle (EUDC) used for type-approval. Some limited data from TRL on Euro 3 vehicles also aided the judgement. Since PM emissions from petrol vehicles are not regulated, and are much lower than those from diesel cars, it was assumed that PM emissions from Euro 3 and Euro 4 vehicles would remain at Euro 2 levels.

2.1.2 Diesel cars

The emission functions for pre-Euro 1, Euro 1, and Euro 2 vehicles were all derived from TRL measurements. The pre-Euro 1 emission functions were taken from the 1998 TRL database, and the Euro 1 and Euro 2 functions were taken from Barlow *et al.* (2001). The Euro 3 and 4 emission functions (including PM) were based on emission reduction scaling factors applied to the equations for Euro 2 vehicles.

2.1.3 Petrol LGVs

The emission functions for pre-Euro 1 LGVs were drawn from the 1998 TRL database for small and medium sized LGVs, with the Euro 1 functions being taken from Barlow *et al.* (2001). Emission functions for Euro 2 petrol LGVs were not available, and so they were assumed to be the same as for medium-sized petrol cars. The emission functions for Euro 3 and 4 vehicles were based on emission-reduction factors applied to the equations for Euro 2 vehicles. The same scaling factors as those applied to petrol cars were used. No emission factors for PM emissions were available for petrol LGVs. For pre-Euro 1 vehicles, a bulk estimate of 0.04

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g/km, agreed some years ago for use in the NAEI, was retained, but the relative speed dependence around this value was assumed to be the same as that for CO. PM emission functions for Euro 1 and 2 vehicles were assumed to be the same as for medium sized petrol cars. Since PM emissions from petrol vehicles are not regulated, it was assumed that PM emissions from Euro 3 and Euro 4 vehicles would remain at Euro 2 levels.

2.1.4 Diesel LGVs

The emission functions for pre-Euro 1 vehicles were obtained from the 1998 TRL database for medium and large sized LGVs, and the Euro 1 emission functions were taken from Barlow *et al.* (2001). Emission factors for Euro 2 diesel LGVs were not available. For all pollutants except NO_x, the emission levels of Euro 1 vehicles appeared to be within the limits for Euro 2. Hence, the emission coefficients for Euro 2 diesel LGVs were assumed to be the same as those for Euro 1 on the basis that no further reduction in emissions was necessary. For NO_x, a slight reduction in emissions was required from Euro 1 to meet the Euro 2 limits. Therefore, the Euro 1 coefficients were adopted, with a 0.95 scaling factor for Euro 2 vehicles. The Euro 3 and Euro 4 emission functions (including PM) were derived by applying emission-reduction factors to the functions for Euro 2. These scaling factors were estimated following much the same principles as for petrol and diesel cars (*i.e.* based on the extent emissions needed to be reduced to meet the limit values), with information from MEET and some limited data from TRL on Euro 3 vehicles aiding the judgement.

2.1.5 HGVs and buses

The emission functions for pre-Euro I, Euro I, and Euro II vehicles were all drawn from TRL measurements. The pre-Euro I functions were from the 1998 TRL database, and the Euro I and Euro II functions were taken from the 2001 TRL Report. Drive-cycle factors for pre-1988 HGVs, of which some remain in the fleet, have been used in the NAEI; these have corresponded to earlier measurements over the Warren Spring Laboratory (WSL) drive cycles. Speed-dependent emission equations were derived for this old category of HGVs from these existing WSL road-type factors, either assuming the relationship with speed was flat or had the same relative speed-dependence as the later pre-Euro I vehicles on the basis of the variation in the road-type factors with average cycle speed. In the latter case, the emission functions for old HGVs were used, based on emission scaling factors applied to the factors for pre-Euro I vehicles. Euro III and IV emission functions were based on emission reduction scaling factors applied to the equations for Euro II. The scaling factors were drawn from COPERT III (Ntziachristos and Samaras, 2000a).

2.1.6 Motorcycles

Speed-dependent functions provided by TRL were used for different sizes of motorcycle. Prior to 2000, all motorcycles were assumed to be uncontrolled. It was also assumed that mopeds (<50cc) operated only in urban areas, while motorcycles outside urban areas (motorways) would be dominated by 4-stroke engines with a capacity greater than 50cc. Otherwise, the numbers of vehicle kilometres driven on each road type were disaggregated by motorcycle type according to the proportions in the fleet. Motorcycles sold since the beginning of 2000 were assumed to meet the Directive 97/24/EC, and their emission functions were reduced according to the factors given in COPERT III (Choudrie *et al.*, 2008).

2.2 Emission functions for benzene and 1,3-butadiene

The emission coefficients for benzene and 1,3-butadiene were the same as those for total hydrocarbons, except for the use of a scaling coefficient reflecting the mass fraction of these two species in the total hydrocarbon emissions from different vehicle types. The mass fractions were based on the NMVOC emission speciation fractions for benzene and 1,3-butadiene in COPERT III. In deriving species fractions of the total hydrocarbon emission functions given by TRL, it was necessary to account for the amount of methane in the HC emissions, as the COPERT figures refer to fractions of non-methane volatile organic compounds. The methane components of the total HC emissions from each vehicle type were calculated from the COPERT III emission factors for methane.

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2.3 Emissions of CO₂

Carbon dioxide emissions are not regulated under the EU emission standards. Nevertheless, for convenience, the vehicle classification used for the definition of CO_2 emission functions is the same as that for the regulated emissions, but in this case there are not significant, stepwise changes between the legislation classes. Emissions of carbon dioxide (and sulphur dioxide) from road transport are calculated from the consumption of petrol and diesel fuel. Data on petrol and diesel fuels consumed by road transport in the UK are taken from the Digest of UK Energy Statistics published by the Department of Trade and Industry (DTI), and corrected for the fuel consumption of off-road vehicles. Emissions of CO_2 , expressed as kg carbon per tonne of fuel, are based on the carbon content (by mass) of the fuel. Values of the fuel-based emission factors for CO_2 from consumption of petrol and diesel fuels are shown in Table 2.

Table 2: Fuel-based emission factors for carbon (Choudrie et al., 2008).

Fuel	C (kg per tonne of fuel)
Petrol	855
Diesel	863

Average-speed functions for (exhaust) CO₂ were developed by TRL (Barlow *et al.*, 2001). For cars, average fuel consumption factors were calculated from UK fleet-averaged CO₂ emission factors for different car vintages (years of production) provided by DfT following consultation with the Society of Motor Manufacturers and Traders (SMMT). The dependence on speed was based upon the TRL speed functions for different Euro standards. For LGVs, HGVs, buses and motorcycles, the inventory used fuel consumption factors (expressed in grammes of fuel per kilometre) for each vehicle type and road type, calculated directly from the TRL equations. A normalisation procedure was used to ensure that the breakdown of petrol and diesel consumption by each vehicle type, calculated on the basis of the fuel consumption factors, added up to the DTI figures for total fuel consumption in the UK (adjusted for off-road consumption).

Total CO₂ emissions from vehicles running on LPG are estimated in the NAEI on the basis of national figures (from DTI) on the consumption of this fuel by road transport. The CO₂ emissions from LPG consumption cannot be broken down by vehicle type because there are no figures available on the total number of vehicles or types of vehicles running on this fuel. It is believed that many vehicles running on LPG are cars and vans converted by their owners and that these conversions are not necessarily reported to vehicle licensing agencies. It is for this same reason that LPG vehicle emission estimates are not possible for other pollutant types, because these would need to be based on traffic data and emission factors for different vehicle types rather than on fuel consumption (Choudrie *et al.*, 2008). Emissions from vehicles running on natural gas are not estimated at present, although the number of such vehicles in the UK is very small. Estimates are not made as there are no separate figures from DTI on the amount of natural gas used by road transport, nor are there useable data on the total numbers and types of vehicles equipped to run on natural gas.

At present, there are no definitive centralised statistics from the DTI on the amount of biofuels consumed by road transport in the UK. The total amount is still relatively small, although it is growing each year. DTI has indicated that biofuels are not combined with fossil fuels in their transport fuel statistics, and are currently investigating the separate provision of national statistics on biofuel consumption by road transport. At present, emissions from road transport consumption of biofuels are not included in the inventory. Carbon emissions from road transport consumption of biofuels would not be included in the national totals. Other pollutant emissions would be included in the inventory on the basis of emission factors and usage rates (amount of fuel consumed or traffic data) although the differences in emission factors for vehicles running on biofuels and those running on fossil fuels are likely to be small for these pollutants (Choudrie *et al.*, 2008).

2.4 Emission degradation functions

An emission factor calculated for a particular vehicle type and emission standard is effectively an average value for in-service vehicles at the time of testing. These vehicles have various ages and mileages, and thus

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any degradation in emissions with vehicle age is included in the sample. However, as time passes the average accumulated mileage of vehicles conforming to a given emission standard increases. For example, the accumulated mileage of Euro 2 cars would generally be very different in 1998 and 2005. In the case of the more recent LDV emission standards included in the 2002 database (*i.e.* Euro 1 and 2 at the time the database was compiled), the vehicles would have been fairly new when the emissions were measured, but Euro 1 and Euro 2 vehicles in the current fleet will be rather old. Therefore, adjustment factors are required to account for the deterioration in emissions with age or mileage.

2.4.1 Cars and LGVs

Based on data from the European Auto-Oil study, the deterioration in emissions with age or mileage was taken into account for Euro 1 and Euro 2 vehicles in the NAEI. It was assumed that emissions of CO and NO_x would increase by 60% over 80,000 km, whist emissions of NMVOCs would increase by 30% over the same accumulated distance (Choudrie *et al.*, 2008). Based on the average annual mileage of cars, 80,000 km corresponded to a time period of 6.15 years.

For Euro 3 and Euro 4 petrol cars the scaling factors took into consideration the requirement for new vehicles to meet certain durability standards. It was assumed that emissions from new vehicles would be a certain percentage lower than the limit value-derived figure when new, so that the vehicle would not have emissions that degrade to levels higher than the limit value over the durability period of the vehicle. The emission degradation rates permitted for Euro 3 and 4 light duty petrol vehicles by Directive 98/69/EC are given in Table 3. Account was taken of the fact that the regulatory cycle for the Euro 3 and 4 tests applies the moment the vehicle is switched on, and therefore includes a period of 'cold start' emissions. The degradation factors for diesel cars estimated following much the same principles as for petrol cars (Table 4).

Table 3: Emission degradation rates for petrol cars (from Choudrie et al., 2008).

Pollutant(s)	Emission standard	Degradation rate
NO _x , HC and CO	Euro 3	x1.2 over 80,000km
	Euro 4	x1.2 over 100,000km

Table 4: Emission degradation rates for diesel cars (from Choudrie et al., 2008).

Pollutant(s)	Emission standard	Degradation rate
PM	Euro 3	x1.2 over 80,000km
	Euro 4	x1.2 over 100,000km
CO	Euro 3	x1.1 over 80,000km
	Euro 4	x1.1 over 100,000km

Note: Although the referenced report gives durability for Euro 4 cars over 100,000km, Directive 98/69/EC actually specifies 80,000 km.

2.4.2 HGVs and buses

According to Choudrie *et al.* (2008), the degradation factors for heavy-duty vehicles are taken from COPERT III. However, this is a source of some confusion, as COPERT III does not contain degradation factors for HDVs.

2.5 Fuel and technology scaling factors

Emissions from existing vehicles in the fleet can be reduced if improved fuels (e.g. lower sulphur content) are used or if the vehicles are retrofitted with emission-control devices (e.g. particulate traps). In the NAEI, scaling factors are applied to the basic emission factors for each year of the inventory. These scaling factors are designed to reflect the penetration of improved fuels and other technologies which ought to influence the

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emission levels in future years. The NAEI takes account of the early introduction of certain emission and fuel quality standards and additional voluntary measures to reduce emissions from road vehicles in the UK fleet. In addition the use of engine developments and exhaust abatement technologies, while designed to limit the emissions of specific pollutants such as PM, can have significant impacts on other non-regulated pollutants. The fuel and technology scaling factors currently in use are given in Appendix B. The fuel and technology scaling factors were devised several years ago, and many were assumed to stabilise after 2005. Clearly there are some doubts as to their relevance to emission factors now being derived from more recent test programmes.

2.5.1 Early introduction of ultra-low sulphur petrol and diesel – HGVs and buses

The early introduction of ultra-low sulphur petrol and diesel (100% by 2001) into the national fleet was taken into account. Many bus fleets had converted to ultra-low sulphur diesel (ULSD) as early as 1997, and this was also accounted for. The impact these fuels would have on emissions from existing vehicles in the fleet was based on empirical formulae from EPEFE⁵ on the relationship between emissions and fuel quality, combined with information drawn from MEET, the World-Wide Fuel Charter reports and various reports prepared by Millbrook and LT Buses on the effects of fuel quality on emissions from heavy duty vehicles (Murrells, 2000).

Emissions from HGVs and buses were scaled down according to the proportions running on ULSD fuel in each year, the proportions fitted with oxidation catalysts or particulate traps (CRTs), and the effectiveness of these measures in reducing emissions. Choudrie *et al.* (2008) state that (the small number of) HGVs equipped with CRTs have their emissions reduced by the amounts shown in Table 5. It is assumed that a HDV fitted with a CRT is also running on ultra-low sulphur diesel. The effectiveness of measures in reducing emissions from a Euro II bus is shown in Table 6. Again, it is assumed that a bus fitted with an oxidation catalyst or CRT is also running on ULSD. These scaling factors are relative to emissions from a bus running on 500 ppm sulphur diesel and are based on analysis of fuel quality effects by Murrells (2000) and data on the effectiveness of oxidation catalysts on bus emissions by LT Buses (1998).

Table 5: Scaling factors for emissions from a Euro II HGV running on ultra-low sulphur diesel and fitted with an oxidation catalyst or CRT (Choudrie *et al.*, 2008).

		СО	NMVOCs	NO _x
ULSD only	Urban	0.96	0.97	0.94
	Rural	1.01	1.02	0.99
ULSD + CRT	Urban	0.10	0.12	0.81
	Rural	0.10	0.12	0.85

Table 6: Scaling factors for emissions from a Euro II bus running on ultra-low sulphur diesel and fitted with an oxidation catalyst or CRT (Choudrie *et al.*, 2008).

		СО	NMVOCs	NO _x
ULSD only	Urban	0.91	0.72	1.01
	Rural	1.01	1.02	0.99
ULSD + oxidation catalyst	Urban	0.20	0.39	0.97
	Rural	0.22	0.55	0.95
ULSD + CRT	Urban	0.17	0.19	0.90
	Rural	0.19	0.27	0.88

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⁵ EPEFE = European Programme on Emissions, Fuels and Engine Technologies.

2.5.2 The effect of benzene content of petrol on exhaust emissions of benzene

The effect of the benzene content of petrol on exhaust emissions of benzene was included in the 2002 revision to the UK emission factors. According to the UK Petroleum Industries Association (UKPIA), a substantial decrease (76 %) in the benzene content of UK petrol occurred in 2000 in order to meet the lower EU limit of 1% introduced that year. Equations from EPEFE and MEET were used to derive factors reflecting the effect of reduced benzene content on benzene emissions from catalyst cars. No such information was available for non-catalyst cars. However, on the basis of fundamental combustion chemistry and the significant reductions in ambient benzene concentrations observed in early 2000 at a number of air pollution monitoring sites, it was concluded that the reductions in benzene content of petrol led to a proportional reduction in benzene emissions from non-catalyst cars. This was represented with an emission reduction scaling factor for this class of vehicle. For all vehicle categories except buses, benzene emissions were assumed to stabilise at 2001 levels. For buses, emissions were assumed to stabilise at 2006 levels.

2.5.3 Retrofitting of PM traps and oxidation catalysts on heavy-duty diesel vehicles

The retrofitting of particulate traps and oxidation catalyst on some heavy duty diesel vehicles is accounted for, on the basis of information on their likely uptake. The assumptions on their effects on emissions and their fleet uptake are described in the Technical Annex of the Air Quality Strategy consultation document (DEFRA *et al.*, 2001).

2.5.4 CO₂ emissions

The basic CO₂ emission factors will be influenced by the general improvements in technology introduced to improve fuel economy and, for cars in particular, by voluntary agreements between the European Automobile Manufacturers Association (ACEA) and the EU to reduce emissions.

The TRL emission databases were the sources used for pre-Euro 1, Euro 1, and Euro 2 cars, pre-Euro 1 and Euro 1 LGVs, and pre-Euro I, Euro I, and Euro II HGVs and buses, in the same way as for the CO, HC, NO_x and PM functions described above. For cars and LGVs it was assumed that the basic emissions of Euro 3 vehicles would be reduced from the Euro 2 levels by the same proportion that Euro 2 emissions were reduced from Euro 1 levels. The same proportional reduction was applied to Euro 3 emission levels to derive Euro 4 levels. For petrol cars, diesel cars and petrol LGVs, an additional adjustment was made in order to take into account the voluntary agreement: emissions were reduced linearly to 140 g/km between 2000 and 2008, with no further improvement thereafter. Euro III and Euro IV buses and HGVs were assumed to have emission levels equivalent to those of Euro II vehicles.

2.6 Other assumptions

In the NAEI, assumptions are currently made about the proportion of failing catalysts in the petrol car fleet. For first-generation catalyst cars (Euro 1), it is assumed that the catalysts fail in 5% of cars fitted with them each year (for example due to mechanical damage of the catalyst unit) and that 95% of failed catalysts are repaired each year, but only for cars more than three years in age, when they first reach the age for MOT testing. Lower failure rates are assigned to Euro 2 (1.5%), Euro 3 (0.5%) and Euro 4 (0.5%) cars manufactured since 1996.

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3 Review of mileage, fuel and technology effects

3.1 Overview

This Chapter of the report provides a brief review of the mileage, fuel and technology effects on emissions reported in the literature, and in particular the use of scaling factors.

3.2 Mileage effects

3.2.1 Light-duty vehicles

In the ARTEMIS project (Journard *et al.*, 2006), the influence of the mileage M_1 or M_2 (km) for LDVs is expressed by the formula:

$$\frac{emission(M_1)}{emission(M_2)} = \frac{y(M_1)}{y(M_2)}$$
(Equation 1)

Values of y are given for Euro 1 and 2 petrol cars in Table 7, and for Euro 3 and 4 petrol cars in Table 8, in both cases for urban and rural situations (average speeds lower than 19 km/h and higher than 63 km/h respectively). For an intermediate speed, V, the following formula is used:

$$y(V) = y(urban) + \frac{(V - 19) \cdot (y(rural) - y(urban))}{44}$$
 (Equation 2)

Table 7: Emission degradation correction factor $y = a \times Mileage + b$, for Euro 1 and Euro 2 petrol vehicles. Mileage expressed in km, y normalised for the corresponding average mileage.

Petrol Euro 1	and 2	Engine capacity (l)	Average mileage (km)	а	b	Value at ≥ 120,000 km
		≤1.4	29,057	1.523E-05	0.557	2.39
	CO	1.4-2.0	39,837	1.148E-05	0.543	1.92
y (urban)		>2.0	47,028	9.243E-06	0.565	1.67
for		≤1.4	29,057	1.215E-05	0.647	2.10
<i>V</i> ≤19 km/h	HC	1.4-2.0	39,837	1.232E-05	0.509	1.99
		>2.0	47,028	1.208E-05	0.432	1.88
	NO_x	All	44,931	1.598E-05	0.282	2.20
		≤1.4	29,057	1.689E-05	0.509	2.54
	CO	1.4-2.0	39,837	9.607E-06	0.617	1.77
y (rural)		>2.0	47,028	2.704E-06	0.873	1.20
for		≤1.4	29,057	6.570E-06	0.809	1.60
<i>V</i> ≥63 km/h	HC	1.4-2.0	39,837	9.815E-06	0.609	1.79
		>2.0	47,028	6.224E-06	0.707	1.45
	NO_x	all	47,186	1.220E-05	0.424	1.89

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Petrol Euro 3	and 4	Engine capacity (1)	Average mileage (km)	a	b	Value at ≥ 160,000 km
	CO	≤1.4	32,407	7.129E-06	0.769	1.91
	CO	>1.4	16,993	2.670E-06	0.955	1.38
y (urban)	IIC	≤1.4	31,972	3.419E-06	0.891	1.44
for V <19 km/h	HC	>1.4	17,913	0	1	1
, _1> Km/n	NO	≤1.4	31,313	0	1	1
	NO_x	>1.4	16,993	3.986E-06	0.932	1.57
	CO.	≤1.4	30,123	1.502E-06	0.955	1.20
y (rural)	CO	>1.4	26,150	0	1	1
for V >63 km/h	HC	all	28,042	0	1	1
, _03 km/n	NO_x	all	26,150	0	1	1

Table 8: Emission degradation correction factor $y = a \times Mileage + b$, for Euro 3 and Euro 4 petrol vehicles. Mileage expressed in km, y normalised for the corresponding average mileage.

The literature suggests that CO₂ emissions are not affected by vehicle mileage (Samaras and Ntziachristos, 1998; Ntziachristos and Samaras, 2000b; Geivanidis and Samaras, 2004).

3.2.2 Heavy-duty vehicles

In order to determine whether a vehicle mileage effect had to be taken into account for HDVs in the ARTEMIS emission model, the effects of engine deterioration and maintenance on emissions were assessed by Rexeis *et al.* (2005). Data from the Dutch and German in-use compliance programmes were used for this purpose. The assessment focused only on Euro I, II and III vehicles (200 vehicles in total).

The results for Euro I and II vehicles were surprising. Where an increase in emissions with increasing mileage was anticipated, an improvement was observed for most pollutants. A clear increase in emissions was only evident for HC from Euro III vehicles, and to a lesser extent for Euro III PM emissions. One explanation for the lower emissions of vehicles with higher mileage could be that the fuel consumption was, on average, lower for vehicles with a high mileage. Another explanation is that vehicles in the database with a high mileage were probably used for long -distance transport activities. The general conclusion for the ARTEMIS model was that no mileage scaling factors were needed for Euro I to Euro III vehicles.

Rexeis *et al.* (2005) noted that there are currently several different emission-control devices which are considered relevant to the Euro IV emission standards and beyond, including:

- Exhaust gas recirculation (EGR).
- Diesel oxidation catalyst.
- Selective catalytic reduction of NO_x (SCR).
- Diesel particulate filter (DPF).

The conclusions in relation to the deterioration of Euro IV and Euro V technologies were as follows:

- There is no reason to assume that the deterioration pattern of engine-out emissions would differ much from engines of earlier Euro classes.
- Emission-control devices can contribute to the deterioration of specific pollutants as a result of ageing, malfunctioning and even tampering.
- Some of the anticipated effects of component deterioration (including the effects of malfunctioning and tampering) can be prevented by the installation of an OBD system, which will be mandatory from Euro IV onwards.
- Emission-control devices featuring catalysts will show some emission deterioration over the life of the vehicle due to ageing. At present it is not possible to give exact values since the technology is not fully developed and few data are available.

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3.3 Fuel effects

Fuel effects were reviewed in some detail in Task Report 5 (Boulter and Latham, 2008). This work is not repeated here.

3.4 Technology effects

3.4.1 Cars and LGVs

Within the ARTEMIS project Samaras and Geivanidis (2005) provided emission factors for Euro 4 petrol cars. However, there are relatively few measurements for Euro 4 cars, and none for Euro 5 cars. It was proposed that the Euro 4 equations for petrol vehicles are also used for Euro 5 petrol vehicles. In the case of direct injection petrol vehicles, the literature and the limited available data indicated a reduction in fuel consumption of around 10%. Samaras and Geivanidis (2005) also presented the reduction of emissions expected in Euro 4 and 5 diesel vehicles using as basis the emissions of Euro 3 vehicles. These factors where derived from the ratios of the established Euro 4 or expected Euro 5 emission standards (Table 7) over the emission standards of Euro 3:

Table 7: Reduction factors for future diesel vehicle technologies.

	CO	НС	NO_x	PM	
Euro 4	0.781	0.833	0.5	0.5	x Euro 3
Euro 5	0.781	0.833	0.35	0.1	x Euro 3

Table 8 presents the PM mass reduction potential of the installation of a DPF on a vehicle. The factors were derived under the assumption that the application of a DPF leads to PM levels comparable to the expected Euro 5 limit.

Table 8: Reduction of PM mass emissions due to the addition of a DPF.

	PM	
Euro 3 + DPF	0.1	x Euro 3
Euro 4 + DPF	0.1	x Euro 4

3.4.2 Heavy-duty vehicles

In the ARTEMIS model for heavy-duty vehicles, the option of 'DPF-technology' can be chosen, which assumes a reduction in PM mass of approximately 90%, and an increase in fuel consumption of 3%, compared with the relevant basic engine emission map (Rexeis *et al.* (2005).

4 Scaling factors applicable to the 2009 emission factors

The development of the basic emission factors for road vehicles was described by Boulter and Barlow (2009). These basic emission factors are complemented by scaling factors to take account of (i) mileage effects associated with vehicle samples and (ii) future improvements in fuels and vehicle technologies.

4.1 Vehicle mileage scaling factors

An emission factor for a particular vehicle type and emission standard is usually an average value for vehicles of different ages and mileages which inherently takes account of possible changes in emissions with vehicle age, relative to new vehicle emissions performance. However, vehicles which are now rather old would have been relatively new when tested, with a relatively low mileage. For example, the accumulated mileage of Euro 2 vehicles would generally be very different in 1998 and 2005. Therefore, it is possible to refine the basic emission factors using scaling factors for the deterioration in emissions with age or mileage. This is not an altogether straightforward process, as different scaling factors are required for different years, and information is required on the average accumulated mileage of different types of vehicle by year.

4.1.1 Cars and light good vehicles

Rather than using existing mileage scaling factors, examples of new scaling factors for cars and LGVs were determined from the database of emission measurements compiled within the project. The following steps were taken to adjust the measured emission factors to take account of the wide range of vehicle mileage during tests:

- (i) To generate the basic emission functions for cars, the emission test data were normalised to an accumulated mileage of 50,000 km for each vehicle type and pollutant. This process was described by Boulter and Barlow (2009). Only the emission factors for CO, HC and NO_x were normalised for mileage. Too few PM measurements were available to obtain deterioration functions, and literature suggests that CO₂ emissions are not affected by vehicle mileage.
- (ii) For each vehicle category, the average age was calculated for the range of reference years of interest (1995-2030).
- (iii) Relationships between vehicle age and mileage were established, and the average mileage was then calculated for each vehicle category and reference year.
- (iv) For each vehicle category, reference year and pollutant, the emission factor associated with the actual average mileage and the emission factor for 50,000 km were calculated. The scaling factors were calculated by dividing the emission factor for the actual mileage by the emission factor for 50,000 km.

Normalisation of measured emission factors

As noted above, the basic CO, HC and NO_x emission factors for all LDVs were normalised to an accumulated mileage of 50,000 km for each vehicle type and pollutant. Due to a lack of data, no mileage correction was applied to test data relating to fuels other than conventional petrol or diesel. The mileage adjustment was applied for urban, rural and motorway driving using the formula:

$$E_{50,000} = E_{test} \times y_{50,000} / y_{test}$$
 (Equation 3)

Where:

 $E_{50,000}$ = emission factor at 50,000 km.

 E_{test} = emission factor recorded during the test y_{50,000} = mileage adjustment factor for 50,000 km

 y_{test} = mileage during test

The coefficients which are used to calculate the values of *y* for urban, rural and motorway driving are given in Table 9. Values for all the data are also shown.

Table 9: Coefficients of the regression fits to the CO, HC and NO_x emission factors and accumulated mileage data for cars. In each case, the function is of the form y = ax + b, where y is the emission factor in g/km, and x is the accumulated mileage.

								•	•	
Pollintant	Finel	Emission standard	Urban	an	Rural	ป	Motorway	vay	All	
TOTIGIANT	I dict	Emission standard	a	ь	а	ь	а	ь	а	ь
CO	Petrol	Pre-Euro 1	2.570E-05	14.714	4.094E-05	4.621	5.339E-05	3.227	3.974E-05	8.661
		Euro 1	5.197E-05	0.243	3.053E-05	0.409	1.831E-05	2.086	4.303E-05	0.382
		Euro 2	1.428E-05	0.827	1.994E-06	0.552	4.284E-06	1.104	8.418E-06	0.785
		Euro 3	4.650E-06	0.617	1.866E-06	0.483	-1.318E-05	2.752	1.669E-06	0.954
		Euro 4	6.071E-06	0.462	9.622E-06	0.158	1.349E-05	0.430	1.021E-05	0.358
	Diesel	Pre-Euro 1	5.410E-07	0.965	1.025E-06	0.341	2.819E-07	0.375	1.054E-06	0.666
		Euro 1	4.277E-07	0.560	-6.683E-07	0.384	3.094E-07	0.183	-4.836E-07	0.504
		Euro 2	6.379E-06	0.230	2.620E-06	0.118	5.584E-07	0.038	3.749E-06	0.164
		Euro 3	8.183E-07	0.201	5.816E-07	0.038	1.333E-07	0.019	8.146E-07	0.097
		Euro 4	1.803E-06	0.074	1.509E-07	0.008	1.253E-07	0.009	1.166E-06	0.027
HC	Petrol	Pre-Euro 1	4.713E-06	1.804	3.525E-06	0.891	2.896E-06	0.461	4.459E-06	1.192
		Euro 1	4.749E-06	0.034	2.439E-06	0.040	7.092E-07	0.079	3.475E-06	0.042
		Euro 2	9.570E-07	0.122	2.879E-07	0.029	4.140E-07	0.024	6.376E-07	0.070
		Euro 3	2.943E-07	0.051	7.621E-08	0.024	-2.902E-07	0.060	1.256E-07	0.042
		Euro 4	1.214E-06	0.025	-3.931E-08	0.008	-1.340E-07	0.019	3.233E-07	0.022
	Diesel	Pre-Euro 1	5.121E-07	0.162	3.681E-08	0.086	4.510E-08	0.071	4.294E-07	0.120
		Euro 1	1.104E-07	0.089	-1.466E-07	0.063	-6.353E-08	0.036	-7.471E-08	0.082
		Euro 2	1.077E-06	0.036	1.704E-07	0.035	8.807E-08	0.019	5.253E-07	0.035
		Euro 3	3.863E-07	0.035	1.803E-07	0.015	4.645E-08	0.007	2.944E-07	0.021
		Euro 4	1.012E-06	0.010	3.015E-07	0.010	1.480E-06	0.010	1.024E-06	0.010
NO_{x}	Petrol	Pre-Euro 1	2.548E-06	1.378	-1.157E-06	2.688	6.518E-06	1.802	1.250E-06	1.985
		Euro 1	3.368E-06	0.155	3.779E-06	0.181	4.077E-06	0.274	3.761E-06	0.165
		Euro 2	-2.191E-06	0.334	-7.720E-07	0.170	1.301E-06	0.140	-9.811E-07	0.240
		Euro 3	-1.127E-06	0.152	-4.612E-07	0.080	-1.590E-07	0.092	-6.759E-07	0.113
		Euro 4	3.273E-07	0.059	4.379E-07	0.040	7.694E-07	0.010	4.315E-07	0.046
	Diesel	Pre-Euro 1	-2.036E-08	0.828	3.628E-07	0.583	1.731E-06	0.581	3.577E-07	0.714
		Euro 1	3.231E-06	0.588	8.112E-07	0.498	2.880E-07	0.740	1.764E-06	0.618
		Euro 2	9.963E-07	1.078	-1.541E-07	0.708	5.192E-07	0.998	1.611E-07	0.960
		Euro 3	-4.603E-06	1.194	-7.567E-06	0.826	-5.952E-06	1.026	-4.849E-06	1.010
		Euro 4	-3.819E-06	0.913	3.300E-07	0.319	3.411E-07	0.567	-1.312E-06	0.660

Estimation of average vehicle age

NB: The age and mileage values presented here, and the resulting mileage scaling factors, should be viewed as indicative, and are provided to illustrate the recommended approach. These indicative scaling factors are available on the DfT web site. Users of the emission factors must calculate their own mileage scaling factors based on appropriate vehicle age and mileage distributions for each vehicle category and year.

For each car category, the average age was calculated for each reference year from 1995 to 2030 inclusive. UK vehicle licensing statistics⁶ were used for this purpose. The licensing statistics are stated in terms of the numbers of cars licensed by propulsion (fuel), engine capacity, and year of first registration. Similar data are available for LGVs, although there is no distinction according to fuel type. However, this process was not straightforward for a number of reasons.

Firstly, the licensing statistics relate to model years and not specific emission standards. Assumptions were therefore required to align the two. The assumed correspondence between emission standard and model year is given in Table 10.

	-			-
Emission		Model year	s (inclusive)	
standard	Car <2.5 t, taxi	Car 2.5-3.5 t	LGV N1(I)	LGV N1(II/III)
Pre-Euro 1	Up to 1992	Up to 1994	Up to 1994	Up to 1994
Euro 1	1993 to 1996	1995 to 1998	1995 to 1997	1995 to 1998
Euro 2	1997 to 2000	1999 to 2001	1998 to 2000	1999 to 2001
Euro 3	2001 to 2005	2002 to 2006	2001 to 2005	2002 to 2006
Euro 4	2006 to 2010	2007 to 2011	2006 to 2010	2007 to 2011
Euro 5	2011 to 2015	2012 to 2016	2011 to 2015	2012 to 2016
Euro 6	2016 to 2020	2017 to 2020	2016 to 2020	2017 to 2020

Table 10: Assumed correspondence between emission standard and model year for LDVs.

Secondly, actual statistics were available for reference years up to and including 2006. The statistics for a particular year were used to define the age distribution in the following year. For example, the 2006 statistics were used to define the age distribution in 2007. Assumptions were therefore required to estimate vehicle age distributions in future years. For this purpose, it was assumed that the vehicle age distributions in 2007 could be applied to each year in the future.

The 2007 distributions for petrol and diesel cars, and for the three engine size ranges (<1400 cc, 1400-2000 cc and >2000 cc) were normalised to give the percentage of vehicles by age, and the normalised distributions were applied to future years. The 2007 distributions are shown for petrol cars and diesel cars in Figure 1 and Figure 2 and for LGVs in Figure 3.

A problem associated with future projections was the treatment of the oldest vehicles in the fleet, as these are combined in the statistics (*e.g.* 'Pre-1988'). For such vehicles, it was assumed that the oldest vehicles were evenly distributed in terms of model years. This is a relatively crude assumption which would benefit from further refinement, although the number of vehicles in the oldest age band was generally rather small compared with the total (an exception being petrol cars >2000 cc).

The resulting average ages are shown in Table 11 to Table 15.

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⁶ Vehicle licensing statistics for recent years are available from DfT at http://www.dft.gov.uk/pgr/statistics/datatablespublications/vehicles/licensing/

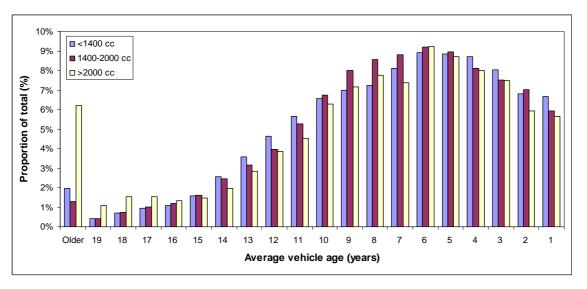


Figure 1: Normalised age distribution for petrol cars in 2007, based on licensing statistics for 2006.

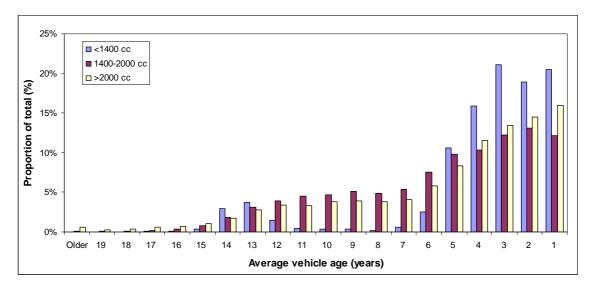


Figure 2: Normalised age distribution for diesel cars in 2007, based on licensing statistics for 2006.

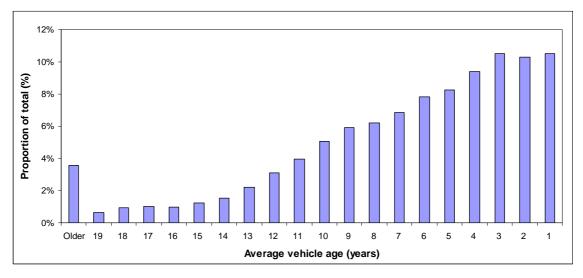


Figure 3: Normalised age distribution for all LGVs in 2007, based on licensing statistics for 2006.

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Table 11: Average age by vehicle category and model year (cars <2.5 tonnes).

Fire twe Froins canacity (cc)			ı	l	ı	l	ı	l	ı		L	ı	L	L	L	L		L	L	L	П	П	П	п	П		П	П	П	П	ı	l	0
cury (e	cc) standard	\$661	9661	866I 266I	8661		2001	2002	2003	2004	2002	9007	2007	5007	5010	2011	2012	2013	2014	2015	2012	2018	5010	5050	2021	5055	2023	2024	707e	2077	2028	5059	503
<1400 cc	Pre-Euro 1	8.4 9	9.1 9.		10.5 11.1	.1 11.7				14.5							22.5									32.5						39.5	40.5
<1400 cc	Euro 1									4.6							17.1									27.5						34.5	35.5
<1400 cc	Euro 2 Furo 3			-i	C. I.S					0.0							88									18.0						30.5	27.0
<1400 cc	Euro 4									ì							1.4									13.3						20.1	22.0
<1400 cc	Euro 5																1.0									8.8						15.4	16.4
<1400 cc	į				ļ	- 1	- 1	į			i	i	i		- 1	- 1	ļ	- !	- 1	- 1	- 1	- 1	- 1	į	- 1	4.1	- 1	. ;		- 1	i	10.7	11.6
400-2000 cc	Pre-Euro 1	8 .	8.4 9.	9.0	9.9 10.6	11.3	3 12.0	12.7	13.5	14.3	15.1	15.9 17	17.2 18.	18.1 18.9	9 20.0	21.3	22.5	23.5	24.5	25.5 20	26.5 27			5 30.5		32.5				5 37.5		39.5	40.5
33 0007-004									÷ ÷	t -							7.7.7									0.12						4 6	50.0
400-2000 cc				-					† <u>'</u>	t C							2 8							217 0		0.07						26.0	27.0
1400-2000 cc								2	1	ì							1.4									13.4						19.9	22.0
400-2000 cc																	1.0									8.						15.4	16.4
1400-2000 cc	Euro 6					- 1						į	i			1				- 1						4.1				9.8		10.5	11.5
.2000 cc		9.5 10		10.6 11.					15.0									23.5								32.5						39.5	40.5
>2000 cc	Euro 1		1.8 2.		3.3 4.3	3 5.3	3 6.3	7.3	8.2	9.2	10.2	11.2 12						18.3								27.5						34.5	35.5
>2000 cc	Euro 2			-:					4.5									14.2								23.5						30.5	31.5
>2000 cc	Euro 3							1.0	1.5				4.2 5.0	0.9 0.	6.9	7.8	8.	9.6	10.5	11.5	12.5 13					18.3				.0 24.0		26.0	27.0
>2000 cc	Euro 4											_						5.0								13.4						20.3	22.0
>2000 cc	Euro 5																1.0	1.5								00 00						15.9	16.9
>2000 cc	Euro 6	i	ı	- 1	- 1	- 1	ı	į		ij	Ì	į	i	. !	. !	- !	ı	- 1	- 1	- 1	- 8		- 1		- 1	4.2	- 1			- 1	ı	10.5	11.5
<1400 cc	Pre-Euro 1	5.4 6	6.3 7.	7.2 8.0					12.1																	32.5						39.5	40.5
<1400 cc	Euro 1			12 4.2	2 5.2	2 6.2	2 7.2	òċ	9.2	10.2	11.2	12.1 13	13.1 13.	13.3 13.5	5 14.2	15.6	16.7	17.5	18.5	20.4 2	21.5 22					27.5						34.5	35.5
<1400 cc	Euro 2			1.					4.3																	23.5						30.5	31.5
<1400 cc	Euro 3							1.0	1.2																	17.5						26.0	27.0
<1400 cc	Euro 4											_														13.3						20.3	22.0
<1400 cc																	1.0									80. K				2 13.3		14.2	13.0
1400-2000 cc	Pre-Euro 1	1			6 9.5	5 9.9	11.1		1	1		į	i	1	1	1	22.5	1	1	1	1	1	1	1	1	32.5	1		1	1	1	39.5	40.5
1400-2000 cc		1.4	1.9 2.	2.4 3.4				7.4	8.4	9.4	10.3	11.3 12	12.2 12.	12.9 13.7	7 14.6	5 15.8	16.9	17.8	18.6	19.6	21.5 22					27.5						34.5	35.5
400-2000 cc				-;	0 1.5												12.9									23.5						30.5	31.5
400-2000 cc	Euro 3							1.0									8.9									17.8						26.0	27.0
400-2000 cc												1					3.7									13.0						19.5	22.0
1400-2000 cc																	1.0									8.9						14.8	15.9
1400-2000 cc	Euro 6											i	i						- 1				-			3.7	- 1			- 1	- 1	10.8	11.6
>2000 cc		7.0.7	7.9 8.	8.8 9.7				12.8	13.6	14.4	15.1	15.9 17	17.0 17.	8.81 9.71	8. 19.8	3 21.0	22.5	23.5	24.5 2	25.5 20	26.5 27			5 30.5		32.5				5 37.5		39.5	40.5
>2000 cc	Euro 2				0 15	5 2.0	25										13.0	13.9								23.5						30.5	31.5
>2000 cc	Euro 3																6.8	6.6								17.9						26.0	27.0
>2000 cc	Euro 4																3.6	4.4								13.3						19.7	22.0
>2000 cc	Euro 5																1.0	1.5						4 6.6		8.9				5 13.3		15.3	16.4
>2000 cc	Euro 6																									3.6						10.8	11.7
All	Euro 1	1.7 2	2.0 2.	2.3 3.4	3.4 4.4	4 5.4	4 6.4		8.4	9.4	10.3	11.3 12					17.1	17.9			1				1	27.5					1	34.5	35.5
All	Euro 2			1.				3.4	4.4	5.4							13.2	14.1						(1		23.5	24.5	25.5 2				30.5	31.5
All	Euro 3							1.0	1.5	2.0			4.1 5.1	.1 6.0	6.9	7.9	8.8	9.6						4 16.4	_	17.9	18.8			(4		26.0	27.0
All	Euro 4											-					4.1	5.1	0.9	6.9	7.9 8.			_		13.4	14.4	15.4		_		19.9	22.0
W.	Euro 5																0.1	5						0.9		00 00	9.6			.5 13.4	14.4	15.4	16.4
11.4																		ż															

Table 12: Average age by vehicle category and model year (cars >2.5 tonnes).

	Vehicle type Huel type Engine connectiv (cr.) Enission
Standard 8.8 9.0 9.2 Euro 1 8.8 9.0 9.2 Euro 2 1.0 1.5 Euro 3 1.0 1.5 Euro 4 1.0 1.5 Euro 6 Fre-Euro 1 4.9 5.8 6.8 Euro 1 1.0 1.5 Euro 3 1.0 1.5 Euro 3 1.0 1.5	
Standard 88 9.0 9.2 Euro 1 88 9.0 9.2 Euro 2 1.0 1.5 Euro 3 1995 Euro 4 1.0 1.5 Euro 6 Fre-Euro 1 4.9 5.8 6.8 Euro 3 1.0 1.5 Euro 3 1.0 1.5 Euro 3 1.0 1.5	
1	Emission
10 % 5 9 1996 15 % 15 1997	
1. 5 % 1. 5 1997	
2.7	
0 0 0 1996	
2.5 8.4 2.3 11.3	
1.0 3.3 1 2000 1.0 3.4 2000	1
15 4 4 3 12 2001	
10.8 2.002 1.9 2.002	
11.6 11.6 2003 1.0 2003	
114.4 1.5 1.5 2004 1.7.5 1.3	
2005 1.9 1.9	
2006 2.6 2.7 2.6 2.6 2.6	
2007 17.0 10.2 3.2 3.2 2.7	
2008 11.2 2008 11.0 2008	
2009 5.0 11.5 2009 1.5 2009	
2010 2010 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1	ļ ,
2011 2011 2011 2011 2011 2011 2011 2011	Average age by
2012 2012 2013 2013 2013 2013 2013 2013	
2013 11.0 2013 2013 2013 2013 2013	reference year
23.5 17.4 13.8 9.6 5.0 1.5 23.5 23.5 17.1 13.7 9.9	e year
2015 18.2 14.9 10.5 6.0 2.1 2.1 17.9 10.8	
25.5 19.1 16.0 11.5 6.9 2.7 2.7 2.7 15.8 11.7 6.6	
2017 202 202 17.0 12.5 7.8 3.2 3.2 26.5 19.7 16.8 12.5 7.8	
2018 27.5 27.5 27.5 17.9 13.4 8.8 8.8 8.8 10.0 27.5 21.5 21.5 21.5 21.5 21.5 21.5 21.5 21	
28.5 114.7 1.5 22.5 2019 2019 2019 2019 2019 2019 2019 2019	
2020 2020 2020 2020 2020 2020 2020 202	
2021 2021 21.0 11.5 6.9 2.7 2.7 2.7 2.7 2.7 2.1.0 16.4 11.7	
2022 21.5 22.5 22.0 22.0 22.0 22.0 22.0 3.6 3.6 3.6 3.6 3.7.8 3.1.5 2.5.5 2.5.5 2.5.5 3.1.5 3.1.5 2.5.5 3.1.	
2023 32.5 226.5 118.3 118.3 2023 2023 2023 2023 2023 2023 2023 20	
2024 27.5 24.0 119.1 114.7 114.7 2024 21.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27	
2025 228.5 228.5 229.4 200.4 200.4 200.4 200.5 200.4 200.5 200.4 200.5 200.6 2	
2026 2026 2026 2027 2027 2027 2027 2027	
2027 30.5 30.5 27.0 223.0 117.6 112.5 30.5 30.5 30.5 30.5 117.2 217.0 21	
2028 37.5 31.5 228.0 224.0 224.0 2118.2 113.4 113.4 113.4 113.3 37.5 31.5 31.5 31.5 31.5 31.5 31.5 31.5 31	
2029 2029 2029 2029 2029 2029 2029 2029	
2030 2030 2030 2030 2030 2030 2030 2030	

Table 13: Average age by vehicle category and model year (taxis).

R069	R068	R067	R066	R065	R064	R063	Code	
Car (taxi)	Vehicle type							
Diesel	Vehicle type — Fuel type Engine capacity (cc)							
AII	All	AII	AII	All	All	All	gine capacity (cc)	•
Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro 1	standard	Emission
					1.3	7.0		
					1.8	7.9	1996	
					2.3	8.8	1997	
				1.0	3.3	9.7 10.5	1998	
				1.5	4.3			
				2.0	5.4	9.8	2000	
				2.5	6.3	12.1	2001	
			1.0	3.5	7.3	12.8	2002	
			1.4	4.5	8.3	13.6 14.4	2003	
			1.8	5.5	9.3	14.4	2004	
			2.2	6.5	10.3	15.1	2005	
			2.6	7.5	11.3	15.1 15.9	2006	
		1.0	3.6	8.5	12.3	17.0	2007	
		1.5	4.4	9.4	13.0	17.0 17.9	2008	
		1.9	5.4	10.4	13.9	18.8	2009	
		2.4	6.6	11.4	15.0	18.8 19.8	2010	
		2.7	7.8	12.3	16.1	21.0	2011	Averag
	1.0	3.6	8.9	13.0	17.1	22.5	2012	verage age by
	1.5	4.4	9.9	13.9	17.9	23.5	2013	
	1.9	5.4	10.8	15.0	18.8	24.5	2014	reference year
	2.4	6.6	11.7	16.1	19.8	25.5	2015	
	2.7	7.8	12.5	17.1	21.5	26.5	2016	
1.0	3.6	8.9	13.3	17.9	22.5	27.5	2017	
1.5	4.4	9.9	14.2	18.7	23.5	28.5	2018	
1.9	5.4	10.8	15.3	19.6	24.5	29.5	2019	
2.4	6.6	11.7	16.4	21.5	25.5	30.5	2020	
2.7	7.8	12.5	17.2	22.5	26.5	31.5	2021	
3.6	8.9	13.3	17.9	23.5	27.5	32.5	2022	
4.4	9.9	14.2	18.8	24.5	28.5	33.5	2023	
5.4	10.8	15.3	19.8	25.5	29.5	34.5	2024	
6.6	11.7	16.4	22.0	26.5	30.5	35.5	2025	
7.8	12.5	17.2	23.0	27.5	31.5	36.5	2026	
8.9	5 13.3	2 17.9	24.0	5 28.5	32.5	37.5	2027	
9.9	3 14.2	9 18.7	25.0	5 29.5	5 33.5	5 38.5	2028	
10.8	2 15.3	7 19.7	26.0	5 30.5	5 34.5	5 39.5	2029	
00	3 16.4	7 22.0	0 27.0	5 31.5	5 35.5	5 40.5	2030	

Table 14: Average age by vehicle category and model year (LGV N1(I)).

	2030	39.5	34.0	31.0	27.0	22.0	15.9	11.6	39.5	34.0	31.0	27.0	22.0	15.9	11.6
	5050	2	33.0 34	30.0	26.0 27	19.5 22	14.8 15	10.8	38.5 39	33.0 34	30.0	26.0 27	19.5 22	14.8 15	10.8 11
	2028	37.5 38.	32.0 33	29.0 30	25.0 26	18.5 19	13.8 14	9.9 10	37.5 38	32.0 33	29.0 30	25.0 26	18.5 19	13.8 14	9.9 10
			31.0 32		24.0 25	17.7	13.0 13		36.5 37	31.0 32	28.0 29		17.7 18	13.0 13	8.9
	2027	35.5 36.5		27.0 28.0	23.0 24	16.9	12.3 13	8.9	35.5 36			.0 24.0	16.9	12.3 13	
	5026		.0 30.0			15.9 16	11.6 12	6 7.8		.0 30.0	.0 27.0	.0 23.0		11.6 12	6 7.8
	5052	5 34.5	0 29.0	0 26.0	6 22.0			9.9	5 34.5	0 29.0	0 26.0	6 22.0	8 15.9		6.6
	707	5 33.5	0 28.0	0 25.0	6 19.6	8 14.8	10.8	5.6	5 33.5	0 28.0	0 25.0	6 19.6	8 14.8	10.8	5.6
	5053	5 32.5	0 27.0	0 24.0	8 18.6	0 13.8	6.6	7 4.6	5 32.5	0 27.0	0 24.0	8 18.6	0 13.8	6.6	4.6
	2022	5 31.5	0 26.0	0 23.0	9 17.8	3 13.0	8.9	3.7	5 31.5	0 26.0	0 23.0	9 17.8	3 13.0	8.9	3.7
	2021	.5 30.5	0 25.0	0 22.0	9 16.9	6 12.3	5 7.8	1 2.9	5 30.5	0 25.0	0 22.0	9 16.9	6 12.3	7.8	1 2.9
	5020	5 29.	0 24.0	3 21.0	8 15.9	8 11.6	9.9	2.4	5 29.5	0.24.0	3 21.0	8 15.9	8 11.6	9.9	2.4
	5019	28.5	23.0	. 19.3	14.8	10.8	5.6	2.0	28.5	23.0	. 19.3	14.8	10.8	5.6	2.0
	2018	27.5	22.0	18.4	13.8	9.6	4.6	1.5	27.5	22.0	18.4	13.8	6.6	4.6	1.5
	2017	26.5	21.0	17.7	13.0	8.9	3.7	1.0	26.5	21.0	17.7	13.0	8.9	3.7	1.0
	5016	25.5	19.3	16.7	12.3	7.8	2.9		25.5	19.3	16.7	12.3	7.8	2.9	
	2015	24.5	18.4	15.5	11.6	9.9	2.4		24.5	18.4	15.5	11.6	9.9	2.4	
nce yea	7014	23.5	17.7	14.5	10.8	5.6	2.0		23.5	17.7	14.5	10.8	5.6	2.0	
y refere	2013	21.3	16.7	13.6	6.6	4.6	1.5		21.3	16.7	13.6	6.6	4.6	1.5	
Average age by reference year	2012	19.7	15.5	12.8	8.9	3.7	1.0		19.7	15.5	12.8	8.9	3.7	1.0	
Averag	1107	18.5	14.5	11.9	7.8	2.9			18.5	14.5	11.9	7.8	2.9		
	2010	17.4	13.6	10.9	9.9	2.4			17.4	13.6	10.9	9.9	2.4		
	5000	16.2	12.8	10.0	5.6	2.0			16.2	12.8	10.0	5.6	2.0		
	8007	15.0	11.9	9.0	4.6	1.5			15.0	11.9	9.0	4.6	1.5		
	2002	14.0	10.9	8.0	3.7	1.0			14.0	10.9	8.0	3.7	1.0		
	9007	13.1	10.0	7.0	2.8				13.1	10.0	7.0	2.8			
	2002	12.2	0.6	0.9	2.3				12.2	0.6	0.9	2.3			
	2004	11.4	8.0	5.0	1.9				11.4	8.0	5.0	1.9			
	2003	10.7	7.0	4.0	4.1				10.7	7.0	4.0	4.1			
	2002	6	0	0	1.0				6.6	0	3.0	1.0			
		6.6	6.0	3.0	_				01	0	α	-			- 1
	1002	9.1	5.0 6.	2.0 3.	-				9.1	5.0	2.0 3	1			
	2000		4.1 5.0 6.	1.5 2.0 3.	_				8.0 9.1 9	4.1 5.0 6		-			
		9.1	3.0 4.1 5.0 6.	2.0	1				7.5 8.0 9.1 9	3.0 4.1 5.0 6	2.0	1			
	2000	8.0 9.1	4.1 5.0	1.5 2.0					6.7 7.5 8.0 9.1 9	2.0 3.0 4.1 5.0 6	1.5 2.0	-			
	1999	7.5 8.0 9.1	3.0 4.1 5.0	1.5 2.0	1				5.8 6.7 7.5 8.0 9.1 9		1.5 2.0	1			
	1998 1999	6.7 7.5 8.0 9.1	3.0 4.1 5.0	1.5 2.0	1				4.8 5.8 6.7 7.5 8.0 9.1 9	2.0	1.5 2.0	1			
	2000 3000 3000 3000 3000	5.8 6.7 7.5 8.0 9.1	1.5 2.0 3.0 4.1 5.0	1.5 2.0	1				5.8 6.7 7.5 8.0 9.1	1.5 2.0	1.5 2.0	1			
un -	0007 6661 2661 9661 5661	3.8 4.8 5.8 6.7 7.5 8.0 9.1	1.0 1.5 2.0 3.0 4.1 5.0	1.0 1.5 2.0					3.8 4.8 5.8 6.7 7.5 8.0 9.1	1.0 1.5 2.0	1.0 1.5 2.0				
Emission	0007 6661 2661 9661 5661	3.8 4.8 5.8 6.7 7.5 8.0 9.1	1.0 1.5 2.0 3.0 4.1 5.0	1.5 2.0		Euro 4	Euro 5	Euro 6	4.8 5.8 6.7 7.5 8.0 9.1	1.5 2.0	1.0 1.5 2.0		Euro 4	Euro 5	Euro 6
	standard 1995 1999 1996 1996 1996 1996 1996 1996	5.8 6.7 7.5 8.0 9.1	1.0 1.5 2.0 3.0 4.1 5.0	1.0 1.5 2.0		Euro 4	Euro 5	Euro 6	3.8 4.8 5.8 6.7 7.5 8.0 9.1	1.0 1.5 2.0	1.0 1.5 2.0		Euro 4	Euro 5	Euro 6
	standard 1995 1999 1996 1996 1996 1996 1996 1996	Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	Euro 1 1.0 1.5 2.0 3.0 4.1 5.0	Euro 2 1.0 1.5 2.0	Euro 3				Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	Euro 1 1.0 1.5 2.0	Euro 2 1.0 1.5 2.0	Euro 3			
	standard 1995 1999 1996 1996 1996 1996 1996 1996	3.8 4.8 5.8 6.7 7.5 8.0 9.1	1.0 1.5 2.0 3.0 4.1 5.0	1.0 1.5 2.0		All Euro 4	All Euro 5	All Euro 6	3.8 4.8 5.8 6.7 7.5 8.0 9.1	1.0 1.5 2.0	1.0 1.5 2.0		All Euro 4	All Euro 5	All Euro 6
	standard 1995 1999 1996 1996 1996 1996 1996 1996	All Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	All Euro 1.0 1.5 2.0 3.0 4.1 5.0	All Euro 2 1.0 1.5 2.0	All Euro 3	All	All	All	All Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	All Euro 1 1.0 1.5 2.0	All Euro 2 1.0 1.5 2.0	All Euro 3	All	All	All
	standard 1995 1999 1996 1996 1996 1996 1996 1996	Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	Euro 1 1.0 1.5 2.0 3.0 4.1 5.0	Euro 2 1.0 1.5 2.0	Euro 3				Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	All Euro 1 1.0 1.5 2.0	All Euro 2 1.0 1.5 2.0	Euro 3			
	standard 1995 1999 1996 1996 1996 1996 1996 1996	Petrol All Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	Petrol All Euro 1 1.0 1.5 2.0 3.0 4.1 5.0	Petrol All Euro 2 1.0 1.5 2.0	Petrol All Euro 3	Petrol All	Petrol All	Petrol All	Diesel All Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	Diesel All Euro 1 1.0 1.5 2.0	Diesel All Euro 2 1.0 1.5 2.0	Diesel All Euro 3	Diesel All	Diesel All	Diesel All
	0007 6661 2661 9661 5661	All Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	All Euro 1.0 1.5 2.0 3.0 4.1 5.0	Petrol All Euro 2 1.0 1.5 2.0	Petrol All Euro 3	Petrol All	Petrol All	Petrol All	Diesel All Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	Diesel All Euro 1 1.0 1.5 2.0	Diesel All Euro 2 1.0 1.5 2.0	Diesel All Euro 3	All	All	All
	standard 1995 1999 1996 1996 1996 1996 1996 1996	Petrol All Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	Petrol All Euro 1 1.0 1.5 2.0 3.0 4.1 5.0	Petrol All Euro 2 1.0 1.5 2.0	Petrol All Euro 3	Petrol All	All	Petrol All	Diesel All Pre-Euro 1 3.8 4.8 5.8 6.7 7.5 8.0 9.1	Diesel All Euro 1 1.0 1.5 2.0	Diesel All Euro 2 1.0 1.5 2.0	Diesel All Euro 3	Diesel All	Diesel All	Diesel All

Table 15: Average age by vehicle category and model year (LGV N1(II/III)).

			5.8 200 6.7 7.5 1999
8.5 9.5 4.9 5.9	1.5		4.5 5.6 6.5 1.5 1.9 2.9
1.9 2.4			
4 12.2 13.1	Ξ	8.0 9.1 9.9 10.7 11.	9.1 9.9
7.5 8.5 9.5	7	3.6 4.5 5.6 6.5 7	4.5 5.6 6.5
4.9	3.9		1.5 1.9 2.9
1.5 1.9 2.4		1.0 1.	
12.2 13.1	11.4	8.0 9.1 9.9 10.7 11.4	8.0 9.1 9.9
8.5 9.5	7.5	4.5 5.6 6.5	4.5 5.6 6.5
9 4.9 5.9	3.9	1.0 1.5 1.9 2.9 3.9	1.5 1.9 2.9
5 1.9 2.4	1.5	1.0 1.3	
12.2 13.1	11.4	8.0 9.1 9.9 10.7 11.4	9.1 9.9 10.7 1
8.5 9.5	7.5	3.6 4.5 5.6 6.5 7.5	4.5 5.6 6.5
4.9 5.9	3.9	1.0 1.5 1.9 2.9 3.9	1.5 1.9 2.9
1.9 2.4	1.5	1.0 1.5	

Estimation of average mileage

Relationships between vehicle age and mileage were established using data supplied by VOSA from in-service emission tests (MOT) conducted between November 2006 and November 2007 (VOSA, 2007). The data from VOSA described the average mileage by model year for around 33 million cars and 730,000 LGVs. Model years period to 1993 were stated as bands (1978-1982, 1983-1987 and 1988-1992). As in-service tests are conducted primarily on vehicles which are at least three years old, the most recent mileage data, with some exceptions, were for 2004.

For the vehicle categories listed in the VOSA data, the average accumulated mileage was plotted as a function of vehicle age relative to 2007 (*i.e.* 2006 models were assumed to be one year old, 2005 models two years old, and so on). The results are shown in Figure 4 (cars) and Figure 5 (LGVs).

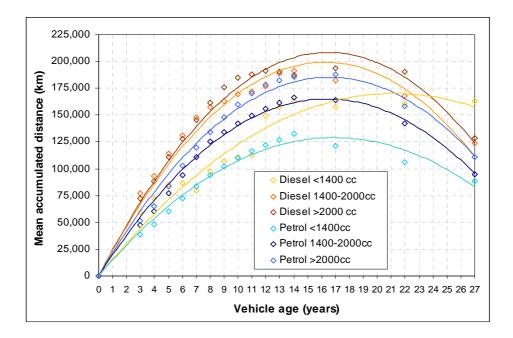


Figure 4: Vehicle mileage as a function of age, based on in-service test data (cars).

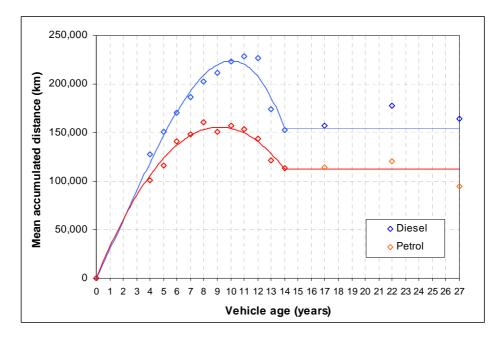


Figure 5: Vehicle mileage as a function of age, based on in-service test data (LGVs).

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The plots for cars indicate that the average accumulated mileage for vehicles typically increases with age for vehicles up to around 16 or 17 years old, and then appears to decrease for older vehicles. Presumably the decrease in the average mileage is due to high-mileage vehicles being removed from the fleet. The average mileage of small diesel cars appears to have a slightly different relationship with age compared with other types of car, with a peak in accumulated mileage occurring for vehicles which are around 21 or 22 years old, but the numbers of old vehicles of this type were relatively small. In the case of LGVs, the peak accumulated mileage occurred for vehicles between around 9 and 10 years old.

For cars, second-order polynomial functions (forced through zero) were fitted to the data. For LGVs no simple function could be fitted to the data, and a polynomial function was used for vehicles less than or equal to 14 years old. It was assumed that there was no further change in mileage for vehicles with an age greater than 14 years. The coefficients for the regression fits are shown in Table 16. In all cases, it was assumed that there was no further change in mileage for vehicles older than 27 years.

Vehicle	Б1	Engine	Vehicle	E a	Coefficients			
type	Fuel	capacity (cc)	age (years)	Equation ^a	a	b	С	
Car	Petrol	<1400	0-27	$y = ax^2 + bx$	-452.02	15,274		
		1400-2000	0-27	$y = ax^2 + bx$	-616.25	20,172		
		>2000	0-27	$y = ax^2 + bx$	-675.25	22,366		
		All	0-27	$y = ax^2 + bx$	-537.38	18,172		
	Diesel	<1400	0-27	$y = ax^2 + bx$	-378.22	16,938		
		1400-2000	0-27	$y = ax^2 + bx$	-757.02	24,568		
		>2000	0-27	$y = ax^2 + bx$	-766.48	25,276		
		All	0-27	$y = ax^2 + bx$	-746.21	24,658		
LGV	Petrol	All	<=14	$y = ax^2 + bx$	-1,855.1	33,997		
			>14	y = a	112,358.4			
	Diesel	All	<=14	$y = ax^3 + bx^2 + cx$	-160.27	1002.6	28,386	
			>14	y = a	154,132.7			

Table 16: Equations describing accumulated vehicle mileage as a function of age.

For each vehicle category and reference year, the functions in Table 16 were used to calculate the average vehicle mileage. In the case of cars the functions for the different engine size bands were used. For LPG cars the functions for 1400-2000 cc petrol cars were used. For cars >2.5 tonnes the functions for large petrol and diesel cars were used. The functions for large diesel cars were also used for taxis. In the case of LGVs only the functions for all engine sizes were used (the division between petrol and diesel was retained).

Calculation of mileage scaling factors

For each vehicle category, reference year and pollutant, the emission factor associated with the actual average mileage, and the emission factor for 50,000 km, were calculated using Equation 2 and the coefficients in Table 9 ('all' driving conditions). These coefficients were applied to all LDVs. For LPG cars the functions for petrol cars were used. Where a function had a negative gradient (*i.e.* emissions decreased with increased mileage), it was assumed that there was no further reduction in emissions above 100,000 km.

The mileage scaling factors were then calculated by dividing the emission factor for the actual mileage by the emission factor for 50,000 km. The final scaling factors are given in Appendix C.

4.1.2 Heavy-duty vehicles

The general conclusion from the ARTEMIS work on HDVs was that no emission deterioration factors were needed for Euro I to Euro III vehicles. It was also concluded that there is no reason to assume that the

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a where y is the accumulated mileage in km, and x is the vehicle age in years.

deterioration pattern of engine-out emissions from Euro IV and Euro V vehicles would differ much from engines of earlier Euro classes. However, the ageing, malfunctioning and tampering of emission-control devices on Euro IV and Euro V vehicles could lead to increased emissions. At present, it is not possible to give exact values since the technology is not fully developed and few data are available (Rexeis *et al.*, 2005).

The database of heavy-duty emission factors compiled in this project was considered to be too small to allow deterioration effects to be examined. As a consequence of this, and taking into account the findings of ARTEMIS, no mileage scaling factors were developed for heavy-duty vehicles.

4.1.3 Two-wheel vehicles

For the UK, Boulter and Barlow (2009) recommended the use ARTEMIS emission factors for two-wheel vehicles. However, emission degradation was not studied in ARTEMIS and no degradation functions were available. This was identified as an area for further research (Elst *et al.*, 2006).

4.2 Fuel composition scaling factors

The scaling factors for fuel composition (sulphur content), taken from Boulter and Latham (2008), are given in Appendix D. In order to the derive fuel composition scaling factors, an adapted version of the method presented in COPERT III (and retained in COPERT 4) was used. The baseline fuels which were used were identical to those used in COPERT, except for the addition of a 'Fuel 2009' having a maximum sulphur content of 10 ppm. The correspondence between fuels and emission standards, for all vehicle types, was also taken from COPERT, with the addition of a 2009 fuel. It was assumed that there would be no further improvements in fuels beyond 2009. The correspondence between fuel and emission standards was applied to all light-duty and heavy-duty vehicles. No fuel scaling factors were determined for two-wheel vehicles.

4.3 Scaling factors for biofuels

Based upon the available evidence, Boulter and Latham (2008) concluded that emission scaling factors for biodiesel are not required in the UK, given that the blending of petroleum diesel with biodiesel in a proportion of less than 10% is expected to have no effect on emissions, and the biofuel content of diesel is not predicted to exceed 5% by volume

A similar argument appears to be justifiable for bioethanol blends, although there appear to be few recommendations for specific adjustment factors. Consequently, no scaling factors are provided here. The effects of bioethanol blends are currently being reviewed for inclusion in COPERT 4. When this information becomes available, the need for scaling factors in the UK should be reconsidered.

4.4 Technology scaling factors

For future LDV technologies, such as Euro 5 and Euro 6 cars, assumptions were made to derive the basic emission factors, based upon the limit values in legislation (Boulter and Barlow, 2009). No further assumptions are required, as technological improvements are accounted for implicitly. For example, for LDVs the use of a DPF will be required to meet the Euro 5 and Euro 6 PM standards and this is taken into account in the basic emission factors. However, an important consideration is the fitting (or retro-fitting) of a DPF to pre-Euro 5 diesel vehicles. Where this is the case, based on the values presented by Samaras and Geivanidis (2005) it is assumed that the basic PM emission factor is multiplied by 0.1 (*i.e.* the DPF leads to a 90% reduction in PM mass emissions).

For heavy-duty vehicles, the majority of Euro VI vehicles are expected to be fitted with DPFs, whereas Euro V vehicles are not expected to need them to meet the limits. Again, this is taken into account in the basic emission factors for Euro V and Euro VI vehicles. For pre-Euro V heavy-duty vehicles retro-fitted with a DPF, a scaling factor of 0.1 is again recommended, based on Rexeis *et al.* (2005).

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Appendix A: Abbreviations and terms used in the Task Reports

ACEA European Automobile Manufacturers Association.

ADMS Atmospheric Dispersion Modelling System.

ARTEMIS Assessment and Reliability of Transport Emission Models and Inventory Systems.

An EC 5th Framework project, funded by DG TREN and coordinated by TRL.

http://www.trl.co.uk/artemis/introduction.htm

AURN Automatic Urban and Rural Network. Automatic monitoring sites for air quality

that are or have been operated on behalf of the Department for Environment, Food

and Rural Affairs in the UK.

AVERT Adaptation of Vehicle Environmental Response by Telematics. Project funded by

the Foresight Vehicle programme.

http://www.foresightvehicle.org.uk/dispproj1.asp?wg_id=1003

BP British Petroleum.

CEN European Standards Organisation.

CERC Cambridge Environmental Research Consultants, the developers of the ADMS

model suite.

Cetane number

(CN)

Cetane number is a measure of the combustion quality of diesel fuel. Cetane is an alkane molecule that ignites very easily under compression. All other hydrocarbons in diesel fuel are indexed to cetane (index = 100) as to how well they ignite under compression. Since there are hundreds of components in diesel fuel, the overall CN of the diesel is the average of all the components. There is very little actual cetane in diesel fuel. Generally, diesel engines run well with a CN between 40 and 55.

CITA International Motor Vehicle Inspection Committee, based in Brussels.

CNG Compressed natural gas (primarily methane).

CH₄ Methane.

CO Carbon monoxide.

CO₂ Carbon dioxide.

uCO₂ 'Ultimate' CO₂.

COLDSTART A model for cold-start emissions developed by VTI in Sweden.

CONCAWE The Oil Companies' European Association for Environment, Health and Safety in

Refining and Distribution.

COST European Cooperation in Science and Technology.

CRT Continuously Regenerating Trap – a trademark of Johnson Matthey.

CVS Constant-volume sampler.

COPERT COmputer Program to calculate Emissions from Road Transport.

http://lat.eng.auth.gr/copert/

CORINAIR CO-oRdinated INformation on the Environment in the European Community - AIR

DEFRA Department for Environment, Food and Rural Affairs.

DfT Department for Transport, UK.

DI Direct injection.

DMRB Design Manual for Roads and Bridges.

http://www.standardsforhighways.co.uk/dmrb/

DPF Diesel particulate filter.

DTI Department of Trade and Industry (now the Department for Business, Enterprise and

Regulatory Reform – BERR).

Driving cycle The term 'driving cycle' (or sometimes 'duty cycle' is used to describe how a

vehicle is to be operated during a laboratory emission test. A driving cycle is designed to reflect some aspect of real-world driving, and usually describes vehicle

speed as a function of time.

Driving pattern The term 'driving pattern' is used to describe how a vehicle is operated under real-

world conditions, based on direct measurement, or the time history of vehicle operation specified by a model user. In the literature, this is also often referred to as a driving cycle. However, in this work it has been assumed that a driving pattern

only becomes a driving cycle once it has been used to measure emissions.

Dynamics Variables which emission modellers use to describe the extent of transient operation

(see entry below for 'transient') in a driving cycle (*e.g.* maximum and minimum speed, average positive acceleration). Can be viewed as being similar to the concept

of the 'aggressiveness' of driving.

DVPE Dry vapour pressure equivalent. The difference between DVPR and (the older)

RVP is the measurement method. DVPE is measured 'dry' after removing all moisture from the test chamber prior to injection of the sample. This overcomes the unpredictability of results experienced when testing samples containing oxygenates by the conventional RVP method. DVPE is measured at a temperature of 37.8°C.

EC European Commission.

ECE Economic Commission for Europe.

EGR Exhaust gas recirculation.

EIA Environmental Impact Assessment

EMEP Cooperative Programme for Monitoring and Evaluation of the Long-Range

Transmission of Air Pollutants in Europe.

EMFAC EMission FACtors model, developed by the California Air Resources Board.

EMFAC 2007 is the most recent version.

EMPA One of the research institutes of the Swiss ETH organisation.

EPEFE European Programme on Emissions, Fuels and Engine Technologies

ETC European Transient Cycle.

EU European Union.

EUDC Extra Urban Driving Cycle.

EXEMPT EXcess Emissions Planning Tool.

FAME Fatty acid methyl ester.

FHB Fachhochschule Biel (FHB): Biel University of applied science, Switzerland.

FID Flame ionisation detector.

FIGE (or FiGE) Forschungsinstitut Gerausche und Erschutterungen (FIGE Institute), Aachen,

Germany. Now TUV Automotive GmbH.

Fischer-Tropsch Fischer-Tropsch diesel is a premium diesel product with a very high cetane number

diesel (FTD) (75) and zero sulphur content. It is generally produced from natural gas.
 FTP Federal Test Procedure – the driving cycle used in US emission tests.

FTIR Fourier-transform infrared spectroscopy.

GC/MS Gas chromatography/mass spectrometry.

GDI Gasoline Direct Injection.

GHG Greenhouse gas.

GVW Gross vehicle weight.

HBEFA/Handbook Handbook Emission Factors for Road Transport (Handbuch Emissionsfaktoren des

Strassenverkehrs). An emission model used in Switzerland, Germany and Austria.

http://www.hbefa.net/

HDV Heavy-duty vehicles. Road vehicles greater than 3.5 tonnes (GVW), where GVW is

the gross weight of the vehicle, *i.e.* the combined weight of the vehicle and goods.

HGV Heavy goods vehicles. Goods vehicles greater than 3.5 tonnes GVW.

HOV High-occupancy vehicle.

HyZem Hybrid technology approaching efficient Zero Emission Mobility.

IDI Indirect injection.

IM Inspection and Maintenance: in-service vehicle road worthiness testing.

INFRAS A private and independent consulting group based in Switzerland.

INRETS Institut National de Recherche sur les Transports et leur Sécurité, France.

IUFC-15 INRETS urbain fluide court. Short, urban free-flow driving cycle.

IRC-15 INRETS route courte. Short rural driving cycle.

JCS A European Joint Commission funded project: *The inspection of in-use cars in*

order to attain minimum emissions of pollutants and optimum energy efficiency, carried out on behalf of EC DGs for Environment (DG XI) Transport (DG VII) and Energy (DG XVII). Project coordinated by LAT, University of Thessaloniki.

LDV Light-duty vehicles. Road vehicles less than 3.5 tonnes GVW, including cars and

light goods vehicles.

LGV Goods/commercial vehicles less than 3.5 tonnes GVW.

LPG Liquefied petroleum gas.M25 London orbital motorway.

MEET Methodologies for Estimating air pollutant Emissions from Transport. European

Commission 4th Framework project coordinated by INRETS.

MHDT Millbrook Heavy-Duty Truck (driving cycle).MLTB Millbrook London Transport Bus (driving cycle).

MOBILE USEPA vehicle emission modelling software.

MODEM Modelling of Emissions and Fuel Consumption in Urban Areas. A research project

within the EU DRIVE programme coordinated by INRETS.

MOUDI Micro-orifice uniform deposit impactor.

MPI Multi-point injection.

MTC AVL MTC Motortestcenter AB. Sweden.

MVEG Motor Vehicle Emission Group.

NAEI National Atmospheric Emissions Inventory (UK).

http://www.naei.org.uk/

NEDC New European Driving Cycle.

NETCEN National Environmental Technology Centre.

N₂O Nitrous oxide.
NH₃ Ammonia.

NMVOC Non-methane volatile organic compounds.

NO Nitric oxide.

NO₂ Nitrogen dioxide.

NO_x Total oxides of nitrogen.

OBD On-board diagnostics.

OSCAR Optimised Expert System for Conducting Environmental Assessment of Urban

Road Traffic. A European Fifth Framework research project, funded by DG Research. Project and coordinated by the University of Hertfordshire.

PAHs Polycyclic aromatic hydrocarbons.

PARTICULATES An EC Fifth Framework research project, funded by DG TREN and coordinated by

LAT, Thessaloniki.

http://lat.eng.auth.gr/particulates/

PHEM Passenger car and Heavy-duty Emission Model. One of the emission models

developed in COST Action 346 and the ARTEMIS project.

PM Particulate matter.

PM₁₀ Airborne particulate matter with an aerodynamic diameter of less than 10 μm.
 PM_{2.5} Airborne particulate matter with an aerodynamic diameter of less than 2.5 μm.

PMP Particle Measurement Programme.

POPs Persistent organic pollutants.

ppm Parts per million.

PSV Public Service Vehicle.

Road Information relating to the road, such as the geographical location (*e.g.* urban, rural), the functional type (*e.g.* distributor, local access), the speed limit, the number

of lanes and the presence or otherwise of traffic management measures.

RME Rapeseed methyl ester.

RTC Reference test cycles.

RTD Real-time diurnal (evaporative emissions).RTFO Renewable Transport Fuel Obligation.

RVP Reid vapour pressure.

SCR Selective catalytic reduction.

SEA Strategic Environmental Assessment.

SHED Sealed Housing for Evaporative Determination.

SMMT Society of Motor Manufacturers and Traders.

SO₂ Sulphur dioxide.

TEE Traffic Energy and Emissions (model).

THC/HC Total hydrocarbons.

TNO TNO Automotive, The Netherlands. The power train and emissions research

institute of the holding company, TNO Companies BV.

Traffic characteristics/

conditions

Information relating to the bulk properties of the traffic stream – principally its

speed, composition and volume/flow or density.

TRAMAO Traffic Management and Air Quality Research Programme. A research programme

funded by the UK Department for Transport.

http://www.dft.gov.uk/pgr/roads/network/research/tmairqualityresearch/trafficmanagementandairquali3927

Transient Relates to when the operation of a vehicle is continuously varying, as opposed to

being in a steady state.

TRL Limited (Transport Research Laboratory), UK.

TRRL Transport and Road Research Laboratory - former name of TRL.

TUG Technical University of Graz, Austria.

TUV TÜV Rheinland, Germany. Exhaust emission testing used to be undertaken at this

institute based in Cologne. These activities were transferred to another institute in

the TUV group, based in Essen, in 1999.

TWC Three-way catalyst.

UG214 A project within DfT's TRAMAQ programme which involved the development of

realistic driving cycles for traffic management schemes.

UKEFD United Kingdom Emission Factor Database (for road vehicles).

UKPIA UK Petroleum Industries Association

ULSD Ultra-low-sulphur diesel.

UROPOL Urban ROad POLlution model.

USEPA United States Environmental Protection Agency.

UTM/UTMC Urban Traffic Management / Urban Traffic Management and Control.

Vehicle operation The way in which a vehicle is operated (e.g. vehicle speed, throttle position, engine

speed, gear selection).

VeTESS Vehicle Transient Emissions Simulation Software.

VOCs Volatile organic compounds.

VOSA Vehicle and Operator Services Agency

WMTC World Motorcycle Test Cycle. A common motorcycle emissions certification

Procedure. The cycle is divided into urban, rural, and highway driving.

WSL Warren Spring Laboratory.

WVU West Virginia University, US.

WWFC World-Wide Fuel Charter. The World Wide Fuel Charter is a joint effort by

European, American and Japanese automobile manufacturers and other related associations, and recommends global standards for fuel quality, taking into account

the status of emission technologies.

Appendix B: Fuel and technology scaling factors currently used in NAEI

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Table B1: Current fuel and technology scaling factors for carbon monoxide.

Buses	Artic HGVs	Rigid HGVs	Diesel LGVs	Petrol LGVs	Diesel cars	Petrol cars
Old Pre-Euro I Euro I Euro II Euro III Euro IV Euro IV+	Old Pre-Euro I Euro II Euro III Euro IV Euro IV+	Old Pre-Euro I Euro II Euro III Euro IV Euro IV+	Pre-Euro 1 Euro 1 Euro 2 Euro 3 Euro 4	Euro 1 Euro 2 Euro 3 Euro 4	Pre-Euro 1 Euro 1 Euro 2 Euro 3 Euro 4	CO Euro 1 Euro 2 Euro 3 Euro 4
1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000	1.000 1.000 1.000 1.000	1996 1.000 1.000 1.000
0.991 0.991 0.991 0.729 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1997 1.000 1.000 1.000 1.000
0.958 0.958 0.958 0.692 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1998 1.000 1.000 1.000 1.000
0.926 0.926 0.926 0.656 1.000 1.000	1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1999 1.000 1.000 1.000 1.000
0.907 0.907 0.907 0.596 0.899 1.000	0.956 0.956 0.956 0.943 0.947 1.000	0.956 0.956 0.956 0.949 0.947 1.000	0.943 0.943 0.943 1.000	0.763 0.763 0.947 1.000	0.943 0.943 0.943 1.000	2000 0.763 0.763 0.947 1.000
0.907 0.907 0.907 0.589 0.785 1.000	0.956 0.956 0.956 0.941 0.919 1.000 1.000	0.956 0.956 0.956 0.947 0.929 1.000	0.943 0.943 0.943 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2001 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.583 0.824 1.000	0.956 0.956 0.956 0.939 0.929 1.000	0.956 0.956 0.956 0.946 0.936 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2002 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.582 0.818 1.000	0.956 0.956 0.956 0.937 0.927 1.000	0.956 0.956 0.956 0.946 0.934 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000	2003 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.588 0.806 1.000	0.956 0.956 0.956 0.937 0.923 1.000	0.956 0.956 0.956 0.946 0.932 1.000	0.943 0.943 0.943 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2004 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2005 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2006 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2007 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2008 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000	2009 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000	2010 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2011 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2012 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2013 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2014 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000	2015 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2016 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2017 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2018 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2019 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2020 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2021 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2022 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2023 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000 1.000	2024 0.676 0.676 0.839 1.000
0.907 0.907 0.907 0.600 0.793 1.000	0.956 0.956 0.956 0.939 0.920 1.000	0.956 0.956 0.956 0.948 0.930 1.000	0.943 0.943 0.943 1.000 1.000	0.676 0.676 0.839 1.000	0.943 0.943 0.943 1.000	2025 0.676 0.676 0.839 1.000

Table B2: Current fuel and technology scaling factors for total hydrocarbons.

2025	95 95 90	0.955 0.955 0.955 1.000 1.000	95 95 30	55 55 55 00 00	70 70 70 62 30 00	70 70 70 70 53 00	0.723 0.723 0.723 0.567 0.630 1.000
	95 0.595 95 0.595 86 0.786 00 1.000		95 0.595 95 0.595 86 0.786 00 1.000	55 0.955 55 0.955 55 0.955 00 1.000	70 0.970 70 0.970 70 0.970 62 0.962 30 0.930 90 1.000	70 0.970 70 0.970 70 0.970 53 0.953 20 0.920 90 1.000	
3 2024	5 0.595 5 0.595 6 0.786 0 1.000	5 0.955 5 0.955 5 0.955 0 1.000 0 1.000	5 0.595 5 0.595 6 0.786 0 1.000	5 0.955 5 0.955 5 0.955 0 1.000 0 1.000	0 0.970 0 0.970 0 0.970 2 0.962 0 0.930 0 1.000	0 0.970 0 0.970 0 0.970 3 0.953 0 0.920 0 1.000	3 0.723 3 0.723 3 0.723 7 0.567 0 0.630 0 1.000
2 2023	5 0.595 5 0.595 6 0.786 0 1.000	5 0.955 5 0.955 5 0.955 0 1.000 0 1.000	5 0.595 5 0.595 6 0.786 0 1.000	5 0.955 5 0.955 5 0.955 0 1.000 0 1.000	0.970 0.970 0.970 2.0.962 0.930 0.930 0.1000	0.970 0.970 0.970 3 0.953 0 0.920 0 1.000	3 0.723 3 0.723 3 0.723 7 0.567 0 0.630 0 1.000
2022	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 0.1000 0.1000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	3 0.723 3 0.723 3 0.723 7 0.567 9 0.630 9 1.000
2021	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2020	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2019	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2018	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000 1.000
2017	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000 1.000
2016	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000 1.000
2015	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2014	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2013	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2012	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2011	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.973 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2010	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.973 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2009	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2008	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2007	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2006	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2005	0.595 0.595 0.786 1.000	0.955 (0.955 (0.955 (0.955 (1.000 1.	0.595 (0.595 (0.595 (0.786 (1.000)	0.955 (0.955 (0.955 (0.955 (1.000 (1.	0.970 0.970 0.970 0.970 0.962 0.930 0.11.000 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.723 0.723 0.723 0.567 0.630 1.000
2004	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.960 0.932 1.000	0.970 0.970 0.970 0.952 0.924 1.000	0.723 0.723 0.723 0.559 0.640 1.000
2003	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.595 0.595 0.786 1.000	0.955 0.955 0.955 1.000 1.000	0.970 0.970 0.970 0.960 0.934 1.000	0.970 0.970 0.970 0.952 0.927 1.000	0.723 0.723 0.723 0.555 0.648 1.000
2002	0.595 0.595 0.786 1.000	0.955 (0.955 (0.955 (0.955 (1.000 1.	0.595 (0.595 (0.595 (0.786 (1.000 (1.	0.955 (0.955 (0.955 (0.955 (1.000 (1.	0.970 0.970 0.970 0.960 0.960 1.000	0.970 0.970 0.970 0.953 0.929 1.000	0.723 0.723 0.723 0.555 0.653 1.000
2001	0.595 (0.595 (0.595 (0.786 (0.	0.955 (0.955 (0.955 (0.955 (0.955 (1.000 1	0.595 (0.595 (0.595 (0.786 (0.786 (1.000 (0.786 (0.	0.955 (0.	0.970 0.970 0.970 0.970 0.962 0.962 0.930 0.1.000 1.000	0.970 (0.970 (0.970 (0.970 (0.955 (0.955 (0.920 (0.	0.723 0 0.723 0 0.723 0 0.560 0 0.625 0 1.000
2000	0.704 0 0.704 0 0.929 0 1.000 1	0.955 0 0.955 0 0.955 0 1.000 1	0.704 0 0.704 0 0.929 0 1.000 1	0.955 0 0.955 0 0.955 0 1.000 1	0.970 0 0.970 0 0.970 0 0.963 0 0.947 0 1.000 1	0.970 0 0.970 0 0.970 0 0.957 0 0.947 0 1.000 1	0.723 0 0.723 0 0.723 0 0.565 0 0.706 0 1.000 1
6661	1.000 0 1.000 0 1.000 0 1.000 1	1.000 0 1.000 0 1.000 1 1.000 1	1.000 0 1.000 0 1.000 0 1.000 1	1.000 0 1.000 0 1.000 0 1.000 1	1.000 0 1.000 0 1.000 0 1.000 0 1.000 1 1.000 1	1.000 0 1.000 0 1.000 0 1.000 0 1.000 1 1.000 1	0.778 0 0.778 0 0.778 0 0.645 0 1.000 1
1998	1.000 1 1.000 1 1.000 1 1.000 1	1.000 1 1.000 1 1.000 1 1.000 1 1.000 1 1.000 1	1.000 1 1.000 1 1.000 1 1.000 1 1.000 1 1.000 1	0.875 0 0.875 0 0.875 0 0.732 0 1.000 1 1.000 1			
1997 1	1.000 1. 1.000 1. 1.000 1. 1.000 1.	1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	1.000 1. 1.000 1. 1.000 1. 1.000 1. 1.000 1.	0.972 0.0972 0.0972 0.0972 0.0972 0.09821 0.1.000 1.1.			
1996 1	1.000 1. 1.000 1. 1.000 1. 1.000 1.	1.000 1.1.0000 1.1.000 1.1.000 1.1.000 1.1.000 1.1.000 1.1.000 1.1.000 1.1.000	1.000 1. 1.000 1. 1.000 1. 1.000 1.	1.000 1 1.000 1 1.000 1 1.000 1 1.000 1	1.000 1. 1.000 1. 1.000 1. 1.000 1. 1.000 1. 1.000 1.	1.000 1. 1.000 1. 1.000 1. 1.000 1. 1.000 1. 1.000 1.	1.000 0. 1.000 0. 1.000 0. 1.000 1. 1.000 1. 1.000 1.
	0 1 0 2 0 3 0 4	Pre-Euro 1 Euro 1 Euro 2 Euro 3	Euro 1 Euro 2 Euro 3 Euro 4	Pre-Euro 1 Euro 1 Euro 2 Euro 3	Old Pre-Euro I Euro I Euro II Euro II Euro III Euro IV Euro IV+	Old Pre-Euro I Euro I Euro II Euro II Euro III Euro IV Euro IV	Old Pre-Euro I Euro II Euro III Euro III Euro IV+ Euro IV+
нс	ol Euro 1 Euro 2 Euro 3 Euro 4					•	•
	Petrol cars	Diesel cars	Petrol LGVs	Diesel LGVs	Rigid HGVs	Artic HGVs	Buses

Buses	Artic HGVs	Rigid HGVs	Diesel LGVs	Petrol LGVs	Diesel cars	Petrol cars
Old Pre-Euro I Euro II Euro III Euro IV Euro IV+	Old Pre-Euro I Euro II Euro III Euro IV Euro IV+	Old Pre-Euro I Euro II Euro III Euro IV Euro IV+	Pre-Euro 1 Euro 1 Euro 2 Euro 3 Euro 4	Pre-Euro 1 Euro 1 Euro 2 Euro 3 Euro 4	Pre-Euro 1 Euro 1 Euro 2 Euro 3 Euro 4	Benzene Pre-Euro 1 Euro 1 Euro 2 Euro 3 Euro 4
1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000
0.972 0.972 0.972 0.972 0.821 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000
0.875 0.875 0.875 0.875 0.732 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1,000 1,000 1,000 1,000 1,000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000
0.778 0.778 0.778 0.645 1.000 1.000	1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1999 1.000 1.000 1.000 1.000
0.723 0.723 0.723 0.565 0.706 1.000	0.970 0.970 0.970 0.957 0.947 1.000	0.970 0.970 0.970 0.963 0.947 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.585 0.585 0.929 1.000	0.955 0.955 0.955 1.000 1.000	2000 0.270 0.585 0.585 0.929 1.000
0.723 0.723 0.723 0.560 0.625 1.000	0.970 0.970 0.970 0.955 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2001 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.555 0.653 1.000	0.970 0.970 0.970 0.953 0.929 1.000	0.970 0.970 0.970 0.960 0.936 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2002 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.555 0.648 1.000	0.970 0.970 0.970 0.952 0.927 1.000	0.970 0.970 0.970 0.960 0.934 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2003 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.559 0.640 1.000	0.970 0.970 0.970 0.952 0.952 1.000	0.970 0.970 0.970 0.960 0.932 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2004 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.973 0.923 1.000	0.970 0.970 0.970 0.962 0.962 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2005 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2006 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2007 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2008 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000	2009 0.270 0.495 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2010 0.270 0.495 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.767 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2011 0.270 0.495 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2012 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2013 0.270 0.495 0.495 0.495 0.786 1.000
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0.723 0.723 0.723 0.767 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2018 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2019 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2020 0.270 0.495 0.495 0.786 1.000
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0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2022 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2023 0.270 0.495 0.495 0.786 1.000
0.723 0.723 0.723 0.567 0.630 1.000	0.970 0.970 0.970 0.953 0.920 1.000	0.970 0.970 0.970 0.962 0.930 1.000	0.955 0.955 0.955 1.000 1.000	0.270 0.495 0.495 0.786 1.000	0.955 0.955 0.955 1.000 1.000	2024 0.270 0.495 0.495 0.786 1.000
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Table B4: Current fuel and technology scaling factors for 1,3-butadiene.

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Table B5: Current fuel and technology scaling factors for NO_x .

Buses	Artic HGVs	Rigid HGVs	Diesel LGVs	Petrol LGVs	Diesel cars	Petrol cars
Old Pre-Euro I Euro I Euro II Euro III Euro IV Euro IV+	Old Pre-Euro I Euro I Euro II Euro IV Euro IV+	Old Pre-Euro I Euro II Euro III Euro IV Euro IV+	Pre-Euro 1 Euro 1 Euro 2 Euro 3 Euro 4	Euro 1 Euro 2 Euro 3 Euro 4	Pre-Euro 1 Euro 1 Euro 2 Euro 3 Euro 4	NOx Euro 1 Euro 2 Euro 3 Euro 4
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1.001 1.001 1.001 0.988 1.000 1.000	1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000	1.000 1.000 1.000 1.000	1997 1.000 1.000 1.000 1.000
1.006 1.006 1.006 0.992 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1998 1.000 1.000 1.000 1.000
1.011 1.011 1.011 0.996 1.000 1.000	1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 1.000 1.000	1.000 1.000 1.000	1.000 1.000 1.000 1.000	1999 1.000 1.000 1.000 1.000
1.014 1.014 1.014 0.992 1.021 1.000	0.941 0.941 0.941 0.939 0.948 1.000	0.941 0.941 0.941 0.940 0.948 1.000 1.000	1.000 1.000 1.000 1.000	0.893 0.893 0.917 1.000	1.000 1.000 1.000 1.000	2000 0.893 0.893 0.917 1.000
1.014 1.014 1.014 0.991 1.004 1.000	0.941 0.941 0.941 0.939 0.943 1.000	0.941 0.941 0.941 0.940 0.945 1.000	1.000 1.000 1.000 1.000	0.854 0.854 0.747 1.000	1.000 1.000 1.000 1.000	2001 0.854 0.854 0.747 1.000
1.014 1.014 1.014 0.990 1.010 1.000	0.941 0.941 0.941 0.938 0.945 1.000	0.941 0.941 0.941 0.939 0.946 1.000	1.000 1.000 1.000 1.000	0.854 0.854 0.747 1.000	1.000 1.000 1.000 1.000	2002 0.854 0.854 0.747 1.000
1.014 1.014 1.014 0.990 1.009 1.000	0.941 0.941 0.941 0.938 0.944 1.000	0.941 0.941 0.941 0.939 0.945 1.000	1.000 1.000 1.000 1.000	0.854 0.854 0.747 1.000	1.000 1.000 1.000 1.000	2003 0.854 0.854 0.747 1.000
1.014 1.014 1.014 1.014 0.991 1.007 1.000	0.941 0.941 0.941 0.938 0.944 1.000	0.941 0.941 0.941 0.939 0.945 1.000	1.000 1.000 1.000 1.000	0.854 0.854 0.747 1.000	1.000 1.000 1.000 1.000	2004 0.854 0.854 0.747 1.000
1.014 1.014 1.014 1.014 0.992 1.005 1.000	0.941 0.941 0.941 0.938 0.938 0.943 1.000	0.941 0.941 0.941 0.940 0.945 1.000 1.000	1.000 1.000 1.000 1.000	0.854 0.854 0.747 1.000	1.000 1.000 1.000 1.000	2005 0.854 0.854 0.747 1.000
1.014 1.014 1.014 1.014 0.992 1.005 1.000	0.941 0.941 0.941 0.938 0.943 1.000	0.941 0.941 0.941 0.940 0.945 1.000 1.000	1.000 1.000 1.000 1.000	0.854 0.854 0.747 1.000	1.000 1.000 1.000 1.000	2006 0.854 0.854 0.747 1.000
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1.014 1.014 1.014 1.014 0.992 1.005 1.000	0.941 0.941 0.941 0.938 0.943 1.000	0.941 0.941 0.941 0.940 0.945 1.000 1.000	1.000 1.000 1.000 1.000	0.854 0.854 0.747 1.000	1.000 1.000 1.000 1.000	2010 0.854 0.854 0.747 1.000
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1.014 1.014 1.014 1.014 0.992 1.005 1.000	0.941 0.941 0.941 0.938 0.938 0.943 1.000	0.941 0.941 0.941 0.940 0.940 0.945 1.000 1.000	1.000 1.000 1.000 1.000	0.854 0.854 0.747 1.000	1.000 1.000 1.000 1.000	2012 0.854 0.854 0.747 1.000
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1.014 1.014 1.014 1.0192 0.992 1.005 1.000	0.941 0.941 0.941 0.941 0.938 0.938 0.943 0.943 1.000	0.941 0.941 0.941 0.941 0.941 0.940 0.945 1.000 1.000	1.000 1.000 1.000 1.000	0.854 0 0.854 0 0.747 0 1.000	1.000 1.000 1.000 1.000	2017 0.854 0.854 0.747 1.000
1.014 1.014 1.014 1.014 0.992 1.005 1.000	0.941 0.941 0.941 0.938 0.938 0.943 1.000	0.941 0.941 0.941 0.941 0.941 0.940 0.940 0.945 0.945 1.000	1.000 1.000 1.000 1.000	0.854 0 0.854 0 0.747 0 1.000	1.000 1.000 1.000 1.000	2018 0.854 0.854 0.747 1.000
1.014 1.014 1.014 0.992 1.005 1.000	0.941 0.941 0.941 0.938 0.938 0.943 1.000 1.000	0.941 0.941 0.941 0.941 0.940 0.940 0.945 1.000 1.000	1.000 1.000 1.000 1.000	0.854 0 0.854 0 0.747 0 1.000	1.000 1.000 1.000 1.000	2019 0.854 0.854 0.747 1.000
1.014 1.014 1.014 1.014 0.992 1.005 1.000	0.941 0.941 0.941 0.938 0.938 0.943 1.000	0.941 0.941 0.941 0.941 0.940 0.940 0.945 1.000 1.000	1.000 1.000 1.000 1.000	0.854 0 0.854 0 0.747 0 1.000	1.000 1.000 1.000 1.000	2020 0.854 0.854 0.747 1.000
1.014 1.014 1.014 0.992 (1.005 1.000	0.941 (0.941 (0.941 (0.938 (0.943 (1.000 1	0.941 (0.941 (0.941 (0.940 (0.945 (1.000)	1.000 1 1.000 1 1.000 1	0.854 (0.854 (0.747 (1.000)	1.000 1 1.000 1 1.000 1 1.000 1	2021 0.854 (0.854 (0.747 (1.000 1
1.014 1.014 1.014 1.014 0.992 1.005 1.000	0.941 (0.941 (0.941 (0.938 (0.938 (0.943 (1.000 (0.941 (0.941 (0.941 (0.940 (0.945 (1.000)	1.000 1 1.000 1 1.000 1 1.000 1	0.854 (0.854 (0.747 (1.000)	1.000 1.000 1.000 1.000	2022 0.854 (0.854 (0.747 (1.000)
1.014 1.014 1.014 0.992 1.005 1.000	0.941 0.941 0.941 0.941 0.938 0.938 0.943 0.943 1.000 1.000	0.941 0.941 0.941 0.941 0.941 0.940 0.945 0.945 1.000	1.000 1.000 1.000 1.000	0.854 0 0.854 0 0.747 0	1.000 1.000 1.000 1.000	2023 0.854 0.854 0.747 1.000
1.014 1 1.014 1 1.014 1 0.992 (1.005 1 1.000 1	0.941 (0.941 (0.941 (0.948 (0.938 (0.943 (1.000)	0.941 (0.941 (0.941 (0.940 (0.945 (1.000)	1.000 1 1.000 1 1.000 1 1.000 1	0.854 (0.854 (0.747 (1.000)	1.000 1 1.000 1 1.000 1 1.000 1	2024 0.854 (0.854 (0.747 (1.000 1
1.014 1.014 1.014 1.0192 0.992 1.005 1.000	0.941 0.941 0.941 0.938 0.943 1.000	0.941 0.941 0.941 0.940 0.940 0.945 1.000	1.000 1.000 1.000 1.000	0.854 0.854 0.747 1.000	1.000 1.000 1.000 1.000	2025 0.854 0.854 0.747 1.000

Table B6: Current fuel and technology scaling factors for PM.

2024 2025 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.905 0.905 0.905 0.905 0.905 0.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952		0.797 0.797 0.797 0.797 0.797 0.797 0.901 0.901 0.897 0.897 1.000 1.000 1.000 1.000	0.589 0.589 0.589 0.589 0.589 0.589 0.523 0.523 0.602 0.602 1.000 1.000
2022 2023 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952		0.797 0.797 0.797 0.797 0.0901 0.901 0.897 0.897 0.000 1.000 0.000 1.000	0.589 0.589 0.589 0.589 0.583 0.589 0.602 0.602 1.000 1.000
2021 1.000 1.000 1.000 1.000	0.883 0.883 0.905 0.952 0.952 1.000 1.000 1.000	0.883 0.883 0.905 0.952	0.797 0.797 0.909 0.909 0.907 1.000 1.000	0.797 0.797 0.901 0.897 1.000 1.000	0.589 0.589 0.589 0.602 1.000
2019 2020 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.905		0.797 0.797 0.797 0.797 0.901 0.901 0.897 0.897 0.000 1.000 0.1000	0.589 0.589 0.589 0.589 0.589 0.589 0.503 0.523 0.602 0.602 1.000 1.000
2017 2018 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952		0.797 0.797 0.797 0.797 0.797 0.901 0.901 0.897 0.897 0.000 1.000 0.000 1.000	0.589 0.589 0.589 0.589 0.589 0.589 0.523 0.523 0.602 0.602 1.000 1.000
2016 1.000 1.000 1.000 1.000	0.883 0.905 0.952 1.000 1.000 1.000	0.883 0.883 0.905 0.952	0.797 0.797 0.797 0.909 0.907 1.000	0.797 0.797 0.797 0.901 0.897 1.000	0.589 0.589 0.589 0.523 0.602 1.000
2014 2015 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.905 0.905 0.952 0.952 0.905 1.000 1.000		0.797 0.797 0.797 0.797 0.901 0.901 0.897 0.897 0.1000 1.000 0.1000	0.589 0.589 0.589 0.589 0.589 0.589 0.523 0.523 0.602 0.602 1.000 1.000
2012 2013 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952 1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 0.883 0.883 0.905 0.905 0.952 0.952 1.000 1.000		0.797 0.797 0.797 0.797 0.797 0.797 0.901 0.901 0.897 0.897 1.000 1.000 1.000 1.000	0.589 0.589 0.589 0.589 0.589 0.589 0.523 0.523 0.602 0.602 1.000 1.000
2011 1.000 1.000 1.000 1.000	0.883 0.883 0.905 0.952 1.000 1.000 1.000	0.883 0.883 0.905 0.952	0.797 0.797 0.909 0.907 0.907 1.000 1.000	0.797 0.797 0.901 0.897 1.000 1.000	0.589 0.589 0.589 0.602 1.000
2009 2010 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.983 0.905 0.905 0.952 0.952 0.905 0.000 1.000 1.000		0.797 0.797 0.797 0.797 0.901 0.901 0.897 0.897 0.000 0.1000 0.1000 0.1000	0.589 0.589 0.589 0.589 0.589 0.589 0.523 0.523 0.602 0.602 1.000 1.000
2007 2008 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.983 0.983 0.983 0.905 0.905 0.905 0.905 0.905 0.905 0.000	0.883 0.883 0.883 0.883 0.983 0.905 0.905 0.952 0.952 0.962		0.797 0.797 0.797 0.797 0.797 0.797 0.901 0.901 0.897 0.897 0.900 1.000 0.000 1.000	0.589 0.589 0.589 0.589 0.589 0.589 0.523 0.523 0.602 0.602 1.000 1.000
2006 1.000 1.000 1.000	0.883 (0.905 (0.	0.883 0.883 0.905 0.952	0.797 0.797 0.797 0.909 0.909 0.907 0.1000 0.1	0.797 0.797 0.797 0.901 0.897 1.000 1.000	0.589 0.589 0.589 0.523 0.602
2004 2005 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952		0.797 0.797 0.797 0.797 0.797 0.797 0.899 0.901 0.900 0.897 1.000 1.000 0.1000	0.589 0.589 0.589 0.589 0.589 0.589 0.515 0.523 0.612 0.602 1.000 1.000
2003 1.000 1.000 1.000 1.000	0.883 0.883 0.905 0.952 1.000 1.000 1.000	0.883 0.883 0.905 0.952	0.797 0.797 0.797 0.907 0.910 1.000 1.000	0.797 0.797 0.797 0.899 0.903 1.000 1.000	0.589 0.589 0.511 0.620 1.000
2001 2002 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.883 0.905 0.905 0.952 0.952 1.000 1.000 1.000 1.000 1.000 1.000	0.883 0.883 0.883 0.983 0.905 0.905 0.952 0.952 0.000 1.000 1.000 1.000		0.797 0.797 0.797 0.797 0.797 0.797 0.903 0.901 0.897 0.905 1.000 1.000	0.589 0.589 0.589 0.589 0.589 0.589 0.516 0.511 0.596 0.625 1.000 1.000
1999 2000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.976 0.883 0.976 0.883 1.000 0.905 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 0.976 0.883 0.976 0.883 1.000 0.905 1.000 0.952		0.870 0.797 0.870 0.797 0.870 0.797 1.000 0.905 1.000 1.000 1.000 1.000	0.645 0.589 0.645 0.589 0.645 0.589 0.609 0.521 1.000 0.682 1.000 1.000
1.000 1.000 1.000 1.000 1.000	0.976 0.976 1.000 1.000 1.000 1.000 1.000	0.976 0.976 1.000 1.000	0.870 0.870 0.870 1.000 1.000 1.000	0.870 0.870 0.870 1.000 1.000 1.000	0.744 0.744 0.744 0.709 1.000 1.000
1996 1997 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	0.994 0.976 0.994 0.976 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000	1.000 1.000 0.994 0.976 0.994 0.976 1.000 1.000 1.000 1.000		0.970 0.870 0.970 0.870 0.970 0.870 1.000 1.000 1.000 1.000 1.000 1.000	0.968 0.842 0.968 0.842 0.968 0.811 1.000 1.000 1.000 1.000
Euro 1 Euro 2 Euro 3 Euro 4	Pre-Euro 1 Euro 1 Euro 2 Euro 3 Euro 3 Euro 4 Euro 1 Euro 1	Euro 4 Pre-Euro 1 Euro 2 Euro 3 Euro 3	10.	П	Old Pre-Euro I Euro II Euro III Euro III Euro IV
Petrol	Diesel cars Petrol LGVs	Diesel LGVs	Rigid HGVs	Artic HGVs	Buses

Appendix C: Examples of mileage scaling factors applicable to 2009 emission factors

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Table C1: Mileage scaling factors for CO by vehicle category and reference year (cars <2.5 tonnes).

				Total collection D																Milea	age scaling	Mileage scaling factor by reference year	eference y	ear															
Code	Vehicle type	pe Fuel type	e Engine capacity (cc)	standard	\$661	9661	£661	8661	6661	2000	1007	2002	2003	7007	2002	5000	2007		5000	5010	2012	2013	7014	2015	5016	2017	2018	5019	5020	1707	2022	2023	5024	2025	5026	7202	8707	5059	5030
R001	Car <2.5 t		<1400 cc	Pre-Euro 1	1.172	1.192	1.210	1.226	1.239	1.250	1.261	1.270	1.278	1.285	ı	ı	ı	1.291		ı		ı	_	-	0 1.139	_	1.123	1.123	-	1.123	1.123	1.123	1.123	1.123	1.123	1.123 1	1.123	1.123	1.123
R002	Car <2.5 t		<1400 cc	Euro 1	0.522	0.637	0.747	0.956	1.154	1.337	1.503	1.655	1.790	1.909													2.007			1.634	1.558	1.558	1.558	1.558	1.558	1.558 1	_		.558
R003	Car <2.5 t		<1400 cc	Euro 2				0.754	0.804	0.851	0.893	0.982	1.064	1.139									_				1.540			1.453	1.414	1.369	1.318	1.261	1.230	_	_		230
R004	Car <2.5 t		<1400 cc	Euro 3								0.943	0.955	996.0									_				1.122			1.127	1.126	1.124	1.119	1.108	1.100	_	_		.053
R005	Car <2.5 t	t Petrol	<1400 cc	Euro 4												J	-	-	Ĭ	-			_				1.661			1.823	1.861	1.893	1.916	1.928	1.928	_	_		.790
R006	Car <2.5 t	t Petrol	<1400 cc	Euro 5																	0.5	-	_	0 0.847	-		1.178			1.494	1.584	1.661	1.724	1.778	1.823	_	_		928
R007	Car <2.5 t	t Petrol	<1400 cc	Euro 6																						0.587	0.671			0.927	1.062	1.178	1.288	1.394	1.494				.778
R008	Car <2.5 t	t Petrol	1400-2000 cc	Pre-Euro 1	1.259	1.283	1.304	1.334	1.353	1.371	1.386	1.399	1.410	1.419	1.426	l	ł	i					77.7.1	7 1.238			1.169	i	ŀ	1.169	1.169	1.169	1.169	1.169	1.169	_	_		169
R009	Car <2.5 t	t Petrol	$1400-2000 \infty$	Euro 1	0.660	0.795	0.926	1.205	1.465	1.704	1.919	2.115	2.289	2.441	2.572	2.681 2	2.772 23	2.846 2.9	2.901 2.9	2.938 2.954	54 2.948	48 2.929			64		2.422			1.880	1.77.1	1.77.1	1.77.1	1.771	1.771		1.77.1	177.1	.771
R010	Car <2.5 t	t Petrol	1400-2000 cc	Euro 2				0.787	0.849	0.911	0.970	1.085	1.192	1.290	1.379								_	7 1.804		_	1.780			1.642	1.585	1.519	1.445	1.362	1317	_	_		317
R011	Car <2.5 t	t Petrol	$1400-2000 \infty$	Euro 3								0.951	996'0	0.982	0.997					097 1.113			_		2 1.170	0 1.177	1.181			1.185	1.183	1.179	1.172	1.154	1.142		_		.073
R012	Car <2.5 t	t Petrol	1400-2000 cc	Euro 4												ر	-	_	Ĭ				_	7 1.709		_	2.024			2.242	2.290	2.325	2.346	2.352	2.348				.123
R013	Car <2.5 t	t Petrol	1400-2000 cc	Euro 5																	-9.0	-	_	_						1.828	1.934	2.024	2.107	2.181	2.242				352
R014	Car <2.5 t	t Petrol	1400-2000 ∝	Euro 6												ı										0.642		_		1.095	1.270	1.431	1.577	1.709	1.828		2.024 2	2.107	181
R015	Car <2.5 t	t Petrol	>2000 cc	_	1.380	1.397	1.414	1.443	1.460	1.473	1.484	1.492	1.499	1.503	ŀ		ŀ	i					3 1.346	6 1.303	3 1.256				ł	1.230	1.230	1.230	1.230	1.230	1.230				230
R016	Car <2.5 t	t Petrol	>2000 cc		0.664	0.813	0.958	1.269	1.563	1.835	2.080	2.303	2.503	2.681										(-,						2.163	2.047	2.047	2.047	2.047	2.047				.047
R017	Car <2.5 t	t Petrol	>2000 cc	Euro 2				0.802	0.871	0.937	1.006	1.134	1.253	1.363	1.463	1.552	1.633	71 2697	1.755 1.8	1.808 1.853	53 1.888	716.1 88								1.778	1.717	1.647	1.567	1.478	1.430				430
R018	Car <2.5 t	t Petrol	>2000 cc	Euro 3								0.954	0.972	0.989										_						1.216	1.214	1.210	1.202	1.185	1.173				660
R019	Car < 2.5 t	t Petrol	>2000 cc	Euro 4												٥	_	-					3 1.696		6 1.985					2.455	2.512	2.560	2.585	2.588	2.581	2.567 2			354
R020	Car < 2.5 t	t Petrol		Euro 5																	990	-	_	_						1.985	2.109	2.209	2.302	2.383	2.455				588
R021	Car < 2.5 t		>2000 cc	Euro 6																						Ĭ	-	Ĭ		1.178	1.376	1.533	1.696	1.846	1.985				383
R022	Car < 2.5 t	t Diesel	<1400 cc	Pre-Euro 1	1.045	1.061	1.076	1.090	1.102	1.113	1.125	1.135	1.146	1.155			ı	i	1						į			i	1	1.193	1.193	1.193	1.193	1.193	1.193			ļ.	193
R023	Car < 2.5 t		<1400 cc	Euro 1	1.027	1.013	1.000	0.985	0.972	0.959	0.950	0.950	0.950	0.950	0.950	_	0.950 0.	9.0 056.0	0.950 0.9	0.950 0.950	_		Ĭ	0.950	0 0.950	-	_	Ĭ	_	0.950	0.950	0.950	0.950	0.950	0.950	-	_		950
R024	Car < 2.5 t			Euro 2				0.643	0.730	0.830	0.861	1.020	1.168	1.315	1.444	1.569 1								1 2.304						2.492	2.487	2.474	2.453	2.424	2.406				406
R025	Car < 2.5 t	t Diesel		Euro 3								0.802	0.821	0.854	0.887					179 1.283	83 1.414		3 1.596							1.754	1.772	1.791	1.816	1.824	1.824				777.
R026	Car < 2.5 t	t Diesel		Euro 4												J	-	-	-	-		38 1.146		3 1.413	3 1.652					2.459	2.471	2.498	2.556	2.661	2.736				.897
R027	Car < 2.5 t			Euro 5																	0.5	-	_	_	_		1.146			1.652	1.954	2.227	2.372	2.441	2.459				199
R028	Car < 2.5 t	t Diesel	<1400 cc	Euro 6												- 1	-	-				-	-			0.545	0.650			0.912	1.038	1.146	1.273	1.413	1.652				441
R029	Car < 2.5 t			Pre-Euro 1	1.101	1.121	1.139	1.155	1.168	1.174	1.189	1.198	1.204	1.210	1.214	1.217 1	1.219 1.	1.218 1.2	1.214 1.2	1.208 1.197	571.1 76	75 1.160	0 1.143	3 1.123	3 1.102	2 1.090	1.090		1.090	1.090	1.090	1.090	1.090	1.090	1.090	1.090.1	1.090.1	060'1	060
R030	Car < 2.5 t			Euro 1	1.017	1.005	0.994	0.974	0.955	0.950	0.950	0.950	0.950	0.950	-	-	_			_	-	-	Ĭ	_	-	-	0.950	Ĭ	_	0.950	0.950	0.950	0.950	0.950	0.950	_	-		950
R031	Car < 2.5 t		_	Euro 2				0.720	0.847	0.970	1.072	1.286	1.484	1.667													2.553		2.371	2.277	2.168	2.042	1.900	1.742	1.657				.657
R032	Car < 2.5 t			Euro 3								0.845	0.904	0.965						470 1.563		43 1.703	3 1.749	9 1.787		4 1.837	1.856		1.882	1.880	1.871	1.858	1.832	1.733	1.677		1.538		.363
R033	Car < 2.5 t			Euro 4												J	-						_		2 2.296		2.617		2.810	2.873	2.925	2.970	3.008	3.029	3.025				.687
R034	Car < 2.5 t			Euro 5																	0.6	-	_				1.647	1.867	2.082	2.296	2.481	2.617	2.725	2.810	2.873	2.925 2		3.008	.029
R035	Car < 2.5 t		7	Euro 6	ĺ		į					ļ		į	ł	!	i	i	į	į	i	ı	ł	i	į	-	0.804	Ĭ	1.072	1.194	1.426	1.647	1.867	2.082	2.296			į	810
R036	Car < 2.5 t			Pre-Euro 1	1.131	1.150	1.166	1.180	1.192	1.182	1.210	1.217	1.223	1.227	1.230	1.232 1	1.232 1.	1.230 1.2	1.226 1.2	1.219 1.209	09 1.192	92 1.177	7 1.160	0 1.141	1 1.120	0 1.108	1.108		1.108	1.108	1.108	1.108	1.108	1.108	1.108		1.108		108
R037	Car < 2.5 t			Euro 1	1.018	1.007	0.996	0.975	0.955	0.950	0.950	0.950	0.950	0.950		_	-		-	-	-	-	_	-	-	_	_	_	0.950	0.950	0.950	0.950	0.950	0.950	0.950	-	-		950
R038	Car < 2.5 t			Euro 2				0.728	0.851	0.970	1.087	1.308	1.513	1.703												9 2.677			2.486	2.396	2.290	2.166	2.027	1.871	1.787	1.787			787
R039	Car < 2.5 t			Euro 3								0.849	0.907	0.956													_	_	1.935	1.933	1.926	1.912	1.886	1.798	1.743			1.526	.435
R040	Car < 2.5 t			Euro 4												J	-					17 1.639		6 2.132			2.703	2.821	2.913	2.986	3.045	3.099	3.138	3.153	3.148		3.102 3		.837
R041	Car < 2.5 t	_	٨	Euro 5																	0.6	-	_				1.639			2.368	2.556	2.703	2.821	2.913	2.986				.153
R042	Car < 2.5 t	t Diesel	>2000 cc	Euro 6		į	į		j							- 1		ı	į				-				Ĭ	- 1	1.076	1.175	1.417	1.639	1.876	2.132	2.368	2.556 2	2.703 2		.913
R043	Car < 2.5 t		All		0.710	0.795	0.878	1.205	1.465	1.704	1.919	2.115	2.289	2.441	2.572	2.681 2	2.772 2.	2.846 2.9	2.901 2.9	2.938 2.954	54 2.948	48 2.929	9 2.891	1 2.816	6 2.679	9 2.561	.,			1.880	1.771	1.771	1.771	1.771	1.771	_		1.77.1	.771
R044	Car < 2.5 t	_	All	Euro 2				0.787	0.849	0.911	0.970	1.085	1.192	1.290													_		_	1.642	1.585	1.519	1.445	1.362	1317	1317 1			317
R045	Car < 2.5 t		VII	Euro 3								0.951	996'0	0.982												_	1.181		_	1.185	1.183	1.179	1.172	1.154	1.142	1.127	_		.073
R046	Car < 2.5 t		All	Euro 4												J	-	-	-							_	2.024			2.242	2.290	2.325	2.346	2.352	2.348				.123
R047	Car < 2.5 t	t LPG	All	Euro 5																	9.0	-	_	_		5 1.270	1.431	1.577	1.709	1.828	1.934	2.024	2.107	2.181	2.242	2.290 2	2.325 2	2.346	.352
R048	Car < 2.5 t		All	Euro 6																						0.642	0.761		-	1.095	1.270	1.431	1.577	1.709	1.828			.107	2.181

Table C2: Mileage scaling factors for CO by vehicle category and reference year (cars >2.5 tonnes).

	R061	R060	R059	R058	R057	R056	R055	R054	R053	R052	R051	R050	R049	Code	
	Car 2.5-3.5 t	Vehicle type													
!	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Petrol	Fuel type							
	All	IIA	(cc)	Enoine canacity											
1	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro 1	Ешто б	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro 1		Emission
						1.082							1.351	1995	
					1.026	1.105						0.519	1.360	1996	
					1.014	1.126						0.691	1.369	1997	
					1.003	1.144						0.822	1.415	1998	
					0.992	1.159						0.959	1.434	1999	
				0.728	0.973	1.148					0.802	1.275	1.450	2000	
				0.849	0.952	1.185					0.876	1.568	1.463	2001	
				0.940	0.950	1.196					0.938	1.840	1.475	2002	
			0.849	1.171	0.950	1.205				0.954	1.070	2.085	1.485	2003	
			0.907	1.387	0.950	1.214				0.972	1.194	2.308	1.493	2004	
			0.966	1.586	0.950					0.989	1.309	2.508	1.499	2005	
			1.023	1.767	0.950	1.225				1.007	1.413	2.684	1.503	2006	
			1.076	1.932	0.950	1.230				1.024	1.508	2.837	1.504	2007	
		0.653	1.181	2.100	0.950	1.232			0.667	1.051	1.598	2.965	1.499	2008	
		0.805	1.278	2.233	0.950	1.232			0.792	1.073	1.670	3.075	1.492	2009	
		0.948	1.381	2.341	0.950	1.229			0.928	1.095	1.732	3.160	1.482	2010	
		1.076	1.492	2.442	0.950	1.224			1.055	1.116	1.790	3.231	1.469	2011	Mileage s
		1.175	1.594	2.523	0.950	1.216			1.178	1.135	1.839	3.280	1.448	2012	caling fact
	0.653	1.417	1.676	2.580	0.950	1.202		0.667	1.376	1.152	1.877	3.296	1.418	2013	Mileage scaling factor by refer
	0.805	1.639	1.740	2.627	0.950	1.177		0.792	1.533	1.166	1.908	3.288	1.383	2014	гепсе усаг
	0.948	1.876	1.791	2.666	0.950	1.160		0.928	1.696	1.178	1.931	3.266	1.346	2015	
	1.076	2.132	1.831	2.688	0.950	1.141		1.055	1.846	1.189	1.943	3.224	1.303	2016	
	1.175	2.368	1.863	2.691	0.950	1.120		1.178	1.985	1.199	1.943	3.143	1.256	2017	
	1.417	2.556	1.888	2.679	0.950	1.108	0.667	1.376	2.109	1.207	1.936	3.017	1.230	2018	
	1.639	2.703	1.912	2.658	0.950	1.108	0.792	1.533	2.209	1.214	1.924	2.892	1.230	2019	
5	1.876	2.821	1.929	2.626	0.950	1.108	0.928	1.696	2.302	1.217	1.898	2.744	1.230	2020	
	2.132	2.913	1.935	2.525	0.950	1.108	1.055	1.846	2.383	1.217	1.851	2.573	1.230	2021	
3	2.368	2.986	1.933	2.443	0.950	1.108	1.265	1.985	2.455	1.216	1.805	2.380	1.230	2022	
	2.556	3.045	1.926	2.345	0.950	1.108	1.451	2.109	2.512	1.214	1.749	2.163	1.230	2023	
200	2.703	3.099	1.912	2.230	0.950	1.108	1.614	2.209	2.560	1.210	1.683	2.047	1.230	2024	
	2.821	3.138	1.887	2.099	0.950	1.108	1.774	2.302	2.585	1.202	1.608	2.047	1.230	2025	
	2.913	3.153	1.798	1.951	0.950	1.108	1.924	2.383	2.588	1.185	1.524	2.047	1.230	2026	
	2.986	3.148	1.743	1.787	0.950	1.108	2.065	2.455	2.581	1.173	1.430	2.047	1.230	2027	
	3.045	3.133	1.680	1.787	0.950	1.108	2.170	2.512	2.568	1.157	1.430	2.047	1.230	2028	
9	3.099	3.103	1.607	1.787	0.950	1.108	2.271	2.560	2.541	1.140	1.430	2.047	1.230	2029	
2000	3.138	3.050	1.526	1.787	0.950	1.108	2.359	2.585	2.482	1.121	1.430	2.047	1.230	2030	

Table C3: Mileage scaling factors for CO by vehicle category and reference year (taxis).

	R068	R067	R066	R065	R064	R063	Code	
Car (taxi)	Vehicle type Fuel type							
Diesel								
All	(cc)	ingine capacity						
Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro 1	standard	Emission
					1.018	1.131	1995	
					1.007	1.150	1996	
					0.996	1.166	1997	
				0.728	0.975	1.180	1998	
				0.851	0.955	1.192	1999	
				0.970	0.950	1.182	2000	
				1.087	0.950	1.210	2001	
			0.849	1.308	0.950	1.217	2002	
			0.907	1.513	0.950	1.223	2003	
			0.956	1.703	0.950	1.227	2004	
			1.008	1.874	0.950	1.230	2005	
			1.061	2.028	0.950	1.232	2006	
		0.653	1.181	2.167	0.950	1.232	2007	
		0.805	1.278	2.286	0.950	1.230	2008	
		0.948	1.381	2.391	0.950	1.226	2009	
		1.076	1.492	2.479	0.950	1.219	2010	
		1.175	1.594	2.546	0.950	1.209	2011	Mileage sc
	0.653	1,417	1.676	2.595	0.950	1.192	2012	aling fact
	0.805	1.639	1.740	2.639	0.950	1.177	2013	fileage scaling factor by refere
	0.948	1.876	1.791	2.675	0.950	1.160	2014	ence year
	1.076	2.132	1.831	2.691	0.950	1.141	2015	
	1.175	2.368	1.863	2.689	0.950	1.120	2016	
0.653	1.417	2.556	1.888	2.677	0.950	1.108	2017	
0.805	1.639	2.703	1.912	2.653	0.950	1.108	2018	
0.948	1.876	2.821	1.929	2.611	0.950	1.108	2019	
1.076	2.132	2.913	1.935	2.486	0.950	1.108	2020	
1.175	2.368	2.986	1.933	2.396	0.950	1.108	2021	
1.417	2.556	3.045	1.926	2.290	0.950	1.108	2022	
1.639	2.703	3.099	1.912	2.166	0.950	1.108	2023	
1.876	2.821	3.138	1.886	2.027	0.950	1.108	2024	
2.132	2.913	3.153	1.798	1.871	0.950	1.108	2025	
2.368	2.986	3.148	1.743	1.787	0.950	1.108	2026	
2.556	3.045	3.133	1.680	1.787	0.950	1.108	2027	
2.703	3.099 3	3.102	1.607	1.787	0.950 (1.108	2028	
2.821	3.138	3.049	1.526	1.787	0.950	1.108	2029	
2.913	3.153	2.837	1.435	1.787	0.950	1.108	2030	

Table C4: Mileage scaling factors for CO by vehicle category and reference year (LGV N1(I)).

R083	R082	R081	R080	R079	R078	R077	R076	R075	R074	R073	R072	R071	R070	Code	1
LGV NI(I)	LGV NI(I)	LGV N1(I)	LGV NI(I)	LGV N1(I)	LGV NI(I)	LGV N1(I)	LGV NI(I)	LGV N1(I)	LGV NI(I)	LGV NI(I)	LGV NI(I)	LGV N1(I)	LGV NI(I)	Vehicle type	
Diesel	Petrol	Fuel type													
À	All	All	All	All	All	All	All	All	All	All	All	All	All	(cc)	Engine capacity
Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro 1	Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro 1		Emission
						1.095							1.199	1995	1
					1.021	1.134						0.697	1.263	1996	
					1.005	1.170						0.954	1.314	1997	
					0.989	1.200						1.201	1.351	1998	
				0.778	0.960	1.222					0.875	1.600	1.376	1999	
				0.948	0.950	1.234					0.983	1.986	1.386	2000	
				1.103	0.950	1.250					1.075	2.262	1.395	2001	
			0.877	1.423	0.950	1.255				0.971	1.245	2.489	1.391	2002	
			0.955	1.740	0.950	1.253				0.992	1.393	2.653	1.379	2003	
			1.039	2.039	0.950	1.243				1.013	1.515	2.755	1.359	2004	
			1.115	2.301	0.950	1.226				1.031	1.609	2.795	1.330	2005	
			1.191	2.525	0.950	1.197				1.048	1.678	2.775	1.289	2006	
		0.718	1.366	2.698	0.950	1.153			0.790	1.083	1.721	2.697	1.233	2007	
		0.931	1.515	2.814	0.950	1.153			0.969	1.109	1.738	2.563	1.233	2008	
		1.130	1.662	2.857	0.950	1.153			1.125	1.132	1.730	2.388	1.233	2009	
		1.308	1.800	2.824	0.950	1.153			1.255	1.151	1.698	2.182	1.233	2010	
		1.489	1.922	2.709	0.950	1.153			1.380	1.165	1.643	2.059	1.233	2011	Mileage
	0.718	1.842	2.000	2.521	0.950	1.153		0.790	1.603	1.170	1.571	2.059	1.233	2012	scaling fa
	0.931	2.185	2.026	2.272	0.950	1.153		0.969	1.796	1.169	1.486	2.059	1.233	2013	Mileage scaling factor by refer
	1.130	2.524	2.014	2.113	0.950	1.153		1.125	1.965	1.162	1.436	2.059	1.233	2014	erence year
	1.308	2.842	1.968	2.113	0.950	1.153		1.255	2.103	1.152	1.436	2.059	1.233	2015	
	1.489	3.122	1.899	2.113	0.950	1.153		1.380	2.201	1.140	1.436	2.059	1.233	2016	
0.718	1.842	3.301	1.799	2.113	0.950	1.153	0.790	1.603	2.242	1.125	1.436	2.059	1.233	2017	
0.931	2.185	3.362	1.657	2.113	0.950	1.153	0.969	1.796	2.231	1.106	1.436	2.059	1.233	2018	
1.130	2.524	3.335	1.615	2.113	0.950	1.153	1.125	1.965	2.186	1.100	1.436	2.059	1.233	2019	
1.308	2.842	3.228	1.615	2.113	0.950	1.153	1.255	2.103	2.113	1.100	1.436	2.059	1.233	2020	
1.489	3.122	3.069	1.615	2.113	0.950	1.153	1.380	2.201	2.026	1.100	1.436	2.059	1.233	2021	
1.842	3.301	2.840	1.615	2.113	0.950	1.153	1.603	2.242	1.916	1.100	1.436	2.059	1.233	2022	
2.185	3.362	2.513	1.615	2.113	0.950	1.153	1.796	2.231	1.773	1.100	1.436	2.059	1.233	2023	
2.524	3.335	2.416	1.615	2.113	0.950	1.153	1.965	2.186	1.733	1.100	1.436	2.059	1.233	2024	
2.842	3.228	2.416	1.615	2.113	0.950	1.153	2.103	2.113	1.733	1.100	1.436	2.059	1.233	2025	
3.122	3.069	2.416	1.615	2.113	0.950	1.153	2.201	2.026	1.733	1.100	1.436	2.059	1.233	2026	
3.301	2.840	2.416	1.615	2.113	0.950	1.153	2.242	1.916	1.733	1.100	1.436	2.059	1.233	2027	
3.362	2.513	2.416	1.615	2.113	0.950	1.153	2.231	1.773	1.733	1.100	1.436	2.059	1.233	2028	
3.335	2.416	2.416	1.615	2.113	0.950		2.186	1.733	1.733	1.100	1.436	2.059	1.233	2029	
							2.113		1.733		1.436	2.059	1.233	ı	

Table C5: Mileage scaling factors for CO by vehicle category and reference year (LGV N1(IIII)).

			Engine canacity	Emission																Marcago	y waring taxed	actor by reter	deline year																1
Code	Vehicle type Fuel type	Fuel type		standard	\$661	9661	L661	8661	6661	5000	1007	2002	2003	7004	5002	2007	7007	5000	5010	2011	2012	5013	7014	2015	5016	2017	8107	5019	2020	5051	2022	5053	5054	5052	2026	2027	5059	5030	
R084	TGV N1(II)	Petrol	ΑΠ	Pre-Euro 1	1.199	1.263	1.314	1351	1.376	1.386	1.395	1391	1.379		1.330 1.3	1.289 1.233		33 1.233	33 1.233	33 1.233			1.233	1.233	1.233	1.233	1.233	1.233	1.233	1.233	1.233	1.233	1.233 1.	1.233 1.3	233 1.3	233 1.23		33 1.233	33
R085	LGV N1(II)	Petrol	All	Euro 1		0.697	0.954	1.201	1.409	1.834	2.124	2.386	2.579	2.712 2		793 2.748	48 2.647			17 2.145	5 2.059	9 2.059	2.059	2.059	2.059	2.059	2.059	2.059	2.059	2.059	2.059 2	2.059 2	2.059 2.	2.059 2.0	2.059 2.0	2.059 2.059	59 2:059	59 2:059	26
R086	LGV N1(II)	Petrol	IIV	Euro 2						0.875	0.974	1.048	1.223		1.499	9.1 792.1	1721	21 1.738	88 1.730	30 1.698	3 1.643	3 1.571	1.486	1.436	1,436	1.436	1.436	1.436	1.436	1.436	1.436	1.436	1.436 1.	1.436 1,	1,436 1,	436 1.436	36 1.436		36
R087	LGV N1(II)	Petrol	Ν	Euro 3									0.971 (1.015	1.033 1.052	52 1.083	83 1.109	9 1.132	32 1.151	1.165	5 1.170	1.169	1.162	1.152	1.140	1.125	1.106	1.100	1.100	1.100	1000	1.100	1.100 1.	.100	.100 1.100	00 1.100		90
R088	LGV N1(II)	Petrol	IIV	Euro 4													0.790	96.0 06	59 1.125	25 1.255	5 1.380	0 1.603	1.796	1.965	2.103	2.201	2.242	2.231	2.186	2.113	2.026	1 916	1.773 1.	1.733 1.	7.33 1.7	1.733 1.7	1.733 1.733		33
R089	LGV N1(II)	Petrol	W	Euro 5																		0.790	0.969	1.125	1.255	1.380	1.603	1.796	1.965	2.103	2.201 2	2.242 2	2.231 2.	2.186 2.	2.113 2.0	2.026 1.5	1.916 1.773		33
R090	LGV N1(II)	Petrol	Ψ	Euro 6																							0.790	0.969	1.125	1.255	1.511	1.731	1.908 2.		2.169 2.2	2.232 2.2	2.241 2.210	10 2.140	01
R091	LGV N1(II)	Diesel	Ψ	Pre-Euro 1	1.095	1.134	1.170	1.200	1.222	1.234	1.250	1.255	1.253	1.243	1.226 1.	_	153 1.153	53 1.153	53 1.153	53 1.153	3 1.153	3 1.153	1.153	1.153	1.153	1.153	1.153	1.153	1.153	1.153				1.153 1.					53
R092	LGV N1(II)	Diesel	Ν	Euro 1		1.021	1.005	6860	0.974	0.950	0.950	0.950	0.950		0.950 0.9	0.950 0.950	50 0.950	50 0.950	0.950	50 0.950		0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950 0	0.950 0.	0.950 0.	0.950 0.9	0.950 0.950	50 0.950		20
R093	LGV N1(II)	Diesel	All	Euro 2						0.778	0.932	1.057	1.379		1.998 2.3	2.266 2.4	2.495 2.698	98 2.814	14 2.857	57 2.824	4 2.709	9 2.521	2.272	2.113	2.113	2.113	2.113	2.113	2.113	2.113	2.113 2	2.113 2	2.113 2.	2.113 2.	2.113 2.	2.113 2.1	2.113 2.113	13 2.113	13
R094	LGV N1(II)	Diesel	All	Euro 3									0.877 (1.046	1.125 1.2	1.212 1.366	66 1.515	1.662	52 1.800	0 1.922	2 2.000	2.026	2.014	1.968	1.899	1.799	1.657	1.615	1.615	1.615	1.615	1.615 1.	1.615	1.615	9.1 519.1	1.615 1.615		15
R095	LGV N1(II)	Diesel	All	Euro 4													0.718	18 0.931	1.130	30 1.308	8 1.489	9 1.842	2.185	2.524	2.842	3.122	3.301	3.362	3.335	3.228	3.069 2	2.840 2	2.513 2.	2.416 2.	2,416 2,4	2.416 2.4	2.416 2.416		91
R096	LGV N1(II)	Diesel	ΑΙΙ	Euro 5																		0.718	0.931	1.130	1.308	1.489	1.842	2.185	2.524	2.842	3.122 3	3.301 3	3.362 3.	3,335 3.	3.228 3.0	3.069 2.840	40 2.513		91
R097	LGV N1(II)	Diesel	ΑΠ	Euro 6														-									0.718	0.931	1.130	1.308	1.692 2	2.065 2	2.404 2.	2.714 3.	3.023 3.	3.240 3.3	3.346 3.357	57 3.272	72
R098	LGV N1(III)		All		1.199	1.263	1.314	1351	1.376	1.386	1.395	1391	1.379	1.359 1	1.330 1.3	1.289 1.233	33 1233	33 1.233	33 1.233	33 1.233	3 1.233	3 1.233	1.233	1.233	1.233	1.233	1.233	1.233	1.233	1.233									33
R099	LGV N1(III)	Petrol	ΑΙΙ	Euro 1		0.697	0.954	1.201	1.409	1.834	2.124	2.386	2.579		2.782 2.7	2.793 2.7.	2.748 2.647	47 2.511	11 2.347	17 2.145	5 2.059	9 2.059	2.059	2.059	2.059	2.059	2.059	2.059	2.059	2.059	2.059 2	2.059 2	2.059 2.	2.059 2.0	2.059 2.0	2.059 2.059	59 2.059		26
R100	LGV N1(III)	Petrol	All	Euro 2						0.875	0.974	1.048	1.223		1.499 1.5	5991 1.665	69 1.721	21 1.738	1.730	30 1.698		3 1.571	1.486	1.436	1.436	1.436	1.436	1.436	1.436	1.436	1.436	1.436 1	1.436 1.	1.436 1.	1.436 1.	1.436 1.4	1.436 1.436		36
R101	LGV N1(III)	Petrol	All	Euro 3									0.971		1.015	1.033 1.052		83 1.109	9 1.132	12 1.151	_	5 1.170	1.169	1.162	1.152	1.140	1.125	1.106	1.100	1.100	1.100							00 1.100	00
R102	LGV N1(III)	Petrol	All	Euro 4													0.790	96'0 06	59 1.125	25 1.255	5 1.380	0 1.603	1.796	1.965	2.103	2.201	2.242	2.231	2.186	2.113	2.026	1.916.1	1.773 1.	1.733 1.	1.733 1.7	1.733 1.7	1.733 1.733		33
R103	LGV N1(III)	Petrol	All	Euro 5																		0.790	0.969	1.125	1.255	1.380	1.603	1.796	1.965	2.103	2.201 2	2.242 2	2.231 2.	2.186 2.	2.113 2.0	2.026 1.9	1.916 1.773		33
R104	LGV N1(III)	Petrol	All	Euro 6																							0.790	0.969	1.125	1.255	1.511	1.731	1.908 2.	2.050 2.	2.169 2.3	2.232 2.2	2.241 2.210	-	9
R105	LGV N1(III)	Diesel	All		1.095	1.134	1.170	1.200	1.222	1.234	1.250	1.255	1.253		1.226 1.	1.197 1.1	1.153 1.153	53 1.153	53 1.153	53 1.153	3 1.153	3 1.153	1.153	1.153	1.153	1.153	1.153	1.153	1.153	1.153									53
R106	LGV N1(III)	Diesel	All	Euro 1		1.021	1.005	6860	0.974	0.950	0.950	0.950	0.950		0.950 0.9	0.950 0.950	50 0.950	50 0.950		50 0.950		0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950 0	0.950 0.	0.950 0.	0.950 0.9	0.950 0.950	50 0.950		20
R107	LGV N1(III)	Diesel	ΠV	Euro 2						0.778	0.932	1.057		1.696	1.998 2.3	2.266 2.4	2.495 2.698	98 2.814	14 2.857	57 2.824		9 2.521	2.272	2.113	2.113	2.113	2.113	2.113	2.113	2.113	2.113 2	2.113 2	2.113 2	2.113 2.	2.113 2.	2.113 2.1	2.113 2.113	13 2.113	13
R108	LGV N1(III)	Diesel	ΙΙV	Euro 3									0.877		1.046	1.125 1.2	1212 1366		1.662				2.026	2.014	1.968	1.899	1.799	1.657	1.615	1.615	1.615		1.615	1.615	1,615	971 5191	1.615 1.615		15
R109	LGV N1(III)	Diesel	Ψ	Euro 4													0.718	18 0.931	1.130	30 1.308	8 1.489	1.842	2.185	2.524	2.842	3.122	3.301	3.362	3.335	3.228	3.069 2	2.840 2	2.513 2	2.416 2.	2,416 2,	2.416 2.4	2.416 2.416	16 2.416	91
R110	LGV N1(III)	Diesel	ΙΙV	Euro 5																		0.718	0.931	1.130	1.308	1.489	1.842	2.185	2.524	2.842	3.122 3	3.301 3	3.362 3	3.335 3.	3.228 3.0	3.069 2.840	40 2.513	13 2.416	91
R111	LGV N1(III)	Diesel	All	Euro 6																							0.718	0.931	1.130	1.308	1.692 2	2.065 2	2.404 2	2.714 3.	3.023 3.3	3.240 3.3	3.346 3.357	57 3.272	72

Table C6: Mileage scaling factors for HC by vehicle category and reference year (cars < 2.5 tonnes).

R048	R047	R046	R045	R044	R043	R042	R041	B040	R039	R038	R037	R036	R035	R034	R033	R032	R031	R030	R029	R028	R027	R026	R025	DO2.	R022	R021	R020	R019	R018	R017	R016	R014	R013	R012	R011	R010	B000	R007	R006	R005	R004	R003	R002		Code
Car <2.5 t	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.51	Car <2.51	Car 2	Car <2.5t	Car<2.5t	Car<2.51	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.51	Car<2.5t	Car<2.5t	Car⊲2.5t	Car <2.51	Car 42.51	CH <2.51	Car <2.5t	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.5t	Car <2.51	Car<2.51	Car<2.5t	Car<2.5t	Car<2.5t	Car <2.51	CH (2.5)	Car 42.51	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.5t	Car<2.51	2	Vehicle type
LPG	LPG	LPG	LPG	LPG	LPG	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol	Fellon	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol		
All	All	All	All	All	ΑII	>2000 cc	>2000 cc	>2000 00	>2000 cc	>2000 cc	>2000 cc	>2000 cc	1400-2000 ∝	<1400 cc	<1400 cc	<1400 cc	<1400 cc	<1400 55	<1400 cc	>2000 cc	>2000 cc	>2000 cc	>2000 cc	>2000 cc	>2000 cc	1400-2000 cc	1400-2000 cc	1400-2000 cc	1400-2000 cc	1400-2000 cc	1400 2000 00	<1400 cc	<1400 cc	<1400 cc	<1400 cc	<1400 cc	<1400 cc	100	Fuel type Engine capacity (cc)						
Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Euro 6	Euro 5	Final	Euro 3	Euro 2	Euro 1	Pre-Euro	Euro 6	Euro 5	Euro 4	Euro 3		Euro 1	ъ		Euro 5	Euro 4	Euro 3	T OIL 2	Pre-Euro	Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	İ	Euro 5			Euro 2	-	1	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	,	ty Emission standard
					0.726						1.017	1 1.272						1.016	1 1.208					1.020	_						0.682	Ì				0.070	-	-					0.548		ı
					6 0.806						7 1.006	2 1.310						6 1.005	8 1.250					0 1.013							2 0.823	1				0.000		1					8 0.656		96
					0.885							1.344							1.288					1.000							0.960	1				0.550		1					0.761		97
				0.810	1.194					0.782	0.976	1.373					0.776	0.975	1.321				0.714	0.900	1.186					0.823	1.255					0.810	1104	1 282				0.780	0.958	199	98
				0.865	1.440					0.881	0.957	1.397					0.878	0.958	1.349				0.704	0.973	1.211					0.884	1.533					0.865	1.440	1 208					1.146	199	99
				0.920	1.666					0.976	0.952	1.378					0.976	0.952	1.361				0.004	0.901	1.233					0.944	1.791					0.920	1666	1313				0.867	1319	200	00
				0.973	1.871					1.069	0.952	1.435					1.057	0.952	1.393				0.009	0.900	1.258					1.005	2.023					0.973	1.021	3%				0.905	1.476	200	01
			0.920	1.076	2.056				0.789	1.246	0.952	1.450				0.783	1.228	0.952	1.410				0.723	0.932	1.280				0.926	1.120	2.235				0.920	1.076	2000	1 2 2 7			0.908	0.984	1.620	200)2
			0.945	1.171	2.221				0.869	1,410	0.952	1.462				0.865	1.387	0.952	1.423				0.749	1000	1.302				0.954	1.227	2.424				0.945	1.171	2010	1346			0.927	1.057	1.749	200)3
			0.971	1.260	2.365				0.938	1.562	0.952	1.471				0.950	1.533	0.952	1.435				0.795	0.952	1.320				0.982	1.325	2.592				0.971	1.260	3 3 6 6	36			0.945	1.124	1.861	200)4
			0.995	1.339	2.489				1.011	1.698	0.952	1.477				1.026	1.663	0.952	1.444				0.841	0.902	1.337				1.009	1.414	2.738				0.995	1.339	1.333	1350			0.963	1.185	1.958	200)5
			1.020	1.411	2.592				1.085	1.822	0.952	1.480				1.099	1.781	0.952	1.451				0.902	1255	1.357				1.038	1.494	2.863				1.020	1,411	202.1	385			0.983	1.241	2.041	200)6
		0.741	1.060	1.474	2.678		0.302	0 332	1.254	1.932	0.952	1.481			0.314	1.260	1.884	0.952	1.454			0.124	1.023	0.932	1.375			0.759	1.084	1.566	2.966			0.741	1.060	1.474	1.501	3		0.701	1.014	1.291	2.110	200)7
		0.827	1.096	1.527	2.749		0.024	0.624	1.389	2.027	0.952	1.477			0.623	1.394	1.979	0.952	1.451			0.325	1.0%	0.932	1.394			0.849	1.118	1.622	3.046	ĺ		0.827	1.096	1.527	3 3 3 5	357		0.762	1.040	1.335	2.166	200)8
		0.909	1.128	1.573	2.800		0.300	0000	1.533	2.111	0.952	1.469			0.900	1.528	2.055	0.952	1.444			0.542	1.166	1700	1.404			0.948	1.155	1.676	3.113			0.909	1.128	1.573	3 000	1350		0.827	1.064	1.372	2.212	200)9
		0.989	1.158	1.615	2.836		1.140	1 146	1.689	2.182	0.952	1.455			1.139	1.659	2.121	0.952	1.431			0.708	1.0/3	0.932	1.415			1.040	1.188	1.723	3.160			0.989	1.158	1.615	1.337	337		0.889	1.088	1.404	2.247	201	0
		1.069	1.184	1.652	2.851		1.330	1 338	1.833	2.235	0.952	1.433			1.374	1.789	2.169	0.952	1.407			0.831	1.397	0.952	1.423			1.129	1.219	1.763	3.175			1.069	1.184	1.652	1.510	316		0.947	1.110	1.431	2.268	201	1
	0.741	1.195	1.208	1.679	2.846		0.332	1 803	1.947	2.275	0.952	1.397		0.314	1.822	1.902	2.205	0.952	1.363		0.124	1.074	1.581	1000	1.424		0.759	1.272	1.247	1.794	3.167		0.741	1.195	1.208	1.679	2016	1200	0.701	1.045	1.130	1.453	2.271	201	12
	0.827	1.312	1.228	1.699	2.828		0.624	2 222	2.037	2.310	0.952	1.367		0.623	2.247	1.985	2.234	0.952	1.332		0.325	1.281	1.747	1020	1,423		0.849	1.385	1.269	1.821	3.144		0.827	1.312	1.228	1.699	1.204	1364	0.762	1.129	1.147	1.470	2.262	201	13
	0.909	1.417	1.246	1.713	2.791		0.900	2 688	2.109	2.338	0.952	1.332		0.900	2.670	2.050	2.259	0.952	1.296		0.542	1.527	1.836	0.952	1.419		0.948	1.504	1.289	1.839	3.100		0.909	1.417	1.246	1.713	100	324	0.827	1.208	1.161	1.484	2.239	201	4
	0.989	1.513	1.263	1.719	2.720		1.146	3 181	2.165	2.351	0.952	1.292		1.139	3.084	2.102	2.274	0.952	1.256		0.708	1.795	1.877	0.932	1.413		1.040	1.612	1.308	1.845	3.022		0.989	1.513	1.263	1.719	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1001	0.889	1.285	1.173	1.492	2.192	201	15
	1.069	1.599	1.276	1.717	2.590		1.338	3636	2.210	2.350	0.952	1.248		1.374	3,498	2.141	2.272	0.952	1211		0.831	2.256	1.889	2000	1,405		1.129	1.712	1.324	1.841	2.910		1.069	1.599	1.276	1.717	2 500	163	0.947	1.357	1.183	1.494	2.117	201	6
0.741	1.195	1.675	1.287	1.710	2.478	0.332	1.803	2 008	2.245	2.340	0.952	1.224	0.314	1.822	3.853	2.172	2.260	0.952	1.187	0.124	1.074	2.838	1.896	0.952	1.400	0.759	1.272	1.802	1.336	1.834	2.792	0.741	1.195	1.675	1.287	1.710	170	0.701	1.045	1.422	1.191	1.491	2.043	201	17
0.827	1.312	1.741	1.295	1.698	2.347	0.624	2.232	4 281	2.278	2.321	0.952	1.224	0.623	2.247	4.116	2.199	2.241	0.952	1.187	0.325	1.281	3.365	1.912	0.952	1.400	0.849	1.385	1.875	1.347	1.820	2.652	0.827	1.312	1.741	1.295	1.698	3 1 5	0.762	1.129	1.478	1.199	1.483	1.954	201	18
0.909	1.417	1.800	1.299	1.673	2.195	0.900	2.688	4 508	2.302	2.287	0.952	1.224	0.900	2.670	4.324	2.223	2.207	0.952	1.187	0.542	1.527	3,644	1.948	0.952	1.400	0.948	1.504	1.942	1.352	1.791	2,491	0.909	1.417	1.800	1.299	1.673	3105	0.827	1.208	1.523	1.204	1.466	1.851	201	19
0.989	1.513	1.854	1.301	1.617	2.024	1.146	3.181	4 686	2.311	2.188	0.952	1.224	1.139	3.084	4.488	2.236	2.095	0.952	1.187	0.708	1.795	3,777	2.012	0.902	1.400	1.040	1.612	2.000	1.353	1.742	2.307	0.989	1.513	1.854	1.301	1.617	3 1.140	0.889	1.285	1.562	1.206	1.434	1.733	202	20
1.069	1.599	1.898	1.300	1.574	1.833	1.338	3.636	4 877	2.308	2.116	0.952	1.224	1.374	3.498	4.609	2.233	2.021	0.952	1.187	0.831	2.256	3.812	2.057	0.902	1.400	1.129	1.712	2.052	1.351	1.696	2.102	1.069	1.599	1.898	1.300	1.574	1 022	0.947	1.357	1.595	1.206	1.405	1.601	202	21
1.195	1.675	1.933	1.297	1.523	1.730	1.803	3.998	4 9 40	2.298	2.031	0.952	1.224	1.822	3.853	4.710	2.221	1.933	0.952	1.187	1.074	2.838	3.835	2.082	2000	1.400	1.272	1.802	2.093	1.348	1.642	1.991	1.195	1.675	1.933	1.297	1.523	1 7 20	1.045	1.422	1.623	1.205	1.371	1.529	202	22
1.312	1.741	1.958	1.291	1.464	1.730	2.232	4281	5044	2.278	1.932	0.952	1.224	2.247	4.116	4.795	2.202	1.833	0.952	1.187	1.281	3.365	3.887	2108	0.902	1.400	1.385	1.875	2.128	1.341	1.579	1.194	1.312	1.741	1.958	1.291	1.464	1 7 20	1.129	1.478	1.646	1.201	1.330	1.529	202	23
1.417	1.800	1.973	1.279	1.398	1.730	2.688	4.508	5 120	2.242	1.821	0.952	1.224	2.670	4.324	4.869	2.166	1.719	0.952	1.187	1.527	3.644	3.998	2.144	0.952	1.400	1.504	1.942	2.146	1.327	1.508	1.991	1.417	1.800	1.973	1.279	1.398	1 720	1.208	1.523	1.663	1.193	1.285	1.529	202	24
1.513	1.854	1.978	1.250	1.324	1.730	3.181	4.686	5 1 4 8	2.118	1.696	0.952	1.224	3.084	4.488	4.909	2.027	1.593	0.952	1.187	1.795	3.777	4.201	2.155	0.932	1.400	1.612	2.000	2.148	1.301	1.428	1.991	1.513	1.854	1.978	1.250	1.324	1 7 20	1.285	1.562	1.671	1.176	1.233	1.529	202	25
1.599	1.898	1.974	1.230	1.284	1.730	3.636	4.827	5140	2.042	1.629	0.952	1.224	3.498	4.609	4.903	1.949	1.525	0.952	1.187	2.256	3.812	4.345	2.155	2002	1.400	1.712	2.052	2.143	1.280	1.385	1.194	1.599	1.898	1.974	1.230	1.284	1720	1.357	1.595	1.671	1.162	1.205	1.529	202	26
1.675	1.933	1.966	1.207	1.284	1.730	3.998	4.940	5 100	1.953	1.629	0.952	1.224	3.853	4.710	4.866	1.858	1.525	0.952	1.187	2.838	3.835	4,420	2.148	2002	1,400	1.802	2.093	2.133	1.256	1.385	1.194	1.675	1.933	1.966	1.207	1.284	1 7 20	1.422	1.623	1.667	1.147	1.205	1.529	202	27
1.741	1.958	1.949	1.181	1.284	1.730	4.281	5.044	5051	1.851	1.629	0.952	1.224	4.116	4.795	4.808	1.754	1.525	0.952	1.187	3.365	3.887	4.501	2.135	0.952	1.400	1.875	2.128	2.114	1.228	1.385	1.991	1.741	1.958	1.949	1.181	1.284	1 7 20	1.478	1.646	1.657	1.129	1.205	1.529	202	28
1.800	1.973	1.914	1.151	1.284	1.730	4.508	5.120	4 9 4 7	1.737	1.629	0.952	1.224	4.324	4.869	4.703	1.638	1.525	0.952	1.187	3.644	3.998	4.615	2115	0.952	1.400	1.942	2.146	2.071	1.196	1.385	1.194	1.800	1.973	1.914	1.151	1.284	1720	1.523	1.663	1.632	1.109	1.205	1.529	202	29
1.854	1.978	1.812	1.119	1.284	1.730	4.686	5.148	4 530	1.610	1.629	0.952	1.224	4.488	4.909	4.251	1.509	1.525	0.952	1.187	3.777	4.201	4.656	2.089	0.952	1.400	2.000	2.148	1.979	1.161	1.385	1.991	1.854	1.978	1.812	1.119	1.284	1 720	1.562	1.671	1.571	1.086	1.205	1.529	203	30

Table C7: Mileage scaling factors for HC by vehicle category and reference year (cars > 2.5 tonnes).

			Engine canacity	Emission																	Mileage	scaling fac-	Mileage scaling factor by reference year	ence year																
Code	Vehicle type	e Fueltyp	Vehicle type Fuel type (cc)	standard	\$661	9661	£661	8661	6661	5000	1007	2002	2003	7007	5002	9007	2007	8007	5007	2010	1107	2012	2013	5014	2015	5016	7102	5018	5019	2020	1202	7077	2023	5024	5052	5026	7202	8707	5030	l
R049	Car 2.5-3.5 t	t Petrol	IIV	Pre-Euro 1	1.297	1.304	1.311	1.350	1.366	1.380	1.391	1.401	1.410	0 1.416	1.421	1.424	1.426	1.422	1.415	1.407	1.396	1.379	1.353	1.324	1.292	1.256	1.216	1.194	1.194	1.194	1.194	1.194	1.194 1	1.194	1.194 1	194 1	.194 1.	1.1 461.	1.194 1.	194
R050	Car 2.5-3.5 t	t Petrol	IIV	Euro 1		0.545	0.707	0.832		0.961 1.261	1.538	8 1.796	5 2.028	8 2.239	2.428	2.595	2.740	2.861	2.966	3.046	3.113	3.160	3.175	3.167	3.147	3.106	3.030	2.910	2.792	2.652	2.491	2.307 2	2.102	1.991	1.991	1 166	.1 166	931 166	96.1 1.99	10
R051	Car 2.5-3.5 t	t Petrol	All	Euro 2						0.823	0.889	9 0.945	5 1.063	3 1.174	1.276	1.369	1.454	1.535	1.599	1.655	1.706	1.751	1.784	1.812	1.833	1.843	1.844	1.837	1.826	1.804	1.762	1.720	1.670	1.611	1.544	1 694	385	1.385 1.3	1.385	.385
R052	Car 2.5-3.5 t	t Petrol	IIV	Euro 3									0.926	6 0.954	0.982	1.012	1.040	1.084	1.118	1.155	1.188	1.219	1.247	1.269	1.289	1.308	1.324	1.336	1.347	1.352	1.353	1.351	1.348 1	1.341	1.328	301	280 1.3	.256 1.2	1.228 1.	961.1
R053	Car 2.5-3.5 t	t Petrol	All	Euro 4														0.759	0.849	0.948	1.040	1.129	1.272	1.385	1.504	1.612	1.712	1.802	1.875	1.942	2.000	2.052 2	2.093 2	2.128 2	2.146 2	2.148 2	2.143 2.	2.134 2.1	2.114 2.0	2.072
R054	Car 2.5-3.5 t	t Petrol	IIV	Euro 5																			0.759	0.849	0.948	1.040	1.129	1.272	1.385	1.504	1.612	1.712	1.802	1.875	1.942 2	2.000 2	2.052 2.0	2.093 2.1	2.128 2.	2.146
R055	R055 Car 2.5-3.5 t	t Petrol	ΙΙΥ	Euro 6																								0.759	0.849	0.948	1.040	1.192	1.326 1	1.444	1.560 1	1.668	.770 1.3	.846 1.5	- 1	1.983
R056	Car 2.5-3.5 t			Pre-Euro 1	1.171	1.218	1.261	1.298	1.330	1.306	1.384	1.407	7 1.426		1.456	1.467	1.476	1.481		1.475	1.465	1.447	1.418	1.367		1.292	1.248	i	ĺ	i	1.224				_		_		1.224 1.3	.224
R057	Car 2.5-3.5 t	t Diesel	All	Euro 1		1.024	1.013	1.003	0.993	0.974	0.955	5 0.952	2 0.952	2 0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952 0	0.952 0	0.952 0	0.952 0	0.952 0	0.952 0.3	0.952 0.9	0.952 0.952	52
R058	Car 2.5-3.5 t	t Diesel	All	Euro 2						0.782	0.879	9 0.952	2 1.137	7 1.309	1.468	1.613	1.745	1.879	1.985	2.072	2.152	2.217	2.263	2.301	2.331	2.349	2.352	2.341	2.325	2.299	2.219	2.153 2	2.075 1	1.983	1.878 1	760	.629	.629 1.6	1.629	.629
R059	Car 2.5-3.5 t	t Diesel	All	Euro 3									0.789	0.870	0.953	1.032	1.107	1.254	1.389	1.533	1.689	1.833	1.947	2.037	2.109	2.165	2.210	2.245	2.278	2.302	2.311	2.308 2	2.298 2	2.279 2	2.244 2	2.118 2	2.042	.953 1.8	1.851	1.737
R060	Car 2.5-3.5 t	t Diesel	All	Euro 4														0.332	0.624	0.900	1.146	1.338	1.803	2.232	2.688	3.181	3.636	3.998	4.281	4.508	4.686	4.827 4	4.940 5	5.044 5	5.120 5	5.148 5	5.140 5.	5.109 5.0	5.052 4.9	4.950
R061	Car 2.5-3.5 t	t Diesel	All	Euro 5																			0.332	0.624	0.900	1.146	1.338	1.803	2.232	2.688	3.181	3.636 3	3.998 4	4.281 4	4.508 4	4.686 4	4.827 4.	4.940 5.0	5.044 5.120	50
R062	Car 2 5-35 t	Diesel	W	Fum 6																								0.332	0.624	0.900	1.146	1.648	2.101.2	2.537 3	3.006	3466 3	3.860 4	4.152 44	4410 4.626	97

Table C8: Mileage scaling factors for HC by vehicle category and reference year (taxis).

			Enerine caracity																	Mile	eage scalin	Mileage scaling factor by reference year	reference y	ear															
Code	Code Vehicle type Fuel type	e Fuel type	(00)	standard	\$661	2661 9661		8661	6661	5000	2000	7007	5003	7004	5002	5000	2007	8007	5000	2010	2013	2013	7014	2015	5016	7102	2018	5016	2020	1707	5055	2023	5054	5707	5026	L707	8707	5076	5030
R063	Car (taxi)	Diesel	IIΑ	Pre-Euro 1	1.272	1.310	1.344	1.373	1.397	1.378	1.435	1.450	1.462	1.471	1.477 1	1.480 1.	1.481	1.477 1.	1.469 1.4	1.455 1.4	1.433 1.3	1.397 1.367	57 1.332	1.292	2 1.248	3 1.224	1.224	1.224	1.224	1.224	1.224	1.224	1.224	1.224	1.224	1.224 1	1.224 1.	1.224 1.	.224
R064	Car (taxi)	Diesel	ΙΨ	Euro 1 1.017 1.006 0.996 0.976	1.017	1.006	966'0	9260	0.957	0.952	0.952	0.952	0.952 0		0.952 0	0.952 0	0.952 0	0.952 0.	0.952 0.9	0.952 0.9	0.952 0.9	0.952 0.952	52 0.952	52 0.952	2 0.952	2 0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952 0	0.952 0.	0.952 0.	0.952
R065	Car (taxi)	Diesel	Ψ	Euro 2				0.782	0.881	926.0	1.069			1.562	1 869'1	822 1	.932 2	2.027 2.	2.111 2.	2.182 2.2	2.235 2.2	2.275 2.310	10 2.338	38 2.351	1 2.350	2.340	2.321	2.287	2.188	2.116	2.031	1.932	1.821	969'1	1.629	1.629	.629 1.	1.629 1.	679
R066	Car (taxi)	Diesel	ΙΨ	Euro 3								0.789	0.869	0.938	1.011	1 280	1.254 1	1.389 1.	1.533 1.0	8.1 689.	.833 1.9	1.947 2.037	37 2.109	9 2.165	5 2.210	3.245	2.278	2.302	2.311	2.308	2.298	2.278	2.242	2.118	2.042	1953 1	.851 1.	1.737 1.	019"
R067	Car (taxi)		Ψ	Euro 4												0	0.332 0	0.624 0.	0.900	1.146 1.3	.338 1.8	1.803 2.232	32 2.688	3.181	1 3.636	5 3.998	4.281	4.508	4.686	4.827	4.940	5.044	5.120	5.148	5.140	5.109 5	5.051 4.	4.947 4.	1.539
R068	Car (taxi)	Diesel	Ψ	Euro 5																	0.3	0.332 0.624	24 0.900	00 1.146	6 1.338	3 1.803	2.232	2.688	3.181	3.636	3.998	4.281	4.508	4.686	4.827	4.940 5	5.044 5.	5.120 5.	5.148
R069	Car (taxi)		Ψ	Euro 6																						0.332	0.624	0.900	1.146	1.338	1.803	2.232	2.688	3.181	3.636	3.998 4	4.281 4.	4.508 4.	4.686

Table C9: Mileage scaling factors for HC by vehicle category and reference year (LGV N1(I)).

			Enerine cs	3 nacity	Emission																×	fileage scal	Mileage scaling factor by reference year	by referenc	e year															
Code	Vehicle typ	pe Fuel	Vehicle type Fuel type (cc)	(i)	standard	\$661	9661	∠66 I	8661	6661	5000	1007	2002	2003	5004	5002	9007	2007	8007	5000	2010	1107	2012	2013	5017	2015	2017	2018	5019	2020	1202	2022	2023	5054	5052	5026	LZ0Z	8707	505	2030
R070	TGV N1(I)	 Petrol 	trol All		Pre-Euro 1	1.168	1.222	1.265	1.297	7	1.325 1	1.333	0	_	1.303	1.278	1.244	1.196	961.1	961.1	1.196	1.196	1.196	.1 961.	1.1 961.1	1.1 961.1	1.1 961.	961.1 961.1	961'1 9	961.1 9	961'1 9	961.1 9	961.1 9	1.196	1.196	1.196	961.1	1.196	1.196	1.196
R071	LGV N1(I)	۵	Petrol All	=	Euro 1		0.713 (0.956	1.191	1.568 1	1.934 2	2.195	2.410	2.566	2.663	2.701	2.682	2.607	2.481	2.315	2.119	2.003 2	2.003 2	2.003 2.0	2.003 2.0	2.003 2.0	2.003 2.0	2.003 2.003	B 2.003	3 2.003	3 2.003	3 2.003	3 2.003	2.003	2.003	2.003	2.003	2.003	2.003	2.003
R072	LGV N1(I)	_	Petrol All	=	Euro 2					0.888	0.985	1.067	1.219	1351	1.461	1.545	909'1	1.645	099'1	1.653	1.624	1.575	1.510	.435 1.	.390 1.3	.390 1.3	1.390 1.3	.390 1.390	0 1.390	0 1.390	0 1.390	1.390	1.390	1.390	1.390	1.390	1.390	1.390	1.390	1.390
R073	LGV N1(I)	_	Petrol All	=	Euro 3								0.953	0.987	1.021	1.050	1.077	1.134	1.177	1.215	1.245	1.267	1.276 1.	1.274 1.3	1.264 1.2	1.247 1.2	1.228	1.204 1.172	2 1.163	3 1.163	3 1.163	3 1.163	3 1.163	1.163	1.163	1.163	1.163	1.163	1.163	1.163
R074	TGV N1(I)	_	Petrol All	=	Euro 4													0.848	0.978	1.091	1.185	1.275	1.436	1.576 1.	.698 1.7	8.1 797.1.8	8.1 698.	068'1 868'1	0 1.857	7 1.805	5 1.742	1.662	1.559	1.530	1.530	1.530	1.530	1.530	1.530	1.530
R075	LGV N1(I)		Petrol All	=	Euro 5																	_	0.848 0	.1 876.0	.091	1.185 1.2	1.275 1.4	1.436 1.576	9, 1.698	8 1.797	7 1.869	1.898	8 1.890	1.857	1.805	1.742	1.662	1.559	1.530	1.530
R076	LGV N1(I)	T) Petrol	trol All			- 1																					0.848	0.848 0.978	8 1.09	1.185	5 1.275	1.436	5 1.576	1.698	1.797	1.869	1.898	1.890	1.857	1.805
R077	LGV N1(I,	T) Diesel	esel All		Pre-Euro 1	1.197	1.278	1.352	1.414	1.461	1.484	1.519	1.528	1.524	1.505	1.468	1.408	1.316	1.316	1.316	1.316	1.316			Ī		1.316 1.3					_	ī			_	1.316	1.316	1.316	1.316
R078	TGV N1(I)	 Diesel 	esel All	=	Euro 1		1.020	1.005	0.660	0.962	0.952 0	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952 (0.952 0	0.952 0	0.952 0.	0.952 0.9	0.952 0.9	0.952 0.952	52 0.952	2 0.952	2 0.952	2 0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952
R079	LGV N1(I)	 Diesel 	esel All	=	Euro 2					0.823 0	0.958	1.082	1.338	1.591	1.830	2.040	2.219	2.357	2.449	2.484	2.457	2.366 2	2.216 2	2.016 1.3	8.1 688.	8.1 688.1	8.1 688	.889 1.889	688.1	6 1.889	9 1.889	1.889	1.889	1.889	1.889	1.889	1.889	1.889	1.889	1.889
R080	TGV N1(I)	_	Diesel All	=	Euro 3								0.828	0.937	1.054	1.162	1.268	1.513	1.722	1.928	2.122	2.292 2	2.401 2	2.438 2.	2.422 2.3	2.357 2.2	2.260 2.120	20 1.921	1.862	2 1.862	2 1.862	1.862	1.862	1.862	1.862	1.862	1.862	1.862	1.862	1.862
R081	TGV N1(I)	_	Diesel All	=	Euro 4													0.456	0.866	1.251	1.594	1.942 2	2.622 3	3.283 3.	3.937 4.5	4.550 5.0	5.089 5.433	33 5.552	2 5.498	8 5.294	4 4.987	4.545	3.914	3.728	3.728	3.728	3.728	3.728	3.728	3.728
R082	LGV N1(I)		Diesel All	=	Euro 5																	٠	0.456 0	0.866 1.3	.251 1.5	.594 1.9	1.942 2.622	22 3.283	3 3.937	7 4.550	0 5.089	5.433	5.552	5.498	5.294	4.987	4.545	3.914	3.728	3.728
R083	LGV N1(I)	 Diesel 	esel All	п	Euro 6																						0.456	56 0.866	6 1.251	1.594	4 1.942	2.622	3.283	3.937	4.550	5.089	5.433	5.552	5.498	5.294
																																								l

	Code	R084	R085	R086	R087	R088	R089	R090	R091	R092	R093	R094	R095	R096	R097	R098	R099	R100	R101	R102	R103	R104	R105	R106	R107	R108	R109	R110	
	Vehicle typ	TGANI(II)	LGVN1(II)	LGVN1(II)	LGVN1(II)	LGVN1(II)	LGVN1(II)	LGVN1(II)	LGVN1(II)	LGVN1(II)	LGVN1(II)	LGV N1(II)	LGV N1(II)	LGV N1(II)	LGVN1(II)	LGV N1(III)	LGV N1(III	LGV N1(III	LGV N1(III	LGV N1(III	LGVN1(III	LGV N1(III	LGVN1(III	LGVN1(III	LGV N1(III	LGV N1(III	LGV N1(III	LGV N1(III)	
	Fuel type	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel) Petrol) Petrol) Petrol) Petrol) Petrol) Petrol) Petrol) Diesel) Diesel) Diesel) Diesel) Diesel) Diesel	
-	Vehicle type Fuel type Engine capacity (cc)	All	All	All	All	A	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	
	_	Pre-Euro	Euro 1	Eu	Eu	Euro 4	Euro 5	Eu	Pre-Euro l	Euro I	Eu	Eu	Euro 4	Euro 5	Eu	Pre-Euro	Euro I	Eu	Eu	Eu	Euro 5	Eu	Pre-Euro	Euro 1	Eu	Eu	Eu	Eu	
	Ī	_	<u>a</u>	Euro 2	Euro 3	70 4	70.5	π6		<u>a</u>	Euro 2	Euro 3	4	ъ5	Euro 6	_	<u>a</u>	Euro 2	Euro 3	Euro 4	ъ5	Euro 6	_	<u>a</u>	Euro 2	Euro 3	Euro 4	Euro 5	
	1995	1.168 1.222	0.713						1.197 1.278	1.020						1.168 1.222	0.713						1.197 1.278	1.020					
	1997	22 1.265							78 1.352	20 1.005						22 1.265	13 0.956						78 1.352	20 1.005					
	1998	55 1.297	56 1.191						52 1.414)5 0.990						55 1.297	56 1.191						52 1.414	0.990					
	1999	7 1.317							4 1.461	0 0.976						7 1.317	1 1.387						4 1.461	0 0.976					
	2000	7 1.325		0.888					1 1.484	6 0.952	0.823					7 1.325	7 1.790	0.888					1 1.484	6 0.952	0.823				
	2001	1.333		0.977					1.519	0.952	0.946					1.333	2.065	0.977					1.519	0.952	0.946				
	2002	1.330	2.313	1.043					1.528	0.952	1.045					1.330	2.313	1.043				 	1.528	0.952	1.045				
	2003	1.320	2.496	1.199	0.953				1.524	0.952	1.303	0.828				1.320	2.496	1.199	0.953				1.524	0.952	1.303	0.828			
	2004	1.303	2.621	1.334	0.991				1.505	0.952	1.556	0.951				1.303	2.621	1.334	0.991				1.505	0.952	1.556	0.951			
	2005	1.278	2.688	1.447	1.024				1.468	0.952	1.797	1.064				1.278	2.688	1.447	1.024				1.468	0.952	1.797	1.064			
	2006	1.244	2.699	1.534	1.053				1.408	0.952	2.012	1.175				1.244	2.699	1.534	1.053				1.408	0.952	2.012	1.175			
	2007	1.196	2.656	1.599	1.084				1.316	0.952	2.195	1.298				1.196	2.656	1.599	1.084				1.316	0.952	2.195	1.298			
	2008	1.196	2.560	1.645	1.134	0.848			1.316	0.952	2.357	1.513	0.456			1.196	2.560	1.645	1.134	0.848		i I	1.316	0.952	2.357	1.513	0.456		
	2009	1.196	2.431	1.660	1.177	0.978			1.316	0.952	2.449	1.722	0.866			1.196	2.431	1.660	1.177	0.978			1.316	0.952	2.449	1.722	0.866		
	2010	1.196	2.276	1.653	1.215	1.091			1.316	0.952	2.484	1.928	1.251			1.196	2.276	1.653	1.215	1.091			1.316	0.952	2.484	1.928	1.251		
Mileage scaling factor by re	2011	1.196	2.084	1.624	1.245	1.185			1.316	0.952	2.457	2.122	1.594			1.196	2.084	1.624	1.245	1.185			1.316	0.952	2.457	2.122	1.594		
aling facto	2012	1.196	2.003	1.575	1.267	1.275			1.316	0.952	2.366	2.292	1.942			1.196	2.003	1.575	1.267	1.275			1.316	0.952	2.366	2.292	1.942		
or by refere	2013	1.196	2.003	1.510	1.276	1.436	0.848		1.316	0.952	2.216	2.401	2.622	0.456		1.196	2.003	1.510	1.276	1.436	0.848		1.316	0.952	2.216	2.401	2.622	0.456	
eference year	2014		2.003						1.316							1.196	2.003	1.435	1.274	1.576	0.978	İ	1.316	0.952	2.016	2.438	3.283	0.866	
	2015	1.196	2.003						1.316							1.196							1.316	0.952	1.889	2.422	3.937	1.251	
	2016	1.196			1.247				1.316				4.550		i	1.196						i	1.316			2.357			
	2017		2.003						1.316							1.196						i	1.316						
	2018		2.003 2	1.390	1.204	1.898			1.316									1.390	1.204		1.436		1.316	0.952 (2.120			
	2019		2.003 2	1.390 1	1.172 1				1.316 1				5.552 5		i	1.196 1			1.172 1		1.576 1	į	1.316 1		1.889 1		5.552 5		
	2020	1.196 1		1.390 1	1.163 1				1.316 1							1.196 1				1.857 1		į		0.952 0		1.862 1			
	2021		2.003 2.		1.163 1.				1.316 1.													l				1.862 1.			
	2022		2.003 2.		1.163 1.				1.316 1.													i				1.862 1.			
	2023		2.003 2.0		1.163 1.				1.316 1.3							1.196 1.						l	1.316 1.3		1.889 1.1		4.545 3.9		
	2024		2.003 2.003	1.390 1.3	1.163 1.1				1.316 1.3						i	1.196 1.1				1.559 1.5		i	1.316 1.3		1.889 1.8		3.914 3.7		
	2025	1.196 1.1	03 2.003						1.316 1.316													ļ	1.316 1.316			1.862 1.8			
	2026		03 2.003		1.163 1.163				316 1.316							96 1.196						ļ	816 1.316			862 1.862	3.728 3.73		
	2027		03 2.003						16 1.316													i							
		96 1.196							16 1.316													•				62 1.862			
		96 1.196							16 1.316													i							

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Table C11: Mileage scaling factors for NO_x by vehicle category and reference year (cars <2.5 tonnes).

100 100
0.870 0.870
0.870 (0.880 (0.890) (
0.550 0.580 0.580 0.800
0.890 0.890
0.870 0.880 0.870
0.890 0.976 1.1.54 1.1.154 0.890 0.890 0.890 1.1.184 0.890 0.890 0.890 0.890 0.890 0.890
1 1
8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
1014 1014 1034 1174 11070 0.684 0.890 0.968 11036 11022 0.684 0.68
1025 1026 1027 1021 1021 1021 0.880 0.988 0.988 1023 1023 0.684 0.
10350 10350 10360 10340 1024 1024 10380 10380 1038 1025 1025 1025 1038 1038 1038 1038 1038 1038 1038 1038
0.976 0.076 1.037 1.024 0.089 0.890 0.890 1.036 1.037 1.
1,0394 1,039 1,039 1,039 1,038 1,038 1,038 1,038 1,038 1,036
1.014 1.024 1.321 1.025 0.684 0.890 0.968 1.026 0.684 0.684 0.890 0.890 0.891 0.891
1.025 1.025 1.025 0.684 0.890 0.988 1.047 1.375 1.026 0.684 0.684 0.684 0.684 0.756 0.743
1.039 1.025 1.025 1.025 1.008 1.008 1.006 1.008 1.008 1.008 1.008 1.008 1.008 1.008 1.008 1.008 1.008
1.057 1.068 1.024 0.0895 1.032 1.032 1.332 1.036 0.0884 0.0884 0.0884 0.743 0.743
1.074 1.078 1.372 1.024 0.684 0.684 1.086 1.086 0.684 0.684 0.743
1,065 1,373 1,023 0,684 0,968 1,070 1,024 0,684 0,971 0,576 0,576
1.069 1.368 1.022 0.684 0.988 1.073 1.392 1.023 0.684 0.988 0.576
1.071 1.361 1.021 0.684 1.008 1.022 0.684 1.002 2.194 0.743 0.743
1,073 1,353 1,019 0,699 1,032 1,020 0,703 1,032 1,032 1,032 1,032 0,703 0,703 0,743
1.073 1.342 1.017 0.802 1.058 1.077 1.362 1.018 0.806 0.743 0.805
1.072 1.326 1.015 0.925 1.077 1.344 1.016 0.935 0.743
1.071 1.307 1.013 0.980 1.077 1.322 1.014 0.992 1.987 0.743
1.070 1.284 1.010 1.038 1.036 1.297 1.011 1.047 1.047 1.047 1.047 1.047
1.068 1.258 1.008 1.103 1.007 1.008 1.100 1.810 0.859
1.066 1.227 1.004 1.166 1.172 1.234 1.005 1.161 1.700 0.938
1.063 1.192 1.001 1.070 1.197 1.001 1.577 1.622
1.000 1.000 1.000 1.000 1.000 1.000 1.000
1.056 1.111 0.998 1.064 1.112 0.998 1.292 1.111
1.064 1.064 0.996 1.060 1.063 0.996 1.156
1,014 1,014 1,015 1,011 0,923
1.040 0.987 1.050 0.984 0.871
1,033 0,959 1,044 0,956 0,956
Buro 5 Buro 1 Buro 1 Buro 2 Buro 3 Buro 5 Buro 5 Buro 6 Buro 6 Buro 1 Buro 1 Buro 1 Buro 2 Buro 2 Buro 2 Buro 2 Buro 3 Buro 3 Buro 4 Buro 5 Buro 6 Buro 6 Buro 6 Buro 7 Buro 6 Buro 7 Buro 6 Buro 7
- 1400 cc - 1400
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Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51 Cur 2.51
Euro 5

Table C12: Mileage scaling factors for NO_x by vehicle category and reference year (cars >2.5 tonnes).

R062	R061	R060	R059	R058	R057	R056	R055	R054	R053	R052	R051	R050	R049	Code	
Car 2.5-3.5 t	Car 2.5-3.5 t	Car 2.5-3.5	Car 2.5-3.5	Car 2.5-3.5	Car 2.5-3.5	Car 2.5-3.5	Car 2.5-3.5	Car 2.5-3.5	Car 2.5-3.5	Car 2.5-3.5	Car 2.5-3.5	Car 2.5-3.5 t	Car 2.5-3.5 t	Vehicle type	
t Diesel	t Diesel	t Diesel	t Diesel	t Diesel	t Diesel	-	t Petrol	t Petrol	e Fuel type						
All	All	All	All	All	All	ΑII	All	All	ΑII	All	ΑII	All	IIA		Engine capacity
	_	_	_	_	_			_	_	_	_	_	1	,	apacity
Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro I	Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro 1	standard	Emission
						1.027							1.057	1995	
					0.936	1.035						0.698	1.059	1996	
					0.966	1.042						0.806	1.060	1997	
					0.993	1.048						0.888	1.068	1998	
					1.019	1.053						0.974	1.071	1999	
				0.996	1.068	1.049					1.146	1.173	1.074	2000	
				0.998	1.119	1.062					1.091	1.357	1.076	2001	
				0.999	1.163	1.065					1.046	1.528	1.078	2002	
			1.161	1.003	1.203	1.068				1.240	0.948	1.682	1.079	2003	
			1.099	1.006	1.240	1.071				1.149	0.857	1.821	1.081	2004	
			1.036	1.009	1.272	1.073				1.058	0.773	1.947	1.082	2005	
			0.975	1.012	1.301					0.962	0.743	2.057	1.082	2006	
			0.918	1.015	1.325					0.871	0.743	2.154	1.082	2007	
		1.056	0.806	1.017	1.346	1.077			0.820	0.729	0.743	2.234	1.082	2008	
		1.032	0.703	1.019	1.362	1.077			0.887	0.615	0.743	2.303	1.080	2009	
		1.008	0.684	1.021	1.373	1.076			0.961	0.576	0.743	2.356	1.079	2010	М
		0.988	0.684	1.022	1.384	1.075			1.030	0.576	0.743	2.401	1.077	2011	ileage sca
		0.971 (0.684	1.024	1.392	1.072		_	1.097	0.576	0.743 (2.432	1.073	2012	Aileage scaling factor by refere
	1.056 1	0.932 (0.684 (1.025 1	1.396 1	_		0.820 (1.204 1	0.576 (0.743 (2.442 2	1.068 1	2013	
	.032 1	0.896 (0.684 (.025 1	1.395 1			0.887 (.289 1	0.576 (0.743 (2.437 2	.063 1	2014	тсе уеаг
	1.008 (0.890 (0.684 (1.026 1	1.392 1			0.961 1	1.377 1	0.576 (0.743 (2.423 2	1.057 1	2015	
	0.988 0	0.890 0	0.684 0	1.026 1	1.386 1	1.047 1		1.030 1	1.459 1	0.576 0	0.743 0	2.396 2	1.050 1	2016	
_	0.971 0	0.890 0	0.684 0	1.026 1	1.376 1		0	1.097 1	1.534 1	0.576 0	0.743 0	2.346 2	1.042 1	2017	
.056 1.	0.932 0.	0.890 0.	0.684 0.	1.026 1.	1.348 1.		0.820 0.	1.204 1.	1.601 1.	0.576 0.	0.743 0.	2.266 2.	1.038 1.	2018	
1.032 1.	0.896 0.	0.890 0.	0.684 0.	1.026 L	1.327 1.		0.887 0.	1.289 1.	1.656 L	0.576 0.	0.743 0.	2.188 2.	1.038 1.	2019	
1.008 0.	0.890 0.	0.890 0.	0.684 0.	1.025 1.	1.302 1.		0.961 1.	1.377 1.	1.706 1.	0.576 0.	0.743 0.	2.095 1.	1.038 1.	2020	
0.988 0.	0.890 0.	0.890 0.	0.684 0.	1.024 1.	1.273 1.:	1.036 1.	•	1.459 1.:	1.750 1.	0.576 0	0.743 0.7	1.988 1.	1.038 1.	2021	
0.945 0.9	0.890 0.1	0.890 0.1	0.684 0.4	1.022 1.0	1.240 1.3	1.036 1.0	1.144 1.3	1.534 1.4	1.789 1.1	0.576 0.5	0.743 0.7	1.867 1.	1.038 1.0	2022	
0.907 0.1	0.890 0.1	0.890 0.1	0.684 0.4	1.021 1.0	1.204 1.		1.245 1.3	1.601 1.4	1.819 1.1	0.576 0.5	0.743 0.7	1.731 1.4	1.038 1.0	2023	
0.890 0.8	0.890 0.8	0.890 0.8	0.684 0.6	1.019 1.0	1.184 1.1		1.333 1.4	1.656 1.7	1.846 1.8	0.576 0.5	0.743 0.7	1.657 1.6	1.038 1.0	2024	
0.890 0.8	0.890 0.890	0.890 0.890	0.684 0.684	1.017 1.015	1.184 1.184		1.420 1.501	1.706 1.750	1.859 1.861	0.576 0.576	0.743 0.743	1.657 1.657	1.038 1.0	2025	
0.890 0.890	90 0.890	90 0.890	684 0.684	1.012	84 1.184		501 1.577	750 1.789	861 1.857	576 0.576	143 0.743	557 1.657	1.038 1.038	2026	
90 0.890	90 0.890	90 0.890	84 0.684	12 1.012	84 1.184		77 1.634	89 1.819	57 1.850	76 0.576	43 0.743	57 1.657	38 1.038	2028	
90 0.890	90 0.890	90 0.890	84 0.684	12 1.012	84 1.184		34 1.689	19 1.846	50 1.835	76 0.576	43 0.743	57 1.657	38 1.038	2029	
90 0.890	90 0.890	90 0.890	84 0.684	12 1.012	84 1.184	36 1.036	•	46 1.859	35 1.803	76 0.576	43 0.743	57 1.657	38 1.038	2030	
ľŏ	ŏ	0	4	12	4	6	17	9	ಷ	76	ធ	57	8		I

Table C13: Mileage scaling factors for NO_x by vehicle category and reference year (taxis).

			Rnoine canacity	Emission																	Mileage	scaling fa	lleage scaling factor by referen	ference year	н															
Code	Vehicle type	Fuel type	(cc)	standard	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2027	***	2028 2029
R063	Car (taxi)	Diesel	All	Pre-Euro 1	1.044	1.050	1.055	1.060 1	1.064	1.061	1.070	1.072	1.074	1.07	5 1.077 1	1.077	1.077 1.077	1.077	1.077 1.075	1.073	1.070	1.064	1.059	1.053	1.047	1.040	1.036	1.036	1.036	1.036	1.036	1.036	1.036	5 1.036	6 1.036	6 1.036	36 1.036	36		1.036 1.036
R064	Car (taxi)	Diesel	AII	Euro 1	0.956	0.984	1.011	1.063	1.112	1.159	1.197	1.234	1.267	1.29	1.322	1.344	1.362	1.373	1.384	1.392	1.396	1.395	1.392	1.386	1.375	1.348	1.327	1.302	1.273	1.240	1.204	1.184	1.184	1.184	4 1.184	4 1.184	84 1.184	84	=	1.184 1.184
R065	Car (taxi)	Diesel	All	Euro 2				0.996	0.998	1.000	1.001	1.005	1.008	1.011	1.014	1.016	1.018	1.020	1.022	1.023	1.024	1.025	1.026	1.026	1.026	1.026	1.026	1.026	1.025	1.023	1.022	1.020	1.018	8 1.016	6 1.014	4 1.012	12 1.012	12	Ξ	1.012 1.012
R066	Car (taxi)	Diesel	All	Euro 3								1.161	1.100	1.047	0.992	0.935	0.806	0.703	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684	1 0.684	4 0.684	4 0.684	84 0.684		5	0.684 0.684
R067	Car (taxi)	Diesel	All	Euro 4													1.056	1.032	1.008	0.988	0.971	0.932	0.896	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0 0.890	0 0.890	90 0.890		2	0.890 0.890
R068	Car (taxi)	Diesel	All	Euro 5																		1.056	1.032	1.008	0.988	0.971	0.932	0.896	0.890	0.890	0.890	0.890	0.890	0.890	0 0.890	0 0.890	90 0.890		=	0.890 0.890
R069	Car (taxi)	Diesel	All	Euro 6																							1.056	1.032	1.008	0.988	0.971	0.932	0.896	5 0.890	0 0.890	0.890	90 0.890		9	0.890 0.890

Table C14: Mileage scaling factors for NO_x by vehicle category and reference year (LGV N1(I)).

R083	R082	R081	R080	R079	R078	R077	R076	R075	R074	R073	R072	R071	R070	Code	2
LGV N1(I)	LGV N10	LGV N1(I)	LGV N1(I)	LGV N1(I)	LGV N1(I)	LGV N1(C	LGV N10	LGV N1(I)	LGV N1(I)	LGV N1(I)	LGV N1(I)	LGV N1(I)	LGV N1(I)	Velucie typ	
Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol	Petrol	Vehicle type Fuel type	1
All	ΑII	All	All	All	All	All	All	All	All	All	All	All	All	(cc)	Engine capacity
Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro I	Euro	Euro 5	Euro 4	Euro 3	Euro 2	Euro I	Pre-Euro I		ity Emission
5	51	+	3	2	_		5	01	-	3	2	_		1995	ĕ
					0.948	1.032 1.045						0.810	1.033 1.043	1996	
					8 0.987	5 1.057						0 0.971	3 1.051	1997	
					7 1.027	7 1.067						1 1.126	1 1.057	1998	
				0.997	7 1.100	7 1.074					1.092	6 1.376	7 1.061	1999	
				7 0.999	081.1	1.078					2 1.012	5 1.619	1.063	2000	
				1.002	1.245	1.083					0.945	1.792	1.065	2001	
			1.131	1.007	1.307	1.085				1.152	0.819	1.935	1.064	2002	
			1.048	1.012	1.359	1.084				1.042	0.743	2.038	1.062	2003	
			0.959	1.016	1.399	1.081				0.932	0.743	2.102	1.059	2004	
			0.877	1.020	1.425	1.075				0.838	0.743	2.128	1.054	2005	
			0.795	1.024	1.435	1.066				0.749	0.743	2.115	1.047	2006	
		1.046	0.684	1.026	1.427	1.051			0.886	0.576	0.743	2.065	1.038	2007	
		1.011	0.684	1.028	1.400	1.051			0.983	0.576	0.743	1.982	1.038	2008	
		0.979	0.684	1.029	1.356	1.051			1.068	0.576	0.743	1.871	1.038	2009	
		0.950	0.684	1.028	1.298	1.051			1.138	0.576	0.743	1.742	1.038	2010	
		0.921	0.684	1.027	1.260	1.051			1.206	0.576	0.743	1.665	1.038	2011	Mileage scaling factor by refer
	1.046	0.890	0.684	1.024	1.260	1.051		0.886	1.327	0.576	0.743	1.665	1.038	2012	aling facto
	1.011	0.890	0.684	1.020	1.260	1.051		0.983	1.431	0.576	0.743	1.665	1.038	2013	
	0.979	0.890	0.684	1.017	1.260	1.051		1.068	1.523	0.576	0.743	1.665	1.038	2014	ence year
	0.950	0.890	0.684	1.017	1.260	1.051		1.138	1.598	0.576	0.743	1.665	1.038	2015	
	0.921	0.890	0.684	1.017	1.260	1.051		1.206	1.651	0.576	0.743	1.665	1.038	2016	
1.046	0.890	0.890	0.684	1.017	1.260		0.886	1.327	1.673	0.576	0.743	1.665	1.038	2017	
1.011 (0.890 (0.890 (0.684 (1.017	1.260	1.051	0.983	1.431	1.667	0.576 (0.743 (1.665	1.038	2018	
0.979 0	0.890 0	0.890 0	0.684 0	1.017 1	1.260 1	1.051 1	1.068 1	1.523 1	1.643 1	0.576 0	0.743 0	1.665 1	1.038 1	2019	
0.950 0	0.890 0	0.890 0	0.684 0	1.017 1	1.260 1		1.138 1	1.598 1	1.603 1	0.576 0	0.743 0	1.665 1	1.038 1	2020	
0.921 0	0.890 0	0.890 0	0.684 0	1.017 1	1.260 1		1.206 1	1.651 1	1.556 1	0.576 0	0.743 0	1.665 1	1.038 1	2021	
0.890 0.	0.890 0.	0.890 0.	0.684 0.	1.017 1.	1.260 1.	1.051 1.	1.327 1.	1.673 1.	1.496 1.	0.576 0.	0.743 0.	1.665 1.	1.038 1.	2022	
0.890 0.	0.890 0.	0.890 0.	0.684 0.	1.017 1.	1.260 1.	1.051 1.	1.431 1.	1.667 1.	1.419 1.	0.576 0.	0.743 0.	1.665 1.	1.038 1)	2023	
0.890 0.	0.890 0.	0.890 0.	0.684 0.	1.017 1.	1.260 1.:	1.051 1.	1.523 1	1.643 1.	1.397 1.	0.576 0	0.743 0.	1.665 1.	1.038 1.	2024	
0.890 0.1	0.890 0.1	0.890 0.1	0.684 0.4	1.017 1.0	1.260 1.3	_	1.598 1.4	1.603 1.5	1.397 1.3	0.576 0.5	0.743 0.	1.665 1.4	1.038 1.0	2025	
0.890 0.8	0.890 0.8	0.890 0.8	0.684 0.6	1.017 1.0	1.260 1.2		1.651 1.6	1.556 1.4	1.397 1.3	0.576 0.5	0.743 0.7	1.665 1.6	1.038 1.0	2026	
0.890 0.8	0.890 0.8	0.890 0.8	0.684 0.6	1.017 1.0	1.260 1.2	1.051 1.0	1.673 1.6	1.496 1.4	1.397 1.3	0.576 0.5	0.743 0.7	1.665 1.6	1.038 1.0	2027	
0.890 0.8	0.890 0.8	0.890 0.8	0.684 0.6	1.017 1.0	1.260 1.2	1.051 1.0	1.667 1.6	1.419 1.3	1.397 1.3	0.576 0.5	0.743 0.7	1.665 1.6	1.038 1.0	2028	
0.890 0.8	0.890 0.8	0.890 0.890	0.684 0.684	1.017 1.0	1.260 1.2		1.643 1.6	1.397 1.3	1.397 1.3	0.576 0.576	0.743 0.743	1.665 1.6	1.038 1.0	2029	
0.890	0.890	900	584	1.017	1.260	1.051	1.603	1.397	1.397	576	743	1.665	1.038	2030	

Table C15: Mileage scaling factors for NO_x by vehicle category and reference year (LGV N1(II/III)).

Vehicle from English Engine capacity Emission				sion																Miles	ige scaling	Mileage scaling factor by reference year	sterence ye	ar.														
20002 20003 Standard (c) 20001	1002 5000 5000 5000 5000 5000 5000 5000	1002 5000 5000 5000 5000 5000 5000 5000	1002 5000 5000 5000 5000 5000 5000 5000	0007 0007 6661 4661 9661	2000 3000 3000 3000 3000 3000 3000 3000	2000 2000 1000	3000 3000 3000	5000	2001		2002		5003	7004	5002	2007	7007	8007		2010	2015	5013	5014	2015	5016	7102	2018	5019	5050	2021	2022	2023	5054	2025	2027	5028	5059	5030
LGV NI(II) Petrol All Pre-Eurol 1.033 1.043 1.051 1.057 1.061 1.063 1.065 1.064	1 All Pre-Euro 1 1.033 1.043 1.051 1.057 1.061 1.063 1.065	Pre-Euro 1 1.033 1.043 1.051 1.057 1.061 1.063 1.065	1 1.033 1.043 1.051 1.057 1.061 1.063 1.065	1 1.033 1.043 1.051 1.057 1.061 1.063 1.065	1.043 1.051 1.057 1.061 1.063 1.065	1.057 1.061 1.063 1.065	1.061 1.063 1.065	1.063 1.065	1.065		1.064		1.062		-	.047 1.0	.038 1.0;	1.038 1.03	~	1.038 1.038	38 1.038	38 1.038	8 1.038	8 1.038	8 1.038	1.038	1.038	1.038	1.038	1.038	1.038	.038	0.38 1.0	.038 1.03	38 1.038	8 1.038	1.038	1.038
LGV N (II) Petrol All Euro 1 0.810 0.971 1.126 1.257 1.524 1.706 1.870 1.992	I All Euro 1 0.810 0.971 1.126 1.257 1.524 1.706 1.870	Euro 1 0.810 0.971 1.126 1.257 1.524 1.706 1.870	0.810 0.971 1.126 1.257 1.524 1.706 1.870	0.810 0.971 1.126 1.257 1.524 1.706 1.870	0.971 1.126 1.257 1.524 1.706 1.870	1.126 1.257 1.524 1.706 1.870	1.257 1.524 1.706 1.870	1.524 1.706 1.870	1.706 1.870	1.870		1.99			2.119 2.1	2.126 2.0	2.098 2.0;	2.034 1.94	.949 1.8	1.846 1.719	19 1.665	65 1.665	5 1.665	5 1.665	29971 9	1.665	1.665	1.665	1.665	1.665	1.665	.665 1.	97.1	9.1 299.	997 299	5 1.665	1.665	1.665
LGV N1(II) Petrol All Euro 2 1.019 0.965 0.836	All Euro 2 1.019 0.965 0.836	Euro 2 1.019 0.965 0.836	1.092 1.019 0.965 0.836	1.092 1.019 0.965 0.836	1.019 0.965 0.836	1.019 0.965 0.836	1.019 0.965 0.836	1.019 0.965 0.836	1.019 0.965 0.836	0.965 0.836	0.836		0	0.743 0.7	0.743 0.7	0.743 0.7	0.743 0.74	0.743 0.74	0.743 0.74	0.743 0.743	43 0.743	43 0.743	3 0.743	3 0.743	3 0.743	0.743	0.743	0.743	0.743	0.743	0.743 0	0.743 0.	0.743 0.7	0.743 0.7	0.743 0.743	3 0.743	0.743	0.743
LGV NI(II) Petrol All Euro 3 1.152	All Euro 3	Euro 3			1.152	1.152	1.152	1.152	1.152	1.152	1.152	1.152	_		0.923 0.8	0.827 0.7	0.726 0.5'	0.576 0.576		0.576 0.576	76 0.576	76 0.576	5 0.576	5 0.576	5 0.576	0.576	0.576	0.576	0.576	0.576	0.576 0	0.576 0.	0.576 0.5	0.576 0.5	0.576 0.576	6 0.576	0.576	0.576
LGV NI(II) Petrol All Euro 4	All		Euro 4)4													0.8	0.886 0.983		1.068 1.138	38 1.206	06 1.327	7 1.431	1.523	1.598	1.651	1.673	1.667	1.643	1.603	1.556 1	.496 1.	.419 1.3	.397 1.3	1.397 1.397	7 1.397	1.397	1.397
LGV NI (II) Petrol All Buro 5	All		Euro 5	50																		0.886	5 0.983	3 1.068	8 1.138	1.206	1.327	1.431	1.523	1.598	1.651	.673 1.	.1 799.	.643 1.6	.603 1.556	6 1.496	1.419	1.397
Euro 6	All Buro 6	Euro 6																									0.886	0.983	1.068	1.138	1.277	.396 1.	1.492 1.5	97 1.6	.634 1.668	8 1.673	1.656	1.618
All Pre-Euro 1 1.032 1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	All Pre-Euro 1 1.032 1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	Pre-Euro 1 1.032 1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	1 1.032 1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	1 1.032 1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	1.067 1.074 1.078 1.083 1.085 1.084	1.074 1.078 1.083 1.085 1.084	1.078 1.083 1.085 1.084	1.083 1.085 1.084	1.085 1.084	1.084		-	1.081	0.1 270.1	_	051 1.05	1.05		1.051 1.051	51 1.051	51 1.051	1.051	1.051	1.051	1.051	1.051	1.051	1.051	1.051	_				_		i	1.051
Euro 1 0.948 0.987 1.027 1.064 1.147 1.212 1.278 1.334	All Euro I 0.948 0.987 1.027 1.064 1.147 1.212 1.278 1.334	Euro 1 0.948 0.987 1.027 1.064 1.147 1.212 1.278 1.334	0.948 0.987 1.027 1.064 1.147 1.212 1.278 1.334	0.948 0.987 1.027 1.064 1.147 1.212 1.278 1.334	0.987 1.027 1.064 1.147 1.212 1.278 1.334	1.027 1.064 1.147 1.212 1.278 1.334	1.064 1.147 1.212 1.278 1.334	1.147 1.212 1.278 1.334	1.212 1.278 1.334	1.278 1.334	1.334					1.431 1.4		1.38	.388 1.3	.345 1.286	86 1.260	60 1.260	0 1.260	0 1.260	1.260	1.260	1.260	1.260	1.260	1.260	1.260 1	.260 1.	.260 1.2	.260 1.2	.260 1.260	0 1.260	1.260	1.260
Euro 2 0.997 0.999 1.001 1.006	All Euro 2 0.997 0.999 1.001 1.006	Euro 2 0.997 0.999 1.001 1.006	0.997 0.999 1.001 1.006	0.997 0.999 1.001 1.006	0.999 1.001 1.006	0.999 1.001 1.006	0.999 1.001 1.006	0.999 1.001 1.006	0.999 1.001 1.006	1.001 1.006	1.006				1.016 1.0	.020 1.0	1.023 1.03	1.026 1.028		1.029 1.028	28 1.027	27 1.024	1.020	1.017	7 1.017	1.017	1.017	1.017	1.017	1.017	1.017	1.017 1.	1.017 1.0	1.017 1.017	17 1.017	7 1.017	1.017	1.017
Euro 3	All Euro 3	Euro 3	1,131	1,131										1.038 0.9	0.951 0.8	7.0 798.0	0.773 0.61	0.684 0.684	_	0.684 0.684	84 0.684	84 0.684	1 0.684	1 0.684	1 0.684	0.684	0.684	0.684	0.684	0.684	0.684 0	0.684 0.	0.684 0.0	0.684 0.684	84 0.684	4 0.684	0.684	0.684
LGV NI(II) Diesel All Euro 4	ΑII		Euro 4	14													1.0	1.046 1.01	_	0.979 0.950	50 0.921	21 0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890 0.	0.890 0.8	0.890 0.890	068'0 06	0 0.890	0.890	0.890
LGV N1(II) Diesel All Euro 5	Ψ		Euro 5	50																		1.046	1.011	0.979	0.950	0.921	0.890	0.890	0.890	0.890	0.890	0.890 0.	0.890 0.8	0.890 0.890	068'0 06	0 0.890	0.890	0.890
Euro 6	Diesel All Euro 6	Euro 6												- 1													1.046	1.011	0.979	0.950	0.890	0.890 0.	0.890 0.8	0.890 0.890	068'0 06	0.890	0.890	0.890
Petrol All Pre-Euro 1 1.033 1.043 1.051 1.057 1.061 1.063 1.065 1.064 1.062	Petrol All Pre-Euro 1 1.033 1.043 1.051 1.057 1.061 1.063 1.065 1.064 1.062	Pre-Euro 1 1.033 1.043 1.051 1.057 1.061 1.063 1.065 1.064 1.062	1.033 1.043 1.051 1.057 1.061 1.063 1.065 1.064 1.062	1.033 1.043 1.051 1.057 1.061 1.063 1.065 1.064 1.062	1.043 1.051 1.057 1.061 1.063 1.065 1.064 1.062	1.057 1.061 1.063 1.065 1.064 1.062	1.061 1.063 1.065 1.064 1.062	1.063 1.065 1.064 1.062	1.065 1.064 1.062	1.064 1.062	1.062		9					_	_	~	38 1.038	38 1.038	8 1.038	3 1.038	3 1.038	1.038	1.038	1.038	1.038									1.038
Euro 1 0.810 0.971 1.126 1.257 1.524 1.706 1.870 1.992) Petrol All Euro1 0.810 0.971 1.126 1.257 1.524 1.706 1.870 1.992	Euro 1 0.810 0.971 1.126 1.257 1.524 1.706 1.870 1.992	0.810 0.971 1.126 1.257 1.524 1.706 1.870 1.992	0.810 0.971 1.126 1.257 1.524 1.706 1.870 1.992	0.971 1.126 1.257 1.524 1.706 1.870 1.992	1.126 1.257 1.524 1.706 1.870 1.992	1.257 1.524 1.706 1.870 1.992	1.524 1.706 1.870 1.992	1.706 1.870 1.992	1.870 1.992	1.992			2.075 2.		2.126 2.0		2.034 1.94		1.846 1.719	19 1.665	9971 9		5 1.665	9971 9	1.665	1.665	1.665	1.665	1.665	1.665	.1 599.	.1.665	97 299	1,665 1,665	5 1.665	1.665	1.665
LGVNI(III) Perrol All Euro 2 1.092 1.019 0.965 0.836	All Euro 2 1.019 0.965	Euro 2 1.019 0.965	1.092 1.019 0.965	1.092 1.019 0.965	1.019 0.965	1.019 0.965	1.019 0.965	1.019 0.965	1.019 0.965	0.965		0.836	0		0.743 0.7	0.743 0.7-	0.743 0.74	0.743 0.74	0.743 0.74	0.743 0.743	43 0.743	43 0.743	3 0.743	3 0.743	3 0.743	0.743	0.743	0.743	0.743	0.743	0.743 0	0.743 0.	0.743 0.7	0.743 0.7	0.743 0.743	3 0.743	0.743	0.743
LGVN(III) Petrol All Euro 3 1.152	All Euro 3	Euro 3			1.152	1.152	1.152	1.152	1.152	1.152	1.152	1.152	_	1.029 0.9	0.923 0.8	0.827 0.7.	0.726 0.5'	0.576 0.57	0.576 0.5'	0.576 0.576	76 0.576	76 0.576	5 0.576	5 0.576	0.576	0.576	0.576	0.576	0.576	0.576	0.576 0	0.576 0.	0.576 0.5	0.576 0.5	0.576 0.576	6 0.576	0.576	0.576
() Petrol	ΑΠ		Euro 4	94													0.8	0.886 0.983		1.068 1.138	38 1.206	06 1.327	7 1.431	1.523	1.598	1.651	1.673	1.667	1.643	1.603	1.556 1	.496 1.	1.419 1.3	.397 1.3	1.397 1.397	7 1.397	1.397	1.397
LGVN(III) Petrol All Euro 5	All		Euro 5	50																		0.886	5 0.983	3 1.068	3 1.138	1.206	1.327	1.431	1.523	1.598	1.651	.673 1.	1.667	1.643 1.6	1.556	6 1.496	1.419	1.397
Euro 6) Petrol All Euro 6	Euro 6																	ļ								0.886	0.983	1.068	1.138	1.277 1	.396 1.	.492 1.5	.569 1.6	.634 1.668	8 1.673	1.656	1.618
All Pre-Euro 1 1.032 1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	All Pre-Euro 1 1.032 1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	Pre-Euro 1 1.032 1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	1.032 1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	1.032 1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	1.045 1.057 1.067 1.074 1.078 1.083 1.085 1.084	1.067 1.074 1.078 1.083 1.085 1.084	1.074 1.078 1.083 1.085 1.084	1.078 1.083 1.085 1.084	1.083 1.085 1.084	1.085 1.084	1.084			1.081	_	_	.051 1.05	1.05	_	1021	51 1.051	1.051	1.051	1.051	1.051	1.051	1.051	1.051	1.051	1.051	_	.051 1.	_	_				1.051
Euro 1 0.948 0.987 1.027 1.064 1.147 1.212 1.278 1.334	All Euro1 0.948 0.987 1.027 1.064 1.147 1.212 1.278 1.334	Euro 1 0.948 0.987 1.027 1.064 1.147 1.212 1.278 1.334	0.948 0.987 1.027 1.064 1.147 1.212 1.278 1.334	0.948 0.987 1.027 1.064 1.147 1.212 1.278 1.334	0.987 1.027 1.064 1.147 1.212 1.278 1.334	1.027 1.064 1.147 1.212 1.278 1.334	1.064 1.147 1.212 1.278 1.334	1.147 1.212 1.278 1.334	1.212 1.278 1.334	1.278 1.334	1.334				_	.431 1.4		1.38	.388 1.3	1.345 1.286	86 1.260	60 1.260	0 1.260	0 1.260	1.260	1.260	1.260	1.260	1.260	1.260	1.260 1	.260 1.	.260 1.2	.260 1.2	.260 1.260	0 1.260	1.260	1.260
	All Euro 2 0.997 0.999 1.001 1.006	Euro 2 0.997 0.999 1.001 1.006	900.1 100.1 9990 7990	900.1 100.1 9990 7990	0.999 1.001 1.006	0.999 1.001 1.006	0.999 1.001 1.006	0.999 1.001 1.006	0.999 1.001 1.006	1.001 1.006	1.006				_	0.020 1.0		_	.028 1.0.	1.029 1.028		27 1.024	1.020	1.017	7 1.017	1.017	1.017	1.017	1.017	1.017	1.017	.017 1.	.017 1.0	.017 1.0	1.017	7 1.017	1.017	1.017
LGVN(III) Diesel All Buro 3) Diesel All Euro 3	Euro 3			1.131	1.131	1.131	1.131	1.131	1.131	1.131	1.131	$\overline{}$	1.038 0.9	0.951 0.8	7.0 798.0	0.773 0.61	0.684 0.684		0.684 0.684		84 0.684	1 0.684	1 0.684	0.684	0.684	0.684	0.684	0.684	0.684	0.684 0	0.684 0.	0.684 0.0	0.684 0.684	84 0.684	4 0.684	0.684	0.684
LGVNI(III) Diesel All Euro 4) Diesel All		Euro 4)4													1.0	1.046 1.01	_	0.979 0.950	50 0.921	21 0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890	0.890 0.	0.890 0.8	0.890 0.890	068'0 06	0.890	0.890	0.890
) Diesel All		Euro 5	.5																		1.046	1.011	0.979	0.950	0.921	0.890	0.890	0.890	0.890	0.890	0.890 0.	0.890 0.8	0.890 0.890	068'0 06	0 0.890	0.890	0.890
LGVNI(III) Diesel All Euro 6) Diesel All		Euro 6	90																							1.046	1.011	0.979	0.950	0.890 0	0.890 0.	0.890 0.8	0.890 0.890	90 0.890	0.890	0.890	0.890

Appendix D: Fuel composition scaling factors applicable to 2009 emission factors

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Table D1: Fuel composition scaling factors for CO.

					_		_	_					_	_						_	_	
	7030	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	5076	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2028	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	Z072	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	5026	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2025	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	707	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2023	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	7077	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2021	0.891	0.891	0.891	0.930	0.993	000.1	1.000	706:0	706:0	706:0	3 0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2020	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	706.0	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	5019	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2018	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2017	0.891	0.891	0.891	0.930	0.993	000.1	1.000	706:0	706:0	0.907	3 0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	5016	0.891	0.891	0.891	0:630	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2015	0.891	0.891	0.891	0:630	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
ear	7014	0.891	0.891	0.891	0:630	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
Scaling factor by year	2013	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
ng fact	2012	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
Scali	1107	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2010	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	5000	0.891	0.891	0.891	0.930	0.993	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2008	0.897	0.897	768.0	0.936	1.000	000.1	1.000	706.0	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2007	0.897	0.897	0.897	0.936	1.000	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	7000	0.897	0.897	0.897	0.936	1.000	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	2002	0.897	0.897	0.897	0.936	1.000	1.000	1.000	0.907	0.907	0.907	0.973	1.000	1.000	1.000	1.026	1.026	1.026	1.022	1.000	1.000	1.000
	7007	0.959	0.959	0.959	1.000	1.000	000.1	1.000	3 0.933	3 0.933	0.933	1.000	1.000	1.000	1.000	1.003	1.003	1.003	1.000	1.000	1.000	1.000
	2003	0.959	0.959	0.959	1.000	1.000	1.000	1.000	0.933	3 0.933	0.933	1.000	1.000	1.000	1.000	1.003	1.003	1.003	1.000	1.000	1.000	1.000
	7007	0.959	0.959	0.959	1.000	1.000	1.000	1.000	3 0.933	3 0.933	0.933	1.000	1.000	1.000	1.000	1.003	1.003	1.003	1.000	1.000	1.000	1.000
	7001	0.959	0.959	0.959	1.000	1.000	1.000	1.000	0.933	0.933	0.933	1.000	1.000	1.000	1.000	1.003	1.003	1.003	1.000	1.000	1.000	1.000
	7000	0.959	0.959	0.959	1.000	1.000	1.000	1.000	0.933	0.933	0.933	1.000	1.000	1.000	1.000	1.003	1.003	1.003	1.000	1.000	1.000	1.000
	6661	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	8661	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	<i>L</i> 661	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	9661	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	\$661	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Raceline	fuel	9661	9661	9661	2000	2005	2009	2009	9661	9661	9661	2000	2005	2009	2009	9661	9661	9661	2000	2005	2009	2009
Rac	# # # # # # # # # # # # # # # # # # #	15	15	15	20	20	20	20	15	15	15	20	20	20	20	15	115	15	20	20	20	2(
Fmission	standard	Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Pre-Euro I	Euro I	Euro II	Euro III	Euro IV	Euro V	Euro VI
	Fuel type				Petrol							Diesel							Diesel			
Vehicle	type							Car, taxi,	TGV										HDV			

Table D2: Fuel composition scaling factors for HC.

Propress Particles Parti																							
Price Pric				HDV										LGV	Car, taxi,							type	Vehicle
Price Pric				Diesel							Diesel							Petrol				Fuel type	
1995 1996 1997 1998	Euro VI	Euro V	Euro IV	Euro III	Euro II	Euro I	Pre-Euro I	Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro 1	Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro 1		
1000 1000	2009	2009	2005	2000	1996	1996	1996	2009	2009	2005	2000	1996	1996	1996	2009	2009	2005	2000	1996	1996	1996	fuel	Baseline
1997 1999	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1995	
1997 1999		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		1.000		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1996	
100 100		_	_	_	_		_										_			_		1997	
100 100		1.000	1.000		1.000	1.000	1.000	1.000		1.000		1.000	1.000	1.000	1.000		1.000		1.000	1.000	1.000	1998	
Corn Corn	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1999	
2007 2007 2008 2009	1.000	1.000	1.000	1.000	1.028	1.028	1.028	1.000	1.000	1.000	1.000	0.951	0.951	0.951	1.000	1.000	1.000	1.000	0.971	0.971	0.971	2000	•
2002 2003 2004 2004 2004 2005 2004 2004 2005 2004 2004 2005 2004 2004 2005 2004 2004 2005 2004 2004 2005 2004 2004 2005	-	1.000	1.000	1.000	1.028	1.028	1.028	1.000	1.000	1.000	1.000	0.951	0.951	0.951	1.000	1.000	1.000	1.000	0.971	0.971	0.971	2001	
2003 2004 2005 2006 2004		_			_						_	0.951	0.951	0.951					0.971	0.971	0.971	2002	1
100 100 100 100 100 100 100 10		_										0.951		0.951		_				0.971		2003	1
December December		1.000	1.000		1.028	1.028	1.028					0.951	0.951	0.951		_	1.000		0.971	0.971	0.971	2004	
2006 2007					1.067							0.933	0.933	0.933				_	0.924	0.924	0.924	2005	
1,000 1,00	1.000	1.000	1.000	1.038	1.067	1.067	1.067	1.000	1.000	1.000	0.982	0.933	0.933	0.933	1.000	1.000	1.000	0.952	0.924	0.924	0.924	2006	
2008 2009 2009 2009 2009 2009 2009 2009		1.000	1.000	1.038	1.067	1.067	1.067	1.000		1.000		0.933	0.933	0.933	1.000				0.924	0.924	0.924	2007	
0.992 0.99		1.000	1.000	1.038	1.067	1.067	1.067	1.000	1.000	1.000	0.982	0.933	0.933	0.933	1.000	1.000	1.000	0.952	0.924	0.924	0.924	2008	•
Control Cont		1.000	1.000	1.038	1.067	1.067	1.067	1.000	1.000	1.000	0.982	0.933	0.933	0.933	1.000	1.000	0.992	0.944	0.917	0.917	0.917	2009	•
1.00	1.000	1.000	1.000	1.038	1.067	1.067	1.067	1.000	1.000	1.000	0.982	0.933	0.933	0.933	1.000	1.000	0.992	0.944	0.917	0.917	0.917	2010	
1.000 1.00		1.000		1.038	1.067	1.067	1.067	1.000		1.000	0.982	0.933	0.933	0.933		1.000	0.992	0.944		0.917	0.917	2011	Scami
1.000 1.00			1.000	_	1.067	1.067	1.067		1.000				0.933	0.933		1.000				0.917		2012	gracio
1907 1917	1.000	1.000	1.000	1.038	1.067	1.067	1.067	1.000	1.000	1.000	0.982	0.933	0.933	0.933	1.000	1.000	0.992	0.944	0.917	0.917	0.917	2013	oy yea
0.917 0.91	_	_			_	1.067			_					_		1.000		_				2014	-
0.917 0.91		_		_		1.067	1.067		_		_							_		_		2015	
0.947 0.91		1.000			1.067	1.067	1.067	-	1.000	-				0.933		1.000	-	_		_	0.917	2016	
1.000 1.00	1.000	1.000		1.038	1.067	1.067	1.067	1.000	1.000	1.000					1.000	1.000				-		2017	
0.917 0.91	1.000	1.000			1.067	1.067	1.067	_	1.000	_							1	-		1		2018	
0.917 0.91		-		1.038	_	1.067	1.067		_							1.000		_		_		2019	
0.917 0.91		_				1.067	1.067	-	_									_		-		2020	
0.947 0.91	_			1.038		1.067	1.067		_		_					1.000	_			_	_	2021	
0.917 0.91		_		_		1.067	_		_		_			_		_		_		-		2022	
1.000 1.00		_	1.000			1.067	_									1.000				1		2023	
2026 2027 2026 2027 2027 2027 2027 2028		_				1.067	_		_													2024	
1.000 1.00	1.000		1.000	1.038		1.067	1.067	_	1.000	1.000					_	1.000	_	_		_		2025	
1.000 1.000		_	_	_	_				_		_					_		_		_		2026	
1.000 0.000		_	_	_		-					_				_					_		2027	
	-					1.067							_							1		2028	
2030		_		_	_						_	_		_				_	_	1		2029	
	1.000	1.000	1.000	1.038	1.067	1.067	1.067	1.000	1.000	1.000	0.982	0.933	0.933	0.933	1.000	1.000	0.992	0.944	0.917	0.917	0.917	2030	

Table D3: Fuel composition scaling factors for NO_x.

							_	_					_	_						_	_	
	7030	0.969	0.969	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	5076	0.969	0.969	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	8707	696'0	6960	696'0	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	Z072	696:0	696:0	696:0	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	5026	0.969	0.969	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2025	0.969	696'0	0.969	0.974	166:0	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	707	696'0	696'0	696'0	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2023	0.969	0.969	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2022	0.969	0.969	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	1707	696:0	696'0	0.969	0.974	166:0	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2020	0.969	696'0	0.969	0.974	166'0	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	5019	0.969	0.969	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2018	0.969	0.969	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2017	0.969	696'0	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	5016	0.969	696'0	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2015	0.969	696'0	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
ar	7014	696:0	696'0	696:0	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
Scaling factor by year	2013	0.969	0.969	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
ng facto	2012	696:0	696'0	696:0	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
Scali	7011	696:0	696'0	696:0	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2010	0.969	0.969	0.969	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	5000	696:0	696'0	696:0	0.974	0.991	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2008	0.978	826.0	0.978	0.983	1.000	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2007	0.978	876.0	0.978	0.983	1.000	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	5006	0.978	0.978	0.978	0.983	1.000	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	2002	0.978	876.0	0.978	0.983	1.000	1.000	1.000	1.014	1.014	1.014	1.003	1.000	1.000	1.000	0.993	0.993	0.993	0.994	1.000	1.000	1.000
	7007	0.995	0.995	0.995	1.000	1.000	1.000	1.000	1.011	1.011	1.011	1.000	1.000	1.000	1.000	866'0	0.998	0.998	1.000	1.000	1.000	1.000
	2003	0.995	0.995	0.995	1.000	1.000	1.000	1.000	1.011	1.011	1.011	1.000	1.000	1.000	1.000	866'0	0.998	0.998	1.000	1.000	1.000	1.000
	2002	0.995	0.995	0.995	1.000	1.000	1.000	1.000	1.011	1.011	1.011	1.000	1.000	1.000	1.000	0.998	0.998	0.998	1.000	1.000	1.000	1.000
	7001	0.995	0.995	0.995	1.000	1.000	1.000	1.000	1.011	1.011	1.011	1.000	1.000	1.000	1.000	0.998	0.998	0.998	1.000	1.000	1.000	1.000
	2000	0.995	0.995	0.995	1.000	1.000	1.000	1.000	1.011	1.011	1.011	1.000	1.000	1.000	1.000	0.998	866.0	0.998	1.000	1.000	1.000	1.000
	6661	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	8661	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	L661	1.000	000'1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	9661	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	5661	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
line		9661	9661	9661	2000	2005	2009	2009	9661	9661	9661	2000	92	2009	2009	9661	9661	9661	2000	92	60	5009
Raseline	finel	19	19	19	20	20	20	20	19	19	19	20	2005	20	20	19	19	19	20	2005	2009	20
Fmission	standard	Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Pre-Euro I	Euro I	Euro II	Euro III	Euro IV	Euro V	Euro VI
		P.							P.	<u> </u>						Ь						
	Fuel type				Petrol							Diesel							Diesel			\Box
Vehicle	type							Car, taxi	пGV										HDV			

Table D4: Fuel composition scaling factors for PM.

HDV					Car, taxi, LGV					Vehicle type					
Diesel					Diesel					Fuel type					
Euro VI	Euro V	Euro IV	Euro III	Euro II	Euro I	Pre-Euro I	Euro 6	Euro 5	Euro 4	Euro 3	Euro 2	Euro 1	Pre-Euro 1	Emission standard	
2009	2009	2005	2000	1996	1996	1996	2009	2009	2005	2000	1996	1996	1996	Baseline fuel	
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1995	
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1996	
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1997	
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1998	
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1999	
1.000	1.000	1.000	1.000	0.981	0.981	0.981	1.000	1.000	1.000	1.000	0.957	0.957	0.957	2000	
1.000	1.000	1.000	1.000	0.981	0.981	0.981	1.000	1.000	1.000	1.000	0.957	0.957	0.957	2001	
1.000	1.000	1.000	1.000	0.981	0.981	0.981	1.000	1.000	1.000	1.000	0.957	0.957	0.957	2002	
1.000	1.000	1.000	1.000	0.981	0.981	0.981	1.000	1.000	1.000	1.000	0.957	0.957	0.957	2003	
1.000	1.000	1.000	1.000	0.981	0.981	0.981	1.000	1.000	1.000	1.000	0.957	0.957	0.957	2004	
1.000	1.000	1.000	0.965	0.946	0.946	0.946	1.000	1.000	1.000	0.891	0.852	0.852	0.852	2005	
1.000	1.000	1.000	0.965	0.946	0.946	0.946	1.000	1.000	1.000	0.891	0.852	0.852	0.852	2006	
1.000	1.000	1.000	0.965	0.946	0.946	0.946	1.000	1.000	1.000	0.891	0.852	0.852	0.852	2007	
1.000	1.000	1.000	0.965	0.946	0.946	0.946	1.000	1.000	1.000	0.891	0.852	0.852	0.852	2008	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2009	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2010	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2011	Scalin
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2012	Scaling factor by y
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2013	by year
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2014	=
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2015	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2016	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2017	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2018	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2019	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2020	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2021	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2022	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2023	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2024	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2025	
1.000	1.000	0.997	0.962	0.944 (0.944 (0.944 (1.000	1.000	0.995 (0.887	0.848	0.848	0.848	2026	
1.000	1.000	0.997	0.962	0.944 (0.944 (0.944 (1.000	1.000	0.995	0.887	0.848	0.848	0.848	2027	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2028	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2029	
1.000	1.000	0.997	0.962	0.944	0.944	0.944	1.000	1.000	0.995	0.887	0.848	0.848	0.848	2030	

Emission factors 2009: Report 6 – deterioration factors and other modelling assumptions for road vehicles



TRL was commissioned by the Department for Transport to review the approach used in the National Atmospheric Emissions Inventory (NAEI) for estimating emissions from road vehicles, and to propose new methodologies. This Report addresses the emission deterioration functions and fuel/technology scaling factors currently used in the NAEI. Scaling factors are applied to the basic emission factors to enable the modelling of emissions in different years. These scaling factors cover to the changes in emissions associated with vehicle age ("degradation" or "deterioration"), and the effects of the penetration of improved fuels and vehicle technologies. The current assumptions concerning vehicle age are rather simplistic, and do not take into account the characteristics of the vehicle samples used to derive emission factors. Similarly, the fuel and technology scaling factors were devised several years ago, and many were assumed to stabilise after 2005. The Report provides a brief review of the mileage, fuel and technology effects given in the literature, and describes how new scaling factors (to be applied to the new emission factors) were derived. Scaling factors for different years were developed to account for the following: (i) mileage effects relating to vehicle samples; (ii) fuel composition effects; (iii) increased market penetration of biofuels; and (iv) the effects of future technologies.

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