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Emission factors 2009: Report 3 – exhaust emission factors for road vehicles in the United Kingdom

P G Boulter, T J Barlow and I S McCrae

TRL Limited

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Emissions factors 2009: Report 3 - Exhaust emission factors for road vehicles in the United Kingdom

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By P G Boulter, T J Barlow and I S McCrae

Prepared for: **Department for Transport, Cleaner Fuels & Vehicles 3**
Chris Parkin

	Approvals
Project Manager	*T Barlow*
Quality Reviewed	*I McCrae*

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Contents

Executive Summary

This Report describes the development of 'basic' hot exhaust emission factors for road vehicles in the UK. The term 'basic' is used here to indicate that the emission factors were either normalised or reflected existing vehicle and fuel technologies, and should be used in conjunction with scaling factors when estimating actual emissions. The scaling factors cover aspects such as the actual mileage of vehicles in different categories and years, the effects of changes to fuels, and the effects of specific emission control technologies. The development of appropriate scaling factors has been addressed separately, and is not discussed in this Report.

Emission data for light-duty vehicles (LDVs) and heavy-duty vehicles (HDVs) from as many European test programmes as possible were considered for use in the project. Four separate databases were compiled:

(i) Light-duty vehicles – regulated pollutants (including CO_2).
(ii) Heavy-duty vehicles – regulated pollutants (including CO_2).
(iii) Light-duty vehicles – unregulated pollutants.
(iv) Heavy-duty vehicles – unregulated pollutants.

The full LDV-regulated database contained data for more than 48,000 tests on almost 3,400 vehicles. Around 95% of the vehicles included were cars with a weight of less than 2.5 tonnes, and around 85% of these had a petrol engine. There was also an strong bias towards older vehicles, with more than 80% of the vehicles tested conforming with pre-Euro 1 or Euro 1 emission standards. Only 38 vehicles (1%) complied with Euro 4 emission standards. The LDV-regulated database was firstly normalised to an ambient temperature of 10^{o}C, and then to an accumulated vehicle mileage of 50,000 km. The database was then reduced in size by the exclusion of tests conducted over the driving cycles used in European vehicle type approval, and tests conducted from a cold or warm start. After normalisation and reduction the database contained 1,466 vehicles and 28,312 tests. For each combination of vehicle type, fuel type, emission standard and pollutant, a regression curve was fitted to the emission data and average trip speed data. Emission factors were developed for vehicles complying with emission standards from pre-Euro 1 (*i.e.* all emission standards before Euro 1 combined) to Euro 6. As the database only contained emission factors for vehicles certified up to and including the Euro 4 standard, assumptions were required for Euro 5 and Euro 6 vehicles.

For most categories of petrol and diesel car the CO_2 emission functions which were derived from the LDV-regulated database showed little or no difference between all Euro categories. However, type approval data for new cars, and publications by the European Commission and car manufacturers, indicate that new car CO_2 emissions are decreasing with time. Consequently, and again at the request of DfT, an alternative approach to generating CO_2 emission functions was used which took into account the reduction in emissions from new cars.

The HDV-regulated database was much smaller than the LDV-regulated database, containing 1,454 tests on 125 vehicles. Almost all the tests were conducted on vehicles running on conventional (fossil) diesel. The derivation of emission factors for regulated pollutants directly from the database would have led to substantial gaps. For greater flexibility, the average-speed emission factors from the ARTEMIS project were taken as the basis for the UK emission factors. The three main heavy-duty vehicle categories defined in the ARTEMIS model are 'coaches', 'urban buses' and 'heavy goods vehicles (HGVs)'. These are then further divided into sub-groups according to type and mass. Three levels of vehicle load are taken into consideration: 0%, 50% and 100%, and seven gradient classes are included: -6%, -4%, -2%, 0%, +2+, +4% and +6%. For HGVs emission factors for 0% gradient and 56% load (UK average, with emission factors obtained by interpolation) were calculated. For buses and coaches 0% gradient and 50% load were used. The HDV-regulated database was used to provide UK-specific adjustments to the ARTEMIS model predictions where appropriate. The ARTEMIS model contains emission factors for vehicles certified up to and including the Euro V standard, and further assumptions were required to estimate the emission factors for Euro VI vehicles. Slight modifications were made to the ARTEMIS NO_x functions so that they gave slightly higher emissions at high speeds.

The emission factors for mopeds were taken from COPERT 4, and those for motorcycles were taken from ARTEMIS.

During the curve fitting process for LDVs, a variety of different functions were used in order to produce the best possible fit and the best curve shape. Similarly, the ARTEMIS model for HDVs contains several different types of function. The final step in the process was to fit a 6^{th}-order polynomial to the values calculated using each regression curve. This enabled to the speed-emission curves for most vehicle categories to be calculated using the same basic functional form.

For the unregulated databases the only step taken was to remove tests with cold or warm starts. No normalisation was conducted for ambient temperature, mileage or any other parameter due to a lack of relevant supporting data. The pollutants considered were methane (CH_4), 1,3-butadiene, benzene, nitrous oxide (N_2O), ammonia (NH_3), polycyclic aromatic hydrocarbons (PAHs), nitrogen dioxide (NO_2) and PM size fractions. A simplified version of the vehicle fleet structure for regulated pollutants was used. This was to enable the pooling of the smaller quantities of data for unregulated pollutants. The emission factors for unregulated pollutants were mainly fixed for urban, rural and motorway conditions, although in some cases average-speed functions were developed (again converted to 6^{th}-order polynomials). In the case of PAHs, single emission factors were used for all driving conditions. Where little or no information existed, the emission factors from the COPERT 4 model were used.

There were a number of inconsistencies and general 'difficulties' associated with the data for unregulated pollutants. It was evident that some of the data could not be used to develop emission factors, and some concerns were raised about the validity of ostensibly 'correct' data.

1 Introduction

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 is 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, identifies where approaches could improve the quality of the emission estimates, and shows 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 (this Report).
- 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 (Boulter, 2009).
- Task 7: Review of evaporative emissions modelling (Latham and Boulter, 2009).
- Task 8: Demonstration of new modelling methodologies (Boulter *et al.*, 2009b).
- Task 9: Final report (Boulter *et al.*, 2009b).

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

This Report presents the findings of Task 3 – the development of new UK emission factors for regulated and non-regulated pollutants.

The development of emission factors was conducted in a number of separate stages. The main stages were:

(i) *Vehicle classification*. A vehicle classification structure was required so that emission test data could be assigned appropriately.

(ii) *Data collection*. An effort was made to collect as much emission data as possible from European laboratories, with particular emphasis on the programmes conducted in the UK. The resulting data were assembled into a number of separate databases.

(iii) *Data processing*. Prior to the development of **basic** emission factors the data were processed in a number of ways to ensure that the values were representative of UK real-world driving conditions. The data for specific vehicle categories also had to be extracted.

(iv) *Data analysis*. Once processed, a series of calculations were undertaken to determine appropriate emission factors.

These stages are described in more detail in the following Chapters. The term ‘basic’ is used above to indicate that the emission factors are either normalised or reflect current vehicle and fuel technologies, and should be used in conjunction with scaling factors when estimating actual emissions. The development of appropriate

[1] http://www.naei.org.uk/

scaling factors is being addressed in Task 6 of the project (Boulter, 2009), and is not discussed in this Report. The scaling factors cover aspects such as the actual mileage of vehicles in different categories and years, the effects of changes to fuels, and the effects of specific emission control technologies.

In the measurement and modelling of vehicle emissions, various abbreviations and terms are often used to describe the concepts and activities involved. Appendix A therefore 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.*).

[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.

2 Vehicle classification

In emission inventories and air pollution models traffic data are required for a large number of vehicle categories in order to reflect variation in emission behaviour. The classification of vehicle during testing has a crucial bearing on how the resulting emission data can be used in models. Systems of traffic classification vary, but they generally reflect the typical formats of available traffic data and/or emission-related criteria (*e.g.* Euro standards).

The structure of the emission factors currently used in the NAEI is shown in Figure 1. Some of the vehicle categories used within the NAEI are currently very broad. For example, HGVs are simply sub-divided by 'rigid' and 'articulated'. The emissions from a 12-tonne, 2-axle rigid truck are likely to be very different from a 34-tonne, 4-axle rigid tipper. However, the recent increase in the amount of available emission data has allowed a more detailed structure to be proposed for use in the UK, and this is shown in Figure 2.

In both Figure 1 and Figure 2 the sub-division of the traffic is shown in terms of 'levels'. In both cases the traffic is divided into three main categories: LDVs, HDVs and two-wheel vehicles. For each of these main categories, a further sub-division is required according to a number of criteria, including fuel type (*e.g.* petrol, diesel, LPG), engine size or weight, and compliance with emission control legislation. Not all the details are included below Level 3. The disaggregation of the traffic at Levels 3-6 is usually undertaken by emission and air pollution modellers.

The vehicle categories for regulated pollutants are shown in Table 1 to Table 10. It should be noted that:

- The LGV categories N1(I), N1(II) and N1(III) relate to the weight bands used in the type approval legislation: ≤1305 kg, >1305 kg to ≤1760 kg and >1760 to ≤3500 kg respectively.
- The weight ranges for heavy goods vehicles, buses and coaches refer to the maximum gross vehicle weight.

The main enhancements in the 2009 update to the existing emission factors include the following:

- The addition of fuels other than petrol and diesel for LDVs.
- The addition of Euro 5 and Euro 6 LDVs.
- The inclusion of taxis (black cabs) as a separate category.
- The sub-division of rigid HGVs, articulated HGVs, buses and coaches by weight band.
- The addition of Euro V and Euro VI HDVs.
- The sub-division of two-wheel vehicles into mopeds and motorcycles.
- The sub-division of motorcycles by engine size band.

These aspects have been addressed in the basic emission factors. Further enhancements are included in the scaling factors (*i.e.* they are addressed via adjustments to the basic emission factors).

Some vehicle categories have not been included, primarily because little or no data were available during the project. These include hybrid vehicles and CNG-fuelled vehicles. In such cases, other sources of information have been identified, and it is recommended that future updates of the UK emission factors. Furthermore, consideration was given to the introduction of vehicle categories specifically to reflect the various after-treatment technologies in use. However, there are a number of problems with this approach. Firstly, the baseline vehicle categories reflect a given emission standard, and already include certain technologies (*e.g.* EGR). It would therefore not be reasonable to make a separate allowance for them. Secondly, it would increase the complexity of the overall approach considerably, as many new vehicle categories would be required. Thirdly, data on the effects of specific devices are rather limited. It is therefore recommended that users introduce any additional vehicle categories required, and apply appropriate emission factors or scaling factors from the literature. For the latter, a few examples are provided in the report by Boulter (2009).

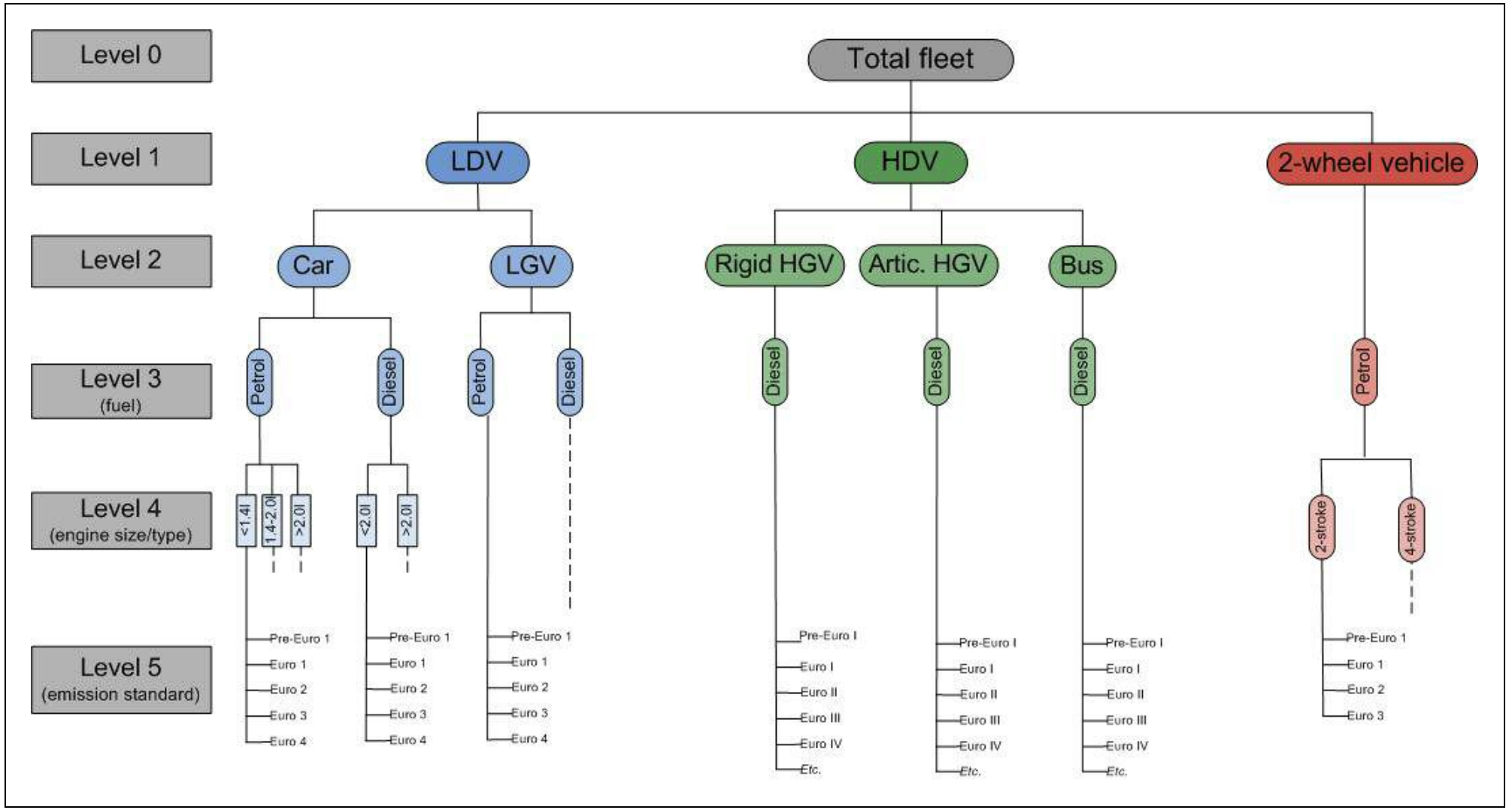

Figure 1: Structure of the road vehicle fleet in the NAEI.

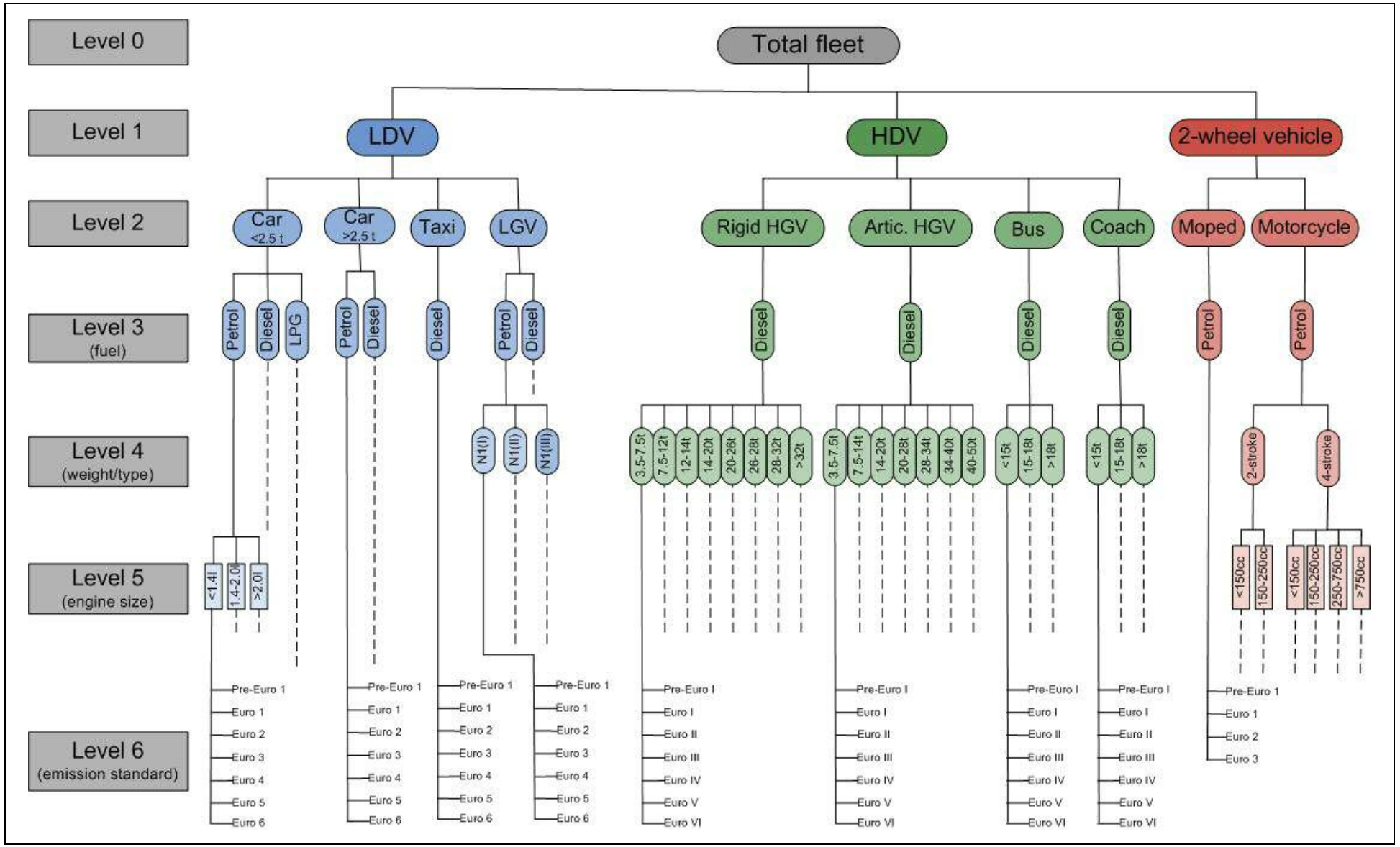

Figure 2: Proposed new structure of the road vehicle fleet (basic emission factors).

Table 1: Vehicle categories for regulated pollutants – cars/minibuses, <2.5 tonnes.

Code	Fuel type	Engine capacity (cc)	Emission standard	Code	Fuel type	Engine capacity (cc)	Emission standard
R001	Petrol	<1400	Pre-Euro 1	**R025**	Diesel	<1400	Euro 3
R002	Petrol	<1400	Euro 1	**R026**	Diesel	<1400	Euro 4
R003	Petrol	<1400	Euro 2	**R027**	Diesel	<1400	Euro 5
R004	Petrol	<1400	Euro 3	**R028**	Diesel	<1400	Euro 6
R005	Petrol	<1400	Euro 4	**R029**	Diesel	1400-2000	Pre-Euro 1
R006	Petrol	<1400	Euro 5	**R030**	Diesel	1400-2000	Euro 1
R007	Petrol	<1400	Euro 6	**R031**	Diesel	1400-2000	Euro 2
R008	Petrol	1400-2000	Pre-Euro 1	**R032**	Diesel	1400-2000	Euro 3
R009	Petrol	1400-2000	Euro 1	**R033**	Diesel	1400-2000	Euro 4
R010	Petrol	1400-2000	Euro 2	**R034**	Diesel	1400-2000	Euro 5
R011	Petrol	1400-2000	Euro 3	**R035**	Diesel	1400-2000	Euro 6
R012	Petrol	1400-2000	Euro 4	**R036**	Diesel	>2000	Pre-Euro 1
R013	Petrol	1400-2000	Euro 5	**R037**	Diesel	>2000	Euro 1
R014	Petrol	1400-2000	Euro 6	**R038**	Diesel	>2000	Euro 2
R015	Petrol	>2000	Pre-Euro 1	**R039**	Diesel	>2000	Euro 3
R016	Petrol	>2000	Euro 1	**R040**	Diesel	>2000	Euro 4
R017	Petrol	>2000	Euro 2	**R041**	Diesel	>2000	Euro 5
R018	Petrol	>2000	Euro 3	**R042**	Diesel	>2000	Euro 6
R019	Petrol	>2000	Euro 4	**R043**	LPG	All	Euro 1
R020	Petrol	>2000	Euro 5	**R044**	LPG	All	Euro 2
R021	Petrol	>2000	Euro 6	**R045**	LPG	All	Euro 3
R022	Diesel	<1400	Pre-Euro 1	**R046**	LPG	All	Euro 4
R023	Diesel	<1400	Euro 1	**R047**	LPG	All	Euro 5
R024	Diesel	<1400	Euro 2	**R048**	LPG	All	Euro 6

Table 2: Vehicle categories for regulated pollutants – cars/minibuses, 2.5-3.5 tonnes.

Code	Fuel type	Engine capacity (cc)	Emission standard	Code	Fuel type	Engine capacity (cc)	Emission standard
R049	Petrol	All	Pre-Euro 1	**R056**	Diesel	All	Pre-Euro 1
R050	Petrol	All	Euro 1	**R057**	Diesel	All	Euro 1
R051	Petrol	All	Euro 2	**R058**	Diesel	All	Euro 2
R052	Petrol	All	Euro 3	**R059**	Diesel	All	Euro 3
R053	Petrol	All	Euro 4	**R060**	Diesel	All	Euro 4
R054	Petrol	All	Euro 5	**R061**	Diesel	All	Euro 5
R055	Petrol	All	Euro 6	**R062**	Diesel	All	Euro 6

Table 3: Vehicle categories for regulated pollutants – cars, taxis.

Code	Fuel type	Engine capacity (cc)	Emission standard
R063	Diesel	All	Pre-Euro 1
R064	Diesel	All	Euro 1
R065	Diesel	All	Euro 2
R066	Diesel	All	Euro 3
R067	Diesel	All	Euro 4
R068	Diesel	All	Euro 5
R069	Diesel	All	Euro 6

Table 4: Vehicle categories for regulated pollutants – LGVs.

Code	Vehicle type	Fuel type	Engine capacity (cc)	Emission standard	Code	Vehicle type	Fuel type	Engine cap-acity (cc)	Emission standard
R070	LGV N1(I)	Petrol	All	Pre-Euro 1	**R091**	LGV N1(II)	Diesel	All	Pre-Euro 1
R071	LGV N1(I)	Petrol	All	Euro 1	**R092**	LGV N1(II)	Diesel	All	Euro 1
R072	LGV N1(I)	Petrol	All	Euro 2	**R093**	LGV N1(II)	Diesel	All	Euro 2
R073	LGV N1(I)	Petrol	All	Euro 3	**R094**	LGV N1(II)	Diesel	All	Euro 3
R074	LGV N1(I)	Petrol	All	Euro 4	**R095**	LGV N1(II)	Diesel	All	Euro 4
R075	LGV N1(I)	Petrol	All	Euro 5	**R096**	LGV N1(II)	Diesel	All	Euro 5
R076	LGV N1(I)	Petrol	All	Euro 6	**R097**	LGV N1(II)	Diesel	All	Euro 6
R077	LGV N1(I)	Diesel	All	Pre-Euro 1	**R098**	LGV N1(III)	Petrol	All	Pre-Euro 1
R078	LGV N1(I)	Diesel	All	Euro 1	**R099**	LGV N1(III)	Petrol	All	Euro 1
R079	LGV N1(I)	Diesel	All	Euro 2	**R100**	LGV N1(III)	Petrol	All	Euro 2
R080	LGV N1(I)	Diesel	All	Euro 3	**R101**	LGV N1(III)	Petrol	All	Euro 3
R081	LGV N1(I)	Diesel	All	Euro 4	**R102**	LGV N1(III)	Petrol	All	Euro 4
R082	LGV N1(I)	Diesel	All	Euro 5	**R103**	LGV N1(III)	Petrol	All	Euro 5
R083	LGV N1(I)	Diesel	All	Euro 6	**R104**	LGV N1(III)	Petrol	All	Euro 6
R084	LGV N1(II)	Petrol	All	Pre-Euro 1	**R105**	LGV N1(III)	Diesel	All	Pre-Euro 1
R085	LGV N1(II)	Petrol	All	Euro 1	**R106**	LGV N1(III)	Diesel	All	Euro 1
R086	LGV N1(II)	Petrol	All	Euro 2	**R107**	LGV N1(III)	Diesel	All	Euro 2
R087	LGV N1(II)	Petrol	All	Euro 3	**R108**	LGV N1(III)	Diesel	All	Euro 3
R088	LGV N1(II)	Petrol	All	Euro 4	**R109**	LGV N1(III)	Diesel	All	Euro 4
R089	LGV N1(II)	Petrol	All	Euro 5	**R110**	LGV N1(III)	Diesel	All	Euro 5
R090	LGV N1(II)	Petrol	All	Euro 6	**R111**	LGV N1(III)	Diesel	All	Euro 6

Table 5: Vehicle categories for regulated pollutants – rigid HGVs.

Code	Fuel type	Weight limit (tonnes)	Emission standard	Code	Fuel type	Weight limit (tonnes)	Emission standard
R112	Diesel	3.5-7.5 t	Pre-Euro I	**R140**	Diesel	20-26 t	Pre-Euro I
R113	Diesel	3.5-7.5 t	Euro I	**R141**	Diesel	20-26 t	Euro I
R114	Diesel	3.5-7.5 t	Euro II	**R142**	Diesel	20-26 t	Euro II
R115	Diesel	3.5-7.5 t	Euro III	**R143**	Diesel	20-26 t	Euro III
R116	Diesel	3.5-7.5 t	Euro IV	**R144**	Diesel	20-26 t	Euro IV
R117	Diesel	3.5-7.5 t	Euro V	**R145**	Diesel	20-26 t	Euro V
R118	Diesel	3.5-7.5 t	Euro VI	**R146**	Diesel	20-26 t	Euro VI
R119	Diesel	7.5-12 t	Pre-Euro I	**R147**	Diesel	26-28 t	Pre-Euro I
R120	Diesel	7.5-12 t	Euro I	**R148**	Diesel	26-28 t	Euro I
R121	Diesel	7.5-12 t	Euro II	**R149**	Diesel	26-28 t	Euro II
R122	Diesel	7.5-12 t	Euro III	**R150**	Diesel	26-28 t	Euro III
R123	Diesel	7.5-12 t	Euro IV	**R151**	Diesel	26-28 t	Euro IV
R124	Diesel	7.5-12 t	Euro V	**R152**	Diesel	26-28 t	Euro V
R125	Diesel	7.5-12 t	Euro VI	**R153**	Diesel	26-28 t	Euro VI
R126	Diesel	12-14 t	Pre-Euro I	**R154**	Diesel	28-32 t	Pre-Euro I
R127	Diesel	12-14 t	Euro I	**R155**	Diesel	28-32 t	Euro I
R128	Diesel	12-14 t	Euro II	**R156**	Diesel	28-32 t	Euro II
R129	Diesel	12-14 t	Euro III	**R157**	Diesel	28-32 t	Euro III
R130	Diesel	12-14 t	Euro IV	**R158**	Diesel	28-32 t	Euro IV
R131	Diesel	12-14 t	Euro V	**R159**	Diesel	28-32 t	Euro V
R132	Diesel	12-14 t	Euro VI	**R160**	Diesel	28-32 t	Euro VI
R133	Diesel	14-20 t	Pre-Euro I	**R161**	Diesel	>32 t	Pre-Euro I
R134	Diesel	14-20 t	Euro I	**R162**	Diesel	>32 t	Euro I
R135	Diesel	14-20 t	Euro II	**R163**	Diesel	>32 t	Euro II
R136	Diesel	14-20 t	Euro III	**R164**	Diesel	>32 t	Euro III
R137	Diesel	14-20 t	Euro IV	**R165**	Diesel	>32 t	Euro IV
R138	Diesel	14-20 t	Euro V	**R166**	Diesel	>32 t	Euro V
R139	Diesel	14-20 t	Euro VI	**R167**	Diesel	>32 t	Euro VI

Table 6: Vehicle categories for regulated pollutants – articulated HGVs.

Code	Fuel type	Weight limit (tonnes)	Emission standard	Code	Fuel type	Weight limit (tonnes)	Emission standard
R168	Diesel	14-20 t	Pre-Euro I	**R186**	Diesel	28-34 t	Euro IV
R169	Diesel	14-20 t	Euro I	**R187**	Diesel	28-34 t	Euro V
R170	Diesel	14-20 t	Euro II	**R188**	Diesel	28-34 t	Euro VI
R171	Diesel	14-20 t	Euro III	**R189**	Diesel	34-40 t	Pre-Euro I
R172	Diesel	14-20 t	Euro IV	**R190**	Diesel	34-40 t	Euro I
R173	Diesel	14-20 t	Euro V	**R191**	Diesel	34-40 t	Euro II
R174	Diesel	14-20 t	Euro VI	**R192**	Diesel	34-40 t	Euro III
R175	Diesel	20-28 t	Pre-Euro I	**R193**	Diesel	34-40 t	Euro IV
R176	Diesel	20-28 t	Euro I	**R194**	Diesel	34-40 t	Euro V
R177	Diesel	20-28 t	Euro II	**R195**	Diesel	34-40 t	Euro VI
R178	Diesel	20-28 t	Euro III	**R196**	Diesel	40-50 t	Pre-Euro I
R179	Diesel	20-28 t	Euro IV	**R197**	Diesel	40-50 t	Euro I
R180	Diesel	20-28 t	Euro V	**R198**	Diesel	40-50 t	Euro II
R181	Diesel	20-28 t	Euro VI	**R199**	Diesel	40-50 t	Euro III
R182	Diesel	28-34 t	Pre-Euro I	**R200**	Diesel	40-50 t	Euro IV
R183	Diesel	28-34 t	Euro I	**R201**	Diesel	40-50 t	Euro V
R184	Diesel	28-34 t	Euro II	**R202**	Diesel	40-50 t	Euro VI
R185	Diesel	28-34 t	Euro III				

Table 7: Vehicle categories for regulated pollutants – buses.

Code	Fuel type	Weight limit (tonnes)	Emission standard	Code	Fuel type	Weight limit (tonnes)	Emission standard
R203	Diesel	<15 t	Pre-Euro I	**R214**	Diesel	15-18 t	Euro IV
R204	Diesel	<15 t	Euro I	**R215**	Diesel	15-18 t	Euro V
R205	Diesel	<15 t	Euro II	**R216**	Diesel	15-18 t	Euro VI
R206	Diesel	<15 t	Euro III	**R217**	Diesel	>18 t	Pre-Euro I
R207	Diesel	<15 t	Euro IV	**R218**	Diesel	>18 t	Euro I
R208	Diesel	<15 t	Euro V	**R219**	Diesel	>18 t	Euro II
R209	Diesel	<15 t	Euro VI	**R220**	Diesel	>18 t	Euro III
R210	Diesel	15-18 t	Pre-Euro I	**R221**	Diesel	>18 t	Euro IV
R211	Diesel	15-18 t	Euro I	**R222**	Diesel	>18 t	Euro V
R212	Diesel	15-18 t	Euro II	**R223**	Diesel	>18 t	Euro VI
R213	Diesel	15-18 t	Euro III				

Table 8: Vehicle categories for regulated pollutants – coaches.

Code	Fuel type	Weight limit (tonnes)	Emission standard	Code	Fuel type	Weight limit (tonnes)	Emission standard
R224	Diesel	15-18 t	Pre-Euro I	**R231**	Diesel	>18 t	Pre-Euro I
R225	Diesel	15-18 t	Euro I	**R232**	Diesel	>18 t	Euro I
R226	Diesel	15-18 t	Euro II	**R233**	Diesel	>18 t	Euro II
R227	Diesel	15-18 t	Euro III	**R234**	Diesel	>18 t	Euro III
R228	Diesel	15-18 t	Euro IV	**R235**	Diesel	>18 t	Euro IV
R229	Diesel	15-18 t	Euro V	**R236**	Diesel	>18 t	Euro V
R230	Diesel	15-18 t	Euro VI	**R237**	Diesel	>18 t	Euro VI

Table 9: Vehicle categories for regulated pollutants – mopeds.

Code	Fuel type	Engine capacity (cc)	Emission standard
R238	Petrol	< 50 cc	Pre-Euro 1
R239	Petrol	< 50 cc	Euro 1
R240	Petrol	< 50 cc	Euro 2
R241	Petrol	< 50 cc	Euro 3

Table 10: Vehicle categories for regulated pollutants – motorcycles.

Code	Vehicle type	Fuel type	Engine capacity (cc)	Emission standard	Code	Vehicle type	Fuel type	Engine cap-acity (cc)	Emission standard
R242	2-stroke	Petrol	<=150	Pre-Euro 1	**R254**	4-stroke	Petrol	150-250	Pre-Euro 1
R243	2-stroke	Petrol	<=150	Euro 1	**R255**	4-stroke	Petrol	150-250	Euro 1
R244	2-stroke	Petrol	<=150	Euro 2	**R256**	4-stroke	Petrol	150-250	Euro 2
R245	2-stroke	Petrol	<=150	Euro 3	**R257**	4-stroke	Petrol	150-250	Euro 3
R246	2-stroke	Petrol	150-250	Pre-Euro 1	**R258**	4-stroke	Petrol	250-750	Pre-Euro 1
R247	2-stroke	Petrol	150-250	Euro 1	**R259**	4-stroke	Petrol	250-750	Euro 1
R248	2-stroke	Petrol	150-250	Euro 2	**R260**	4-stroke	Petrol	250-750	Euro 2
R249	2-stroke	Petrol	150-250	Euro 3	**R261**	4-stroke	Petrol	250-750	Euro 3
R250	4-stroke	Petrol	<=150	Pre-Euro 1	**R262**	4-stroke	Petrol	>750	Pre-Euro 1
R251	4-stroke	Petrol	<=150	Euro 1	**R263**	4-stroke	Petrol	>750	Euro 1
R252	4-stroke	Petrol	<=150	Euro 2	**R264**	4-stroke	Petrol	>750	Euro 2
R253	4-stroke	Petrol	<=150	Euro 3	**R265**	4-stroke	Petrol	>750	Euro 3

3 Data collection

Within Task 3 an effort was made to collect as much emission data as possible from European laboratories, with particular emphasis on the programmes conducted in the UK. The test programmes which were included, and the emission factor databases which resulted, are described below.

3.1 Test programmes

Emission data for LDVs and HDVs from as many European test programmes as possible were considered for use in the project. As far as possible, bag measurements were used, although for some unregulated pollutants aggregated continuous measurements were included.

The programmes from which data were taken are listed in Table 11. The starting point for data collection was the database compiled in the Emission Factors 2000 project (Barlow *et al.*, 2001). Those test programmes already included in the Emission Factors 2000 database are indicated by shaded ID codes.

3.2 Database compilation

Four separate databases were compiled:

(v) Light-duty vehicles – regulated pollutants (including CO_2).

(vi) Heavy-duty vehicles – regulated pollutants (including CO_2).

(vii) Light-duty vehicles – unregulated pollutants.

(viii) Heavy-duty vehicles – unregulated pollutants.

For each of the four databases, the basic structure was taken from the Light Vehicle Emission Measurement (LVEM) database compiled in ARTEMIS (André, 2005; Kljun *et al*., 2005; Joumard *et al*., 2007). This structure is based upon three main groups of parameters, with each group being divided into a number of sub-categories:

(i) *Vehicle parameters*. These parameters provided information on each tested vehicle, such as the make, model, year of registration, engine size, fuel type and emission legislation. Each vehicle had its own unique identification code.

(ii) *Test parameters*. These parameters described the conditions under which the test was conducted, and any other relevant information relating to the test, such as the date, the laboratory, the driving cycle, the ambient temperature, *etc*.

(iii) *Pollutants*. These parameters described the emission factors and fuel consumption associated with each test.

For the LDV and HDV databases (both regulated and unregulated pollutants), the vehicle and test parameters are listed in Table 12 and Table 13. The same test parameters were used for LDVs and HDVs. The sub-categories for the vehicle and test parameters are explained in Table 14, Table 15 and Table 16. In some cases numerical identifiers were used to improve the efficiency and reliability of data handling. The driving cycles included in the database are listed in Appendix B. The fields for regulated and unregulated pollutants are provided in Table 17 and Table 18 respectively.

For the regulated pollutants and CO_2, standard measurement techniques were employed throughout. On the other hand, the various unregulated pollutants were measured using a range of different techniques, such as gas chromatography/mass spectrometry (GC/MS), Fourier-transform infrared spectroscopy (FTIR) and, for particle size measurement, a micro-orifice uniform deposit impactor (MOUDI).

Table 11: Test programmes from which suitable emission data were obtained (regulated pollutants).

ID	Programme title	Original client	Contract /project reference	Laboratory	End year	LDV	HDV
000	MEET	EC		Various EU	1999	✓	×
001	TRL large-scale survey			MIRA/WSL	1992	✓	×
002	TRL LGVs			WSL		✓	✓
003	TRL congested traffic			WSL		✓	×
004	TRL inspection and maintenance tests			WSL	1993	✓	×
005	TRL cold catalyst tests			WSL	1993	✓	×
006	TRL EC IM	EC		Cosworth	1997	✓	×
007	TRL HA M25 high speed	HA		Ricardo	1996	✓	×
008	TRL 1997 LDV	DETR (VSE)		Millbrook	1997	✓	×
009	TRL 1998 HDV	DETR (VET)		Millbrook	1998	✓ (2 LGVs)	✓
010	TRL 1999 LDV	DETR (VET)		Millbrook	1999	✓	✓
011	TRL 2000a LDV and HDV	DETR (TET)		Millbrook	2000	✓	✓
013	TRL UG127 LDV	DETR (DITM)	UG127	AEA	1999	✓	×
014	TRL 2000b LDV	DETR (TET)		Millbrook	2000	✓	×
015	TRL 2001 LDV	DETR (TET)		Ricardo	2001	✓	×
100	EC FP5 ARTEMIS project [a]	EC	1999-RD.10429 / S0018/T3	Various EU		✓	×
101	EC FP5 PARTICULATES project	EC	GRD1-1999-11091 / S0017/T3	Various EU		✓	×
102	EC FP5 OSCAR project	EC	EVK4-CT-2002-00083	TNO	2004	✓	×
103	DfT TRAMAQ - HDV emission measurements	DETR	UG216	Millbrook		×	✓
105	DfT TRAMAQ - Primary NO_2 emissions	DETR	UG294	Millbrook	2000	✓	✓
106	VCA in-service emissions 2006-2006	VCA		Millbrook	2006	✓	×
109	DfT LPG bi-fuel	DfT		Millbrook	2005	✓	×
110	DfT Emission factors – Euro 3 cars	DfT	S0109 / S0326/VB	Ricardo	2003	✓	×
111	DfT Emission factors 2003 (EVT03/54)	DfT	EVT03/54	Shell	2007	✓	✓
112	DfT/DTI: Effects of emerging vehicle technologies	DfT		Millbrook	2005	✓	×
116	DfT: Ethanol emission testing	DfT		AEA	2002	✓	×
130	Tests conducted on London Taxis			BP		✓	×
132	TfL Scoping tests 2007	TfL		Millbrook		×	✓
300	Euro 3 LPG retrofits	DfT	CFV 4/4/06	Tickford	2007	✓	×

a (OSCAR, TRL EC-IM, TRL M25, TRL LSS removed)

Table 12: Structure of LDV databases.

Main group	Sub-categories		
Vehicle parameters (both databases)	Vehicle ID	Engine capacity (cc)	Gearbox ID
	Vehicle type ID	Maximum power (kW)	Number of gears
	Make	Fuel injection ID	Vehicle mass, empty (kg)
	Model	Aspiration ID	Vehicle mass, test (kg)
	Variant	Number of catalysts[a]	Vehicle mass, max. (kg)
	Registration year	Catalyst 1 ID	Odometer reading (km)
	Registration month	Catalyst 2 ID	Fuel type ID
	Emission standard ID	EGR ID	
Test parameters (both databases)	Test date	Driving cycle ID	Ambient pressure (kPa)
	Test year	Hot/cold start ID	Ambient temperature (^{o}C)
	Country ID	Cycle duration (s)	Ambient RH (%)
	Laboratory ID	Cycle distance (km)	Sample type ID
	Test programme ID	Cycle average speed (km/h)	

[a] Including other emission-control devices.

Table 13: Structure of HDV databases.

Main group	Sub-categories		
Vehicle parameters (both databases)	Vehicle ID	Engine capacity (cc)	Vehicle mass, test (kg)
	Vehicle type	Maximum power (kW)	Vehicle mass, max. (kg)
	Rigid/articulated (HGVs)	Injection ID	Maximum GVW range (t)
	Number of axles	Aspiration ID	Odometer reading (km)
	Make	Emission control	Fuel type ID
	Model	EGR ID	
	Registration year	Gearbox ID	
	Emission standard ID	Vehicle mass, empty (kg)	
Test parameters	As for LDVs		

[a] Including other emission-control devices.

Table 14: Sub-categories for vehicle parameters in LDV databases.

Field	Code	Description	Field	Code	Description
Vehicle type ID	1	Car/bus <2.5 t, <9 persons	Catalyst 1/2 ID	1	Oxidation catalyst
	2	Car/bus 2.5-3.5 t, <9 persons		2	3-way-cat. TWC
	3	LGV N1(I)		3	TWC+pre-cat
	4	LGV N1(II)		4	NOx-adsorber
	5	LGV N1(III)		5	Dual-bed catalyst
	6	Taxi (black cab)		6	DPF
				7	SCR
Emission standard ID	0	pre-Euro 1			
	1	Euro 1	EGR ID	0	No
	2	Euro 2		1	Yes
	3	Euro 3			
	4	Euro 4	Gearbox ID	1	manual
				2	automatic
Fuel injection ID	1	Petrol, LPG, CNG: carburettor			
	2	Petrol, LPG, CNG: electrical carb.			
	3	Petrol, LPG, CNG: single-point inj.			
	4	Petrol, LPG, CNG: multi-point inj.			
	5	Petrol, LPG, CNG: direct injection			
	6	Diesel: indirect injection	Fuel type ID	1	Petrol
	7	Diesel: direct injection		2	Diesel
	8	Diesel: common rail		3	LPG
				4	CNG/LNG
Aspiration ID	1	Natural		5	Biodiesel
	2	Turbo		6	Petrol hybrid
	3	Turbo inter-cooled		7	E10 bioethanol-petrol

Table 15: Sub-categories for vehicle parameters in HDV databases.

Field	Description	Field	Description	
Vehicle type	HGV	Max. GVW range	HGV, rigid	3.5-7.5 t
	Bus		HGV, rigid	7.5-12 t
	Coach		HGV, rigid	12-14 t
			HGV, rigid	14-20 t
Fuel type ID	As for LDVs		HGV, rigid	20-26 t
			HGV, rigid	26-28 t
Emission standard ID	As for LDVs		HGV, rigid	28-32
			HGV, rigid	>32t
Fuel injection ID	As for LDVs		HGV, artic.	3.5-7.5 t
			HGV, artic.	7.5-14 t
Aspiration ID	As for LDVs		HGV, artic.	14-20 t
			HGV, artic.	20-28 t
Catalyst 1/2 ID	As for LDVs		HGV, artic.	28-34 t
			HGV, artic.	34-40 t
EGR ID	As for LDVs		HGV, artic.	40-50 t
			HGV, artic.	50-60 t
Gearbox ID	As for LDVs		Bus	<15 t
			Bus	15-18 t
			Bus	>18 t
			Coach	<15 t
			Coach	15-18 t
			Coach	>18 t

Table 16: Sub-categories for test parameters in LDV and HDV databases.

Field	Code	Description	Field	Code	Description
Country ID	AT	Austria	Laboratory ID	1	TRL
	BE	Belgium		2	AEA
	CH	Switzerland		3	Millbrook
	DE	Germany		4	Shell
	FI	Finland		5	Ricardo
	FR	France		6	Cosworth
	GR	Greece		7	MIRA
	HU	Hungary		8	WSL
	IT	Italy		9	BP
	NL	Netherlands		10	ADAC
	SE	Sweden		11	EMPA
	UK	United Kingdom		12	INRETS
				13	Instituto Motori
Test prog-ramme ID	See Table 1.			14	KTI
				15	LAT
				16	RWTUEV
Hot/cold start ID	1	Cold-start		17	TNO
	2	Intermediate		18	MTC
	3	Hot-start		19	TUEVRH
				20	TUG
Sample type ID	1	Bag/filter		21	VTT
	2	Continuous		22	FORD
				23	IFP

Table 17: Regulated pollutants.

CO g/h	NO_x g/h (NO_2 equiv.)	uCO_2 g/h
CO g/km	NO_x g/km (NO_2 equiv.)	uCO_2 g/km
HC g/h ($CH_{1.85}$ equiv.)	PM g/h	FC l/h
HC g/km ($CH_{1.85}$ equiv.)	PM g/km	FC l/100km

Table 18: Unregulated pollutants (g/km unless stated otherwise).

methane	3,4-DM-1-pentene	2,3-DM-heptane	acetaldehyde
ethene	benzene	m-xylene	acetone
ethyne	3,3-DM-pentane	m&p-xylene	acrolein
ethane	cyclohexane	2M-octane	propionaldehyde
propene	2M-hexane	3M-octane	crotonaldehyde
propane	2,3-DM-pentane	styrene	butanone
propadiene	cyclohexene	o-xylene	methacrolein
2M-propane	3M-hexane	1-nonene	butyraldehyde
2M-propene	c-1,3-DM-cyclopentane	nonane	m-tolualdehyde
1-butene	3E-pentane	i-propylbenzene	o-tolualdehyde
1,3-butadiene	2,2,4-TM-pentane	2,2-DM-octane	p-tolualdehyde
butane	t-3-heptene	benzaldehyde	hexanal
t-2-butene	heptane	2,4-DM-octane	naphthalene[a]
1-butyne	2M-2-hexene	n-propylbenzene	2-methylnaphthalene[a]
c-2-butene	t-2-heptene	1M-3E-benzene	1-methylnaphthalene [a]
3M-1-butene	3E-c-2-pentene	1M-4E-benzene	acenaphthene[a]
2M-butane	2,4,4-TM-1-pentene	1,3,5-TM-benzene	acenaphthylene[a]
1-pentene	c-2-heptene	1E-2M-benzene	acenaphthene + acenaphthylene[a]
2M-1-butene	M-cyclohexane	1,2,4-TM-benzene	fluorene[a]
pentane	2,2-DM-hexane	decane	phenanthrene[a]
2M-1,3-butadiene	2,4,4-TM-2-pentene	i-butylbenzene	anthracene[a]
t-2-pentene	2,5-DM-hexane	s-butylbenzene	fluoranthene[a]
3,3-DM-1-butene	2,4-DM-hexane	1M-3-i-propbenzene	pyrene
c-2-pentene	3,3-DM-hexane	1,2,3-TM-benzene	benzo(a)anthracene[a]
2M-2-butene	2,3,4-TM-pentane	1M-4-i-propbenzene	chrysene[a]
cyclopentadiene	toluene	indane	benzo(b)Fluoranthene[a]
2,2-DM-butane	2,3-DM-hexane	1,3-DE-benzene	benzo(b+j)fluoranthene[a]
cyclopentene	2M-heptane	1,4-DE-benzene	dibenz(a,h)Anthracene[a]
3M-1-pentene	4M-heptane	1M-3-n-propbenzene	benzo(k)fluoranthene[a]
cyclopentane	3M-heptane	1M-4-n-propbenzene	benzo(a)pyrene[a]
2,3-DM-butane	c-1,3-DM-cyclohexane	1,2-DE-benzene	benzo(ghi)perylene[a]
MTBE	c-1,4-DM-Cyclohexane	1M-2-n-propbenzene	indeno(1,2,3cd)Pyrene[a]
2M-pentane	t-1,4-DM-Cyclohexane	1,4-DM-2-E-benzene	perylene[a]
4M-t-2-pentene	2,2,5-TM-hexane	1,3-DM-4-E-benzene	NMHC
3M-pentane	1-octene	1,2-DM-4-E-benzene	NO (as NO_2)
2M-1-pentene	t-4-octene	1,3-DM-2-E-benzene	NO_2
1-hexene	octane	undecane	N_2O
hexane	t-2-octene	1,2-DM-3-E-benzene	NH_3
c-3-hexene	t-1,3-DM-cyclohexane	1,2,4,5-tetraM-benzene	SO_2
t-2-hexene	c-2-octene	2M-butylbenzene	H_2S
3M-t-2-pentene	2,3,5-TM-hexane	1,2,3,5-tetraM-benzene	PM_{10}
2M-2-Pentene	2,4-DM-heptane	tert-1b-2M-benzene	$PM_{2.5}$
c-2-hexene	c-1,2-DM-cyclohexane	1,2,3,4-tetraM-benzene	PM_1
3M-c-2-pentene	t-1,2-DM-cyclohexane	n-pentbenzene	NO_2 (% of NO_x)
M-cyclopentane	E-cyclohexane	tert-1b-3,5-DM-benz	PM_{10} (% of PM)
2,4-DM-pentane	3,5-DM-heptane	dodecane	$PM_{2.5}$ (% of PM)
2,2,3-TM-butane	E-benzene	formaldehyde	PM_1 (% of PM)

[a] PAHs given separately as particle phase, vapour phase and total.

For two-wheel vehicles much of the data from UK tests was already included in the extensive database of the ARTEMIS project, and therefore the compilation of a separate database was considered to be unnecessary. The ARTEMIS emission functions for two-wheel vehicles are therefore presented here (with some slight modifications, as requested by DfT), for use in the UK.

3.3 Database summaries

The numbers of vehicles and numbers of tests which were included in the full LDV-regulated database (prior to processing) are given in Table 19 and Table 20. The full LDV-regulated database contained data for more than 48,000 tests on almost 3,400 vehicles. Most of the vehicles tested (around 95%) were cars less than 2.5 tonnes in weight, and around 85% of these had a petrol engine. There was also an strong bias towards older vehicles, with more than 80% of the vehicles tested conforming with pre-Euro 1 or Euro 1 emission standards. Only 38 vehicles (1%) complied with Euro IV emission standards. The numbers of vehicle and tests in the HDV-regulated database are given in Table 21 and Table 22. The full HDV-regulated database was much smaller than the LDV-regulated database, containing 1,454 tests on 125 vehicles. Almost all the tests were conducted on vehicles running on conventional (fossil) diesel. The numbers of vehicles in the LDV-unregulated and HDV-unregulated databases are given in Table 23 and Table 24. For the unregulated pollutant databases, the numbers of measurements are listed by pollutant in Appendix C.

Table 19: Numbers of vehicles in LDV-regulated database prior to processing.

Vehicle type	Fuel	Number of vehicles by emission standard					
		Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Grand Total
Car/minibus <2.5 t, <9 persons	Petrol	1,086	1,289	186	155	24	2,740
	Diesel	228	49	56	83	11	427
	LPG		7	4	24		35
	CNG/LNG				1	1	2
	Biodiesel				2		2
	Hybrid					1	1
	Bioethanol			2	2	1	5
	Subtotal	1,314	1,345	248	267	38	3,212
Car/minibus 2.5-3.5 t, <9 persons	Petrol		3	3			6
	Diesel	2	1	1			4
	LPG				1		1
	Subtotal	2	4	4	1		11
LGV N1(I)	Diesel		1	12	2		15
	Subtotal		1	12	2		15
LGV N1(II)	Petrol	2	1	1			4
	Diesel	3		3			6
	LPG				4		4
	Subtotal	5	1	4	4		14
LGV N1(III)	Petrol	16	29	6	1		52
	Diesel	35	21	18	11		85
	LPG				5		5
	Subtotal	51	50	24	17		142
Taxi (black cab)	Diesel			2	1		3
	Subtotal			2	1		3
Grand Total		1,372	1,401	294	292	38	3,397

Table 20: Numbers of tests in LDV-regulated database prior to processing.

Vehicle type	Fuel	Number of tests by emission standard					
		Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Grand Total
Car/minibus <2.5 t, <9 persons	Petrol	17,350	6,776	4,513	6,368	802	35,809
	Diesel	2,054	984	2,935	2,557	202	8,732
	LPG		35	61	242		338
	CNG/LNG				39	50	89
	Biodiesel				296		296
	Hybrid					15	15
	Bioethanol			28	42	14	84
	Subtotal	19,404	7,795	7,537	9,544	1,083	45,363
Car/minibus 2.5-3.5 t, <9 persons	Petrol		89	110			199
	Diesel	14	19	46			79
	LPG				8		8
	Subtotal	14	108	156	8		286
LGV N1(I)	Diesel		19	122	30		171
	Subtotal		19	122	30		171
LGV N1(II)	Petrol	54	4	34			92
	Diesel	166		54			220
	LPG				32		32
	Subtotal	220	4	88	32		344
LGV N1(III)	Petrol	231	482	194	8		915
	Diesel	812	276	202	154		1,444
	LPG				40		40
	Subtotal	1,043	758	396	202		2,399
Taxi (black cab)	Diesel			48	15		63
	Subtotal			48	15		63
Grand Total		20,681	8,684	8,347	9,831	1,083	48,626

Table 21: Numbers of vehicles in HDV-regulated database prior to processing.

Vehicle category	Rigid/ articulated	Maximum GVW range	Fuel	Number of vehicles by emission standard					
				Pre-Euro I	Euro I	Euro II	Euro III	Euro IV	Grand Total
HGV	Rigid	3.5-7.5 t	Diesel	5	2	7	6	2	22
		7.5-12 t	Diesel			2	3		5
		12-14 t	Diesel		1	1			2
		14-20 t	Diesel	2	2	14	3	1	22
			CNG				1		1
		20-26 t	Diesel		1	2	3		6
		28-32 t	Diesel		1	2	1		4
		>32 t	Diesel			1	1		2
		Subtotal		7	7	29	18	3	64
HGV	Articulated	28-34 t	Diesel		1		1		2
			CNG			1		1	2
		34-40 t	Diesel		3	6	3	1	13
		40-50 t	Diesel			1	2		3
		Subtotal			4	8	6	2	20
Bus		<15 t	Diesel	2	4	5	3		14
		15-18 t	Diesel	2	2	9	7		20
		>18 t	Diesel		1			1	2
			LPG					1	1
		Subtotal		4	7	14	10	2	37
Coach		15-18 t	Diesel			2			2
		>18 t	Diesel		1		1		2
		Subtotal			1	2	1		4
Grand total				11	19	53	35	7	125

Table 22: Numbers of tests in HDV-regulated database prior to processing.

Vehicle category	Rigid/ articulated	Maximum GVW range	Fuel	Number of tests by emission standard					
				Pre-Euro I	Euro I	Euro II	Euro III	Euro IV	Grand Total
HGV	Rigid	3.5-7.5 t	Diesel			35			35
		7.5-12 t	Diesel		8	35	27		70
		12-14 t	Diesel		15			26	41
		14-20 t	Diesel					15	15
			CNG	30	8	85	66		189
		20-26 t	Diesel	59	66	147	109	41	422
		28-32 t	Diesel		8		27		35
		>32 t	Diesel	29	43	62	43		177
		Subtotal			16		16		32
HGV	Articulated	28-34 t	Diesel			4		16	20
			CNG		36	52	24	13	125
		34-40 t	Diesel			16	32		48
		40-50 t	Diesel		52	72	72	29	225
		Subtotal				16	16		32
Bus		<15 t	Diesel		4	4			8
		15-18 t	Diesel		4	20	36		60
		>18 t	Diesel	24	18	174	36	26	278
			LPG				4		4
		Subtotal			4	24	16		44
Coach		15-18 t	Diesel			8	12		20
		>18 t	Diesel	103	24	56	54	54	291
		Subtotal		127	54	302	174	80	737
Grand total				186	180	556	382	150	1,454

Table 23: Numbers of vehicles in LDV-unregulated database (hot-start tests only).

Vehicle type	Fuel type	Number of tests by emission standard					
		Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Grand Total
Car/minibus <2.5 t, <9 persons	Petrol	55	34	38	39	3	169
	Diesel	16	18	32	17	1	84
	LPG			1	2		3
	Hybrid					1	1
	Bioethanol			1	1	1	3
	Subtotal	71	52	72	59	6	260
LGV N1(I)	Diesel			1			1
LGV N1(II)	Diesel			1			1
LGV N1(III)	Diesel	1	1	4	5		11
Taxi (black cab)	Diesel			1	1		2
Grand Total		72	53	79	65	6	275

Table 24: Numbers of vehicles in HDV-unregulated database (hot-start tests only).

Vehicle category	Rigid/ articulated	Maximum GVW range	Fuel	Number of vehicles by emission standard					
				Pre-Euro I	Euro I	Euro II	Euro III	Euro IV	Grand Total
HGV	Rigid	3.5-7.5 t	Diesel		1	6	6	2	15
		7.5-12 t	Diesel			2	3		5
		12-14 t	Diesel						
		14-20 t	Diesel	2	1	13	2	1	19
			CNG				1		1
		20-26 t	Diesel			1	2		3
		28-32 t	Diesel			1	1		2
		>32 t	Diesel			1	1		2
		Subtotal		2	2	24	16	3	47
HGV	Articulated	28-34 t	Diesel				1	1	2
			CNG			1			1
		34-40 t	Diesel		2	4	3	1	10
			CNG			1			1
		40-50 t	Diesel			1	2		3
		Subtotal			2	7	6	2	17
Bus		<15 t	Diesel	1	3	4	3		11
		15-18 t	Diesel	2		7	7		16
		>18 t	Diesel		1			1	2
			LPG					1	1
		Subtotal		3	4	11	10	2	30
Coach		15-18 t	Diesel			1			1
		>18 t	Diesel				1		1
		Subtotal				1	1		2
Grand total				5	8	43	33	7	96

3.4 Treatment of two-wheel vehicles

In the ARTEMIS project, 115 two-wheel vehicles were tested over eight different driving cycles. The ARTEMIS measurements were entered into a database, along with a large number of measurements from the WMTC programme (Elst *et al*., 2006). The vehicles in the database were grouped according to the categorisation provided in Table 25.

Table 25: Vehicle categorisation for two-wheel vehicles in the emission model.

Vehicle category		Engine capacity	Engine type
1	Moped	< 50 cm³	2-stroke
2			4-stroke
3	Motorcycle	≤ 150 cm³	2-stroke
4			4-stroke
5	Motorcycle	150-250 cm³	2-stroke
6	Motorcycle		4-stroke
7	Motorcycle	250 - 750 cm³	4-stroke
8	Motorcycle	> 750 cm³	

4 Data processing

4.1 LDV-regulated database

4.1.1 Normalisation of the database

Many factors contributed to the variability of the emission factors in the LDV database, including variations in the vehicle sample and variations in the test conditions. The raw emissions factors were determined from tests which were conducted under a wide range of conditions, and on in-service vehicles with a variety of accumulated mileages. Adjustment factors were used to normalise the raw LDV data.. This allowed all data to be included (*e.g.* low-temperature tests), and rendered the database internally consistent. During the application of the emission factors, scaling factors are required to allow actual conditions to be taken into account.

A similar process was undertaken in the ARTEMIS project, in which four parameters were taken into account: the gearshift strategy, the vehicle mileage, the ambient air temperature, and the ambient air humidity. These four test parameters were found to have a quantifiable influence on emission levels (Joumard *et al.*, 2006). However, in the UK data the information on gearshift strategy and ambient humidity was rather limited. Consequently, the LDV-regulated database was normalised as follows:

(i) The test results were firstly normalised to a temperature of 10°C.

(ii) The test results were then normalised to an accumulated vehicle mileage of 50,000 km.

The process is described below.

Ambient temperature

The ambient temperature during the tests included in the database ranged from -21.8°C to 38.5°C. The target temperature during a test is often set at 23°C, as in type approval. As some of the laboratories did not have temperature-controlled test chamber, a large proportion of the tests were conducted at a temperature between 20°C and 30°C. Nevertheless, this temperature range is substantially higher than the UK average temperature. According to Met Office data[4] the annual mean temperature for the UK during 2006 was 9.7°C, with similar temperatures in previous years. Consequently, the raw test results were normalised to an ambient temperature of 10°C.

The normalisation was undertaken using functions provided by Laurikko (2005), as given in Table 26.

The influence of the temperature is expressed by the formula:

$$\frac{emission(T_1)}{emission(T_2)} = \frac{y(T_1)}{y(T_2)} \qquad \text{(Equation 1)}$$

Where:

$emission\ (T_1)$	=	emission factor at temperature T_1 (°C)
$emission\ (T_2)$	=	emission factor at temperature T_2 (°C)
$y\ (T_1)$	=	correction factor at temperature T_1 (°C)
$y\ (T_2)$	=	correction factor at temperature T_2 (°C)

Values of ***y*** are given for urban, rural and motorway driving behaviour in Table 26. The test data were firstly normalised to 23°C, and then to 10°C, as the functions in the Table allow intermediate values to be interpolated using the value at 23°C as a reference, and back-calculating via multiplication by ***y***. Examples of the application of this approach are given by Laurikko (2005).

[4] http://www.metoffice.gov.uk/climate/uk/2006/annual/averages1.html

Table 26: Correction factor $y = a \times Temperature + b$, or $y = a\ e^{b.Temperature}$ when in italics, for urban, rural or motorway driving behaviour. Temperature in °C, ***y*** normalised at 23°C.

Pollutant	Fuel	Emission category	Urban		Rural		Motorway	
			a	***b***	***a***	***b***	***a***	***b***
CO	Petrol	Pre-Euro 1	0.0021	0.95	0.003	0.93	0.0054	0.88
		Euro 2	-0.0115	1.3	0.002	0.95	-	-
		Euro 3	-0.0087	1.2	0.0053	0.88	-0.0008	1.02
		Euro 4	No correction		0.017	0.61	-	-
	Diesel	Euro 2	-0.034	1.784	-0.075	2.72	-0.024	1.56
HC	Petrol	Pre-Euro 1	-0.001	1.02	-0.0027	1.066	No correction	
		Euro 2	-0.016	1.37	No correction		-	-
		Euro 3	-0.0525	2.21	-0.025	1.57	-0.001	1.02
		Euro 4	*3.4627*	*-0.0544*	0.0107	0.7442	-	-
			$y = a\ e^{bT}$				$y = a\ e^{bT}$	
	Diesel	Euro 2	-0.027	1.62	-0.032	1.75	*1.43*	*-0.015*
NOx	Petrol	Pre-Euro 1	-0.0075	1.17	-0.0063	1.14	-0.0035	1.08
		Euro 2	-0.0091	1.21	0.0045	0.895	-	-
		Euro 3	-0.0084	1.19	-0.0027	1.065	-0.002	1.05
		Euro 4	-0.01	1.23	0.0013	0.97	-	-
	Diesel	Euro 2	-0.0015	1.05	-0.0015	1.05	-0.0006	1.016
CO_2	Petrol	Pre-Euro 1	-0.0038	1.09	-0.0038	1.09	-0.0033	1.08
		Euro 2	-0.0013	1.03	-0.0017	1.04	-	-
		Euro 3	-0.001	1.03	-0.0013	1.03	-0.0015	1.0342
		Euro 4	-0.0028	1.0619	-0.0016	1.0334	-	-
	Diesel	Euro 2	-0.0015	1.03	-0.0017	1.04	-0.0009	1.0205
PM	Diesel	Euro 2	0.005	0.88	No correction		-0.005	1.11

Vehicle mileage

An emission factor calculated for a particular vehicle type and emission standard is effectively an average value for vehicles of different ages and mileages, which inherently takes account of possible degradation in emissions with vehicle age. Consequently, the emission factors contain an element of deterioration relative to new vehicle emissions performance. However, the older vehicles in the database 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, adjustments are required to account for the deterioration in emissions with age or, better still, mileage. This was 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. This part of the work is addressed in Task 6. At this stage, the emission test data were normalised to an accumulated mileage of 50,000 km for each vehicle type.

The mileage adjustment factors were derived from the database itself. The emissions data for cars were plotted against accumulated mileage for the pollutants CO, HC and NO_x, and for the various vehicle categories, and linear regression functions were fitted to the data. Separate functions were obtained for urban, rural and motorway driving. No specific functions were obtained for LGVs on account of the relatively small amount of data. Too few PM measurements were available to obtain deterioration functions. The literature suggests that CO_2 emissions are not affected by vehicle mileage (Samaras and Ntziachristos, 1998; Ntziachristos and Samaras, 2000b; Samaras and Geivanidis, 2005), and therefore the CO_2 measurements were not adjusted.

An example plot is shown in Figure 3. The relationships between emission factor and accumulated mileage were universally poor, being characterised by low correlation coefficients. In some cases there was actually a reduction in emissions with vehicle mileage. Nevertheless, the resulting functions were still used to normalise the emission factors for all LDVs.

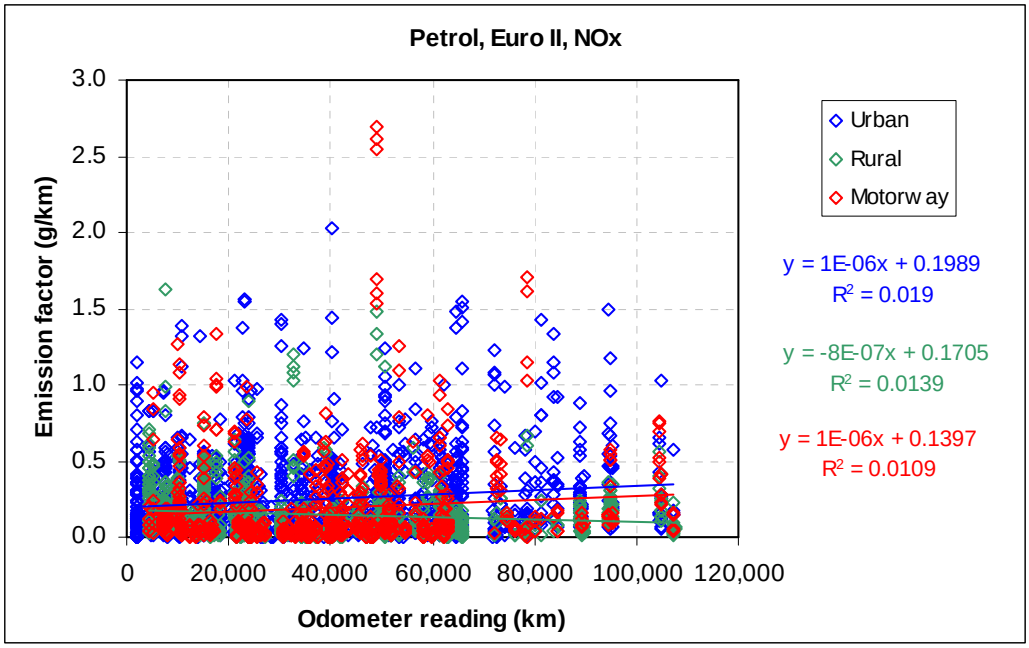

Figure 3: NO_x emission factor plotted against accumulated vehicle mileage for Euro 2 petrol cars.

The mileage normalisation was applied using the following formula for each pollutant and vehicle category:

$$E_{50,000} = E_{test} \times y_{50,000} / y_{test} \qquad \text{(Equation 2)}$$

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 (derived using the regression fit for the pollutant and vehicle category)
y_{test}	=	mileage during test

The coefficients which are used to calculate the values of ***y*** are given in Table 27. Due to a lack of data, no mileage correction was applied to test data relating to fuels other than conventional petrol or diesel.

4.1.2 Reduction of the database

The LDV-regulated database was reduced in size by the exclusion of certain types of test. The tests which were excluded were:

(i) Tests conducted over the driving cycles used in European vehicle type approval (ECE, EUDC, NEDC). These cycles were considered to be unrepresentative of real-world driving conditions. The reduced database therefore only contained emission factors obtained over 'real-world' driving cycles.

(ii) Tests conducted using a cold or warm start. The reduced database only contained hot-start emission factors.

The numbers of vehicles and tests in the LDV-regulated database after normalisation and reduction are given in Table 28 and Table 29.

Table 27: 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.

Pollutant	Fuel	Emission standard	Urban		Rural		Motorway		All	
			a	b	a	b	a	b	a	b
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	0.028
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

Table 28: Numbers of vehicles in LDV-regulated database after normalisation and reduction.

Vehicle type	Fuel	Number of vehicles by emission standard					
		Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Grand Total
Car/minibus <2.5 t, <9 persons	Petrol	418	261	147	155	24	1 005
	Diesel	66	44	56	75	11	252
	LPG		7	4	24		35
	CNG/LNG				1	1	2
	Biodiesel				2		2
	Hybrid					1	1
	Bioethanol			2	2	1	5
	Subtotal	484	312	209	259	38	1 302
Car/minibus 2.5-3.5 t, <9 persons	Petrol		3	3			6
	Diesel	2	1	1			4
	LPG				1		1
	Subtotal	2	4	4	1		11
LGV N1(I)	Diesel		1	12	2		15
	Subtotal		1	12	2		15
LGV N1(II)	Petrol	2	1	1			4
	Diesel	1		3			4
	LPG				4		4
	Subtotal	3	1	4	4		12
LGV N1(III)	Petrol	16	19	6	1		42
	Diesel	26	21	18	11		76
	LPG				5		5
	Subtotal	42	40	24	17		123
Taxi (black cab)	Diesel			2	1		3
	Subtotal			2	1		3
Grand Total		531	358	255	284	38	1 466

Table 29: Numbers of tests in LDV-regulated database after normalisation and reduction.

Vehicle type	Fuel	Number of tests by emission standard					
		Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Grand Total
Car/minibus <2.5 t, <9 persons	Petrol	7 098	2 497	3 327	5 257	665	18 844
	Diesel	990	825	2 471	1 838	169	6 293
	LPG		21	40	188		249
	CNG/LNG				33	44	77
	Biodiesel				264		264
	Hybrid					14	14
	Bioethanol			24	36	12	72
	Subtotal	8 088	3 343	5 862	7 616	904	25 813
Car/minibus 2.5-3.5 t, <9 persons	Petrol		76	99			175
	Diesel	2	17	39			58
	LPG				6		6
	Subtotal	2	93	138	6		239
LGV N1(I)	Diesel		17	109	28		154
	Subtotal		17	109	28		154
LGV N1(II)	Petrol	43	4	32			79
	Diesel	92		43			135
	LPG				24		24
	Subtotal	135	4	75	24		238
LGV N1(III)	Petrol	138	391	177	6		712
	Diesel	531	220	181	141		1 073
	LPG				30		30
	Subtotal	669	611	358	177		1 815
Taxi (black cab)	Diesel			39	14		53
	Subtotal			39	14		53
Grand Total		8 894	4 068	6 581	7 865	904	28 312

4.1.3 Data extraction

For each combination of vehicle type, fuel type, emission standard and pollutant (in other words each code number in Table 1 to Table 10) the sub-set of speed and emissions data was extracted from the main database. No distinction was made between vehicles equipped with manual or automatic transmission; it was assumed that the distribution of transmission types in the sample was representative of that in the vehicle population. The number of data points in a sub-set varied greatly, from less than five to several thousand, as shown in Table 30 to Table 33.

Table 30: Number of data points in each extracted sub-set (car/minibus, <2.5 t).

Code	Vehicle type	Fuel	Engine capacity (cc)	Emission standard	CO (g/h)	HC (g/h)	NO_x (g/h)	PMm (g/h)	CO_2 (g/h)	FC (l/h)
R001	car/minibus, <2.5 t	Petrol	<1400	Pre-Euro 1	2,710	2,710	2,710	9	2,895	2,895
R002	car/minibus, <2.5 t	Petrol	<1400	Euro 1	671	674	670	40	699	699
R003	car/minibus, <2.5 t	Petrol	<1400	Euro 2	696	695	696	179	762	760
R004	car/minibus, <2.5 t	Petrol	<1400	Euro 3	960	959	960	110	971	970
R005	car/minibus, <2.5 t	Petrol	<1400	Euro 4	125	125	125	0	125	125
R008	car/minibus, <2.5 t	Petrol	1400-2000	Pre-Euro 1	3,433	3,436	3,437	123	3,582	3,582
R009	car/minibus, <2.5 t	Petrol	1400-2000	Euro 1	944	965	967	184	1,110	1,109
R010	car/minibus, <2.5 t	Petrol	1400-2000	Euro 2	1,132	1,129	1,131	312	1,268	1,267
R011	car/minibus, <2.5 t	Petrol	1400-2000	Euro 3	1,694	1,723	1,719	439	1,973	1,971
R012	car/minibus, <2.5 t	Petrol	1400-2000	Euro 4	234	224	231	35	260	258
R015	car/minibus, <2.5 t	Petrol	>2000	Pre-Euro 1	315	315	315	10	344	344
R016	car/minibus, <2.5 t	Petrol	>2000	Euro 1	167	161	167	40	192	192
R017	car/minibus, <2.5 t	Petrol	>2000	Euro 2	271	263	270	82	311	311
R018	car/minibus, <2.5 t	Petrol	>2000	Euro 3	320	326	326	56	338	338
R019	car/minibus, <2.5 t	Petrol	>2000	Euro 4	87	72	79	70	87	87
R022	car/minibus, <2.5 t	Diesel	<1400	Pre-Euro 1	64	64	64	0	64	64
R023	car/minibus, <2.5 t	Diesel	<1400	Euro 1	16	16	16	15	16	16
R024	car/minibus, <2.5 t	Diesel	<1400	Euro 2	4	0	4	0	4	4
R025	car/minibus, <2.5 t	Diesel	<1400	Euro 3	8	7	8	8	8	8
R026	car/minibus, <2.5 t	Diesel	<1400	Euro 4	15	15	15	15	15	15
R029	car/minibus, <2.5 t	Diesel	1400-2000	Pre-Euro 1	626	618	626	382	651	651
R030	car/minibus, <2.5 t	Diesel	1400-2000	Euro 1	356	334	359	206	372	371
R031	car/minibus, <2.5 t	Diesel	1400-2000	Euro 2	873	851	873	659	1,049	1,047
R032	car/minibus, <2.5 t	Diesel	1400-2000	Euro 3	579	583	583	733	894	890
R033	car/minibus, <2.5 t	Diesel	1400-2000	Euro 4	88	89	92	115	132	132
R036	car/minibus, <2.5 t	Diesel	>2000	Pre-Euro 1	87	83	87	11	73	73
R037	car/minibus, <2.5 t	Diesel	>2000	Euro 1	76	71	76	60	76	76
R038	car/minibus, <2.5 t	Diesel	>2000	Euro 2	238	229	239	186	266	265
R039	car/minibus, <2.5 t	Diesel	>2000	Euro 3	116	117	118	238	257	256
R040	car/minibus, <2.5 t	Diesel	>2000	Euro 4	16	16	16	16	16	16
R043	car/minibus, <2.5 t	LPG	All	Euro 1	21	21	21	0	21	21
R044	car/minibus, <2.5 t	LPG	All	Euro 2	40	40	40	31	40	40
R045	car/minibus, <2.5 t	LPG	All	Euro 3	82	186	188	0	188	186
-	car/minibus, <2.5 t	CNG	All	All	11	12	12	0	12	0
-	car/minibus, <2.5 t	Biodiesel	All	Euro 3	91	93	76	67	89	89
-	car/minibus, <2.5 t	Petrol hybrid	All	Euro 4	14	14	14	0	14	14
-	car/minibus, <2.5 t	Biothanol	All	Euro 2	24	24	24	22	24	24
-	car/minibus, <2.5 t	Biothanol	All	Euro 3	36	36	36	31	36	36
-	car/minibus, <2.5 t	Biothanol	All	Euro 4	12	12	12	11	12	12

Table 31: Number of data points in each extracted sub-set (car/minibus, 2.5-3.5 t).

Code	Vehicle type	Fuel	Engine capacity (cc)	Emission standard	CO (g/h)	HC (g/h)	NO_x (g/h)	PMm (g/h)	CO_2 (g/h)	FC (l/h)
R050	car/minibus, 2.5-3.5 t	Petrol	All	Euro 1	70	70	70	0	70	70
R051	car/minibus, 2.5-3.5 t	Petrol	All	Euro 2	99	99	99	0	99	99
R057	car/minibus, 2.5-3.5 t	Diesel	All	Euro 1	17	17	17	16	17	17
R058	car/minibus 2.5-3.5 t	Diesel	All	Euro 2	39	39	39	20	39	39

Table 32: Number of data points in each extracted sub-set (LGV).

Code	Vehicle type	Fuel	Engine capacity (cc)	Emission standard	CO (g/h)	HC (g/h)	NO_x (g/h)	PMm (g/h)	CO_2 (g/h)	FC (l/h)
R078	LGV N1(I)	Diesel	All	Euro 1	17	17	17	16	17	17
R079	LGV N1(I)	Diesel	All	Euro 2	109	35	109	29	109	109
R080	LGV N1(I)	Diesel	All	Euro 3	28	28	28	28	28	28
R084	LGV N1(II)	Petrol	All	Pre-Euro 1	43	43	43	0	43	43
R085	LGV N1(II)	Petrol	All	Euro 1	4	4	4	0	4	4
R086	LGV N1(II)	Petrol	All	Euro 2	32	32	32	0	32	32
R091	LGV N1(II)	Diesel	All	Pre-Euro 1	92	92	92	92	92	92
R093	LGV N1(II)	Diesel	All	Euro 2	43	43	43	43	43	43
-	LGV N1(II)	LPG	All	Euro 3	0	24	24	0	24	24
R098	LGV N1(III)	Petrol	All	Pre-Euro 1	128	128	128	0	128	128
R099	LGV N1(III)	Petrol	All	Euro 1	338	338	338	0	338	338
R100	LGV N1(III)	Petrol	All	Euro 2	177	176	177	0	177	177
R101	LGV N1(III)	Petrol	All	Euro 3	0	6	6	0	6	6
R105	LGV N1(III)	Diesel	All	Pre-Euro 1	524	416	524	517	524	524
R106	LGV N1(III)	Diesel	All	Euro 1	212	196	213	176	213	213
R107	LGV N1(III)	Diesel	All	Euro 2	166	117	167	116	167	167
R108	LGV N1(III)	Diesel	All	Euro 3	128	137	141	141	141	141
-	LGV N1(III)	LPG	All	Euro 3	0	30	30	0	30	30

Table 33: Number of data points in each extracted sub-set (car, taxi).

Code	Vehicle type	Fuel	Engine capacity (cc)	Emission standard	CO (g/h)	HC (g/h)	NO_x (g/h)	PMm (g/h)	CO_2 (g/h)	FC (l/h)
R065	Car, taxi	Diesel	All	Euro 2	39	35	39	39	39	39
R066	Car, taxi	Diesel	All	Euro 3	14	14	14	14	14	14

4.2 HDV-regulated database

No processing of the HDV regulated database was undertaken. In order to determine whether adjustments to the basic ARTEMIS emission factors were required, the effects of engine deterioration (mileage) and maintenance on emissions were assessed by Rexeis *et al*. (2005). For investigating the influence of engine deterioration and maintenance on emissions, extensive data on pre-Euro I to Euro III vehicles from the Dutch and German in-use compliance programmes were used. However, for the effect of vehicle mileage on emissions the work showed that no corrections to the emission factors for any Euro class were required.

4.3 LDV-unregulated database

In the case of the LDV-unregulated database, the only step taken was to remove tests with cold or warm starts. Such tests accounted for 18% of the full database. Tests over type approval cycles were retained, as their exclusion would have resulted in the depletion of a database which was already rather limited in size. No

normalisation was conducted for ambient temperature, mileage or any other parameter due to a lack of relevant supporting data.

4.4 HDV-unregulated database

The HDV-unregulated database was treated in a similar manner to the LDV-unregulated database, with the results from warm-start tests and cold-start tests being removed prior to analysis, although such tests were relatively few in number. Again, no normalisation was conducted for ambient temperature, mileage or any other parameter due to a lack of relevant supporting data.

5 Data analysis

5.1 Regulated pollutants (CO, HC, NO_x, PM)

5.1.1 Light-duty vehicles

Vehicles up to and including Euro 4

For each combination of vehicle type, fuel type, emission standard and pollutant, a regression curve was fitted to the emission data (in g/h) and average trip speed data[5]. The 'XLFit4' software package[6] was used for this purpose. The advantages of using the g/h data rather than the g/km data were that simpler regression functions could be used and that the regression fits resulted in more appropriate gradients at low speeds. For example, as the trip speed approaches zero the emission factor, when stated in g/km, approaches infinity. On the other hand, the emission rate (in g/h) has a specific value at zero speed. If reliable emissions data at idle (*i.e.* zero speed) were also available, it would also be possible to fix the zero end of the curve, potentially giving more reliable emissions at very low speed. However, the existing test programmes did not include an idle test (where mass emissions were measured), so the curves had to be fitted to the existing data. The g/h data can be converted to g/km simply by dividing by the speed.

For each set of data, one of 17 different regression models from the XLFit4 database was applied (Table 34). The best model was selected based on a number of considerations, including the r^2 value. Initially, an appropriate model was selected from a group having the highest r^2 values. The resulting functions were converted to give emission factors in g/km by division throughout by the speed term (x). The selected functions (both per unit time and per unit distance) were then plotted against the data, and the results were checked by eye. Where the model fit was obviously incorrect (*e.g.* it gave negative or extremely high emission values), a more appropriate model was selected. In some cases a constant term was used (*i.e.* $y = x$).

Table 34: Regression models used.

Model	Name	Form of function†
1	Linear model	$y = a \cdot x + b$
2	Reciprocal model	$y = 1/(a + b \cdot x)$
3	Quadratic model	$y = a \cdot x2 + b \cdot x + c$
4	Reciprocal quadratic model	$y = 1/(c \cdot x2 + b \cdot x + a)$
5	Exponential model	$y = a \cdot \exp(b \cdot x)$
6	Exponential model with baseline	$y = c + a \cdot \exp(b \cdot x)$
7	Hoerl model	$y = a \cdot bx \cdot xc$
8	Power model	$y = c + a \cdot xb$
9	Two power model	$y = a \cdot xb + c \cdot xd$
10	Bleasdale model	$y = (a + b \cdot x)\text{-}c$
11	Langmuir binding isotherm	$y = a + b \cdot x + \{[c\text{-}b][1\text{-}\exp(\text{-}d \cdot x)]/d\}$
12	Two-phase exponential decay	$y = e + a \cdot \exp(\text{-}b \cdot x) + c \cdot \exp(\text{-}d \cdot x)$
13	Harris model	$y = 1/(a + b \cdot xc)$
14	Sigmoidal model	$y = a - b \cdot \exp(\text{-}c \cdot xd)$
15	Reciprocal exponential model	$y = a + \{b/[1 + \exp(\text{-}c + d \cdot \ln(x) + e \cdot x)]\}$
16	One-phase exponential decay model	$y = c + a \cdot \exp(\text{-}b \cdot x)$
17	Vapour pressure model	$y = \exp[(a + b/x) + c \cdot \ln(x)]$

† y = emission or fuel consumption (g/h or l/h); x = speed (km/h); a, b, c, d, e = coefficients

[5] In the case of LGVs, insufficient data were available to allow the effects of vehicle load to be determined
[6] http://www.idbs.com/xlfit4/

Emission factors were developed for vehicles complying with emission standards from pre-Euro 1 (*i.e.* all emission standards before Euro 1 combined) to Euro 6. However, the LDV-regulated database only contained emission factors for vehicles certified up to and including the Euro 4 standard, and for some vehicle categories the most recent emission standard was not necessarily Euro 4. Consequently, for each vehicle category up to and including Euro 4, any 'missing' emission factors were calculated from the emission factors for the most recent emission standard, based on ratios of type approval limits.

Euro 5 and Euro 6 vehicles

For light-duty vehicles, emission scaling factors were needed for Euro 5 and Euro 6 vehicles relative to Euro 4. The type approval limits for Euro 4, 5 and 6 vehicles are listed in Table 35, together with the ratios relative to Euro 4. It should be noted that a limit for HC emissions for diesel vehicles is not given in the legislation. The shown limit is based on the difference between the 'HC+NO_x' and 'NO_x' limits.

Table 35: Type approval emission limits.

Level	Limits	Positive ignition (petrol *etc*.)					Compression ignition (diesel)				
		CO	HC	HC+ NO_x	NO_x	PM	CO	*HC*	HC+ NO_x	NO_x	PM
Euro 4	g/km	1.0	0.1		0.08		0.5	*0.05*	0.30	0.25	0.025
Euro 5	g/km	1.0	0.1		0.06	0.005	0.5	*0.05*	0.23	0.18	0.005
Euro 6	g/km	1.0	0.1		0.06	0.005	0.5	*0.09*	0.17	0.08	0.005
Euro 5:4	Ratio	1.00	1.00		0.75		1.00	*1.00*		0.72	0.20
Euro 6:4	Ratio	1.00	1.00		0.75		1.00	*1.80*		0.32	0.20

However, Euro 5 and 6 vehicles are subject to different durability requirements together with different set deterioration factors. These are listed in Table 36.

Table 36: Type approval durability and deterioration factors.

Level	Mileage (km)	Positive ignition (petrol *etc*.)					Compression ignition (diesel)				
		CO	HC	HC+ NO_x	NO_x	PM	CO	HC	HC+ NO_x	NO_x	PM
Euro 4	80,000	1.2	1.2		1.2		1.1		1.0	1.0	1.2
Euro 5	160,000	1.5	1.3		1.6	1.0	1.5		1.1	1.1	1.0
Euro 6	160,000	1.5	1.3		1.6	1.0	To be determined				

It has therefore been assumed that the emission limits will be achieved at the durability mileages stated for the different Euro classes. When new, and at 50,000 km (the mileage for which the emissions factors have been derived) the emissions will be different. Therefore, the deterioration factors have been used to scale the factors to 50,000 km for each case. For example, in the case of CO from Euro 4 vehicles:

CO emissions at 80,000 km = 1.0 g/km
CO deterioration factor = 1.2
CO emissions at 0 km = 1.0/1.2 = 0.833 g/km
CO emissions at 50,000 km = 0.833 + 5/8 *(1.0-0.833) = 0.938 g/km

The results emissions and ratios are listed in Table 37.

A similar procedure was carried out for LGVs, which have slightly different type approval limits as listed in Table 38. The durability and deterioration for LGVs are the same as for cars.

Using this procedure, a set of emission scaling factors was derived, as listed in Table 39. For HC emissions from diesel vehicles, as the factor was derived based on the difference between the 'HC+NO_x' and the 'NO_X' limits, the factors were close to or greater than 1. These factors have therefore been set to unity.

Table 37: Emissions at 50,000 km.

Level	50,000 km	Positive ignition (petrol *etc*.)					Compression ignition (diesel)				
		CO	HC	HC+ NO_x	NO_x	PM	CO	*HC*	HC+ NO_x	NO_x	PM
Euro 4	g/km	0.938	0.094		0.075		0.483	*0.050*	0.300	0.250	0.023
Euro 5	g/km	0.771	0.084		0.045	0.005	0.385	*0.047*	0.216	0.169	0.005
Euro 6	g/km	0.771	0.084		0.045	0.005	0.385	*0.084*	0.159	0.075	0.005
Euro 5:4	Ratio	0.822	0.897		0.594		0.798	*0.938*		0.675	0.213
Euro 6:4	Ratio	0.822	0.897		0.594		0.798	*1.688*		0.300	0.213

Table 38 – Type approval emission limits for LGVs.

LGV	Level	Positive ignition (petrol *etc*.)					Compression ignition (diesel)				
		CO	HC	HC+ NO_x	NO_x	PM	CO	*HC*	HC+ NO_x	NO_x	PM
LGV N1(I)	Euro 4	1.00	0.10		0.080		0.50	*0.05*	0.300	0.250	0.025
	Euro 5	1.00	0.10		0.060	0.005	0.50	*0.05*	0.230	0.180	0.005
	Euro 6	1.00	0.10		0.060	0.005	0.50	*0.09*	0.170	0.080	0.005
LGV N1(II)	Euro 4	1.81	0.13		0.100		0.63	*0.06*	0.390	0.330	0.040
	Euro 5	1.81	0.13		0.075	0.005	0.63	*0.06*	0.295	0.235	0.005
	Euro 6	1.81	0.13		0.075	0.005	0.63	*0.09*	0.195	0.105	0.005
LGV N1(III)	Euro 4	2.27	0.16		0.110		0.74	*0.07*	0.460	0.390	0.060
	Euro 5	2.27	0.16		0.082	0.005	0.74	*0.07*	0.350	0.280	0.005
	Euro 6	2.27	0.16		0.082	0.005	0.74	*0.09*	0.215	0.125	0.005

Table 39: Emission scaling factors for future vehicle types.

Vehicle	Euro 5:Euro 4				Euro 6:Euro 4			
	CO	THC	NO_x	PM	CO	THC	NO_x	PM
	Positive ignition (petrol etc.)							
Cars	0.822	0.897	0.594		0.822	0.897	0.594	
LGVs, N1 class I	0.822	0.897	0.594		0.822	0.897	0.594	
LGVs, N1 class II	0.822	0.897	0.594		0.822	0.897	0.594	
LGVs, N1 class III	0.822	0.897	0.590		0.822	0.897	0.590	
	Compression ignition (diesel)							
Cars	0.798	1.000	0.675	0.213	0.798	1.000	0.300	0.213
LGVs, N1 class I	0.798	1.000	0.675	0.213	0.798	1.000	0.300	0.213
LGVs, N1 class II	0.798	1.000	0.668	0.133	0.798	1.000	0.298	0.133
LGVs, N1 class III	0.798	1.000	0.673	0.089	0.798	1.000	0.300	0.089

Treatment of taxis

Due to the very limited sample sizes for taxis, the emission factors derived from the database were considered to be unreliable. Consequently, it was assumed that the emission factors for N1(III) LGVs would also be used for taxis. This assumption was based on a comparison between the characteristics and performance of taxis (LTI TX2 and TX4), such as engine size, power, weight, *etc*.), and the corresponding average values for different vehicle types in the database (i.e. diesel cars >2.0l, diesel N1(I), diesel N1(II), diesel N1(III), *etc*.). The overall best match was obtained for N1(III) vehicles. Furthermore, the sample sizes for N1(III) vehicles in the database were larger than those for the other options.

Effects of diesel particulate filters

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, as describe above. However, it is expected that the majority of Euro 5 and 6 diesel light-duty vehicles will be fitted with diesel particulate filters (DPFs), and if a DPF is fitted then the reduction in particulate emissions will be greater than the reduction inferred from the PM limits. From the PMP (Andersson *et al*., 2007), it was found that DPFs typically reduced LDV emissions to 0.5 mg/km. This constant value is therefore used for PM emissions for all Euro 5 and Euro 6 LDVs.

Another 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).

5.1.2 Heavy-duty vehicles

ARTEMIS emission functions

The derivation of emission factors for regulated pollutants directly from the corresponding database would have led to substantial gaps (see Table 21 and Table 22). For greater flexibility, the average-speed emission factors from the ARTEMIS project were taken as the basis for the UK emission factors.

Workpackage 400 of ARTEMIS dealt with the establishment of reliable emission factors for HDVs. The HDV work included close co-operation with the COST Action 346[7] and the Handbook of Emission Factors (HBEFA) project, and provided a great deal of insight into the emission behaviour of modern vehicles (Rexeis *et al*., 2005). The aims of the HDV work were as follows:

- To develop a model capable of accurately simulating emission factors for all types of HDV over any driving cycle and for various vehicle loads and gradients.
- To acquire the necessary model input data via a measurement programme, a data collection exercise, and a literature review.
- To generate a database of emission factors for ARTEMIS, using the model and the data.

During the data collection exercise, emission measurements for 102 heavy-duty engines and 7 HDVs were obtained from ARTEMIS and other national and international programmes, representing the most extensive database of HDV emission factors in Europe. Data from dynamometer tests and on-board measurements on 50 HDVs were collected and used for model validation purposes. The resulting emission model - PHEM (Passenger car and Heavy-duty vehicle Emission Model) - estimates fuel consumption and emissions based on the engine power demand and engine speed during a driving cycle. The model combines steady-state engine maps with correction functions for transient operation, and was used to derive a database of emission factors for ARTEMIS.

Boulter and Barlow (2005) described the derivation of a large number (11,970) of average-speed fuel consumption and emission functions for conventional heavy-duty road vehicles in ARTEMIS. The functions are based on the database of fuel consumption values and emission factors. The exhaust pollutants covered are carbon monoxide (CO), total hydrocarbons (THC), oxides of nitrogen (NO_x) and particulate matter (PM).

The three main heavy-duty vehicle categories defined in the model are ‘coaches’, ‘urban buses’ and ‘heavy goods vehicles’. These are then further divided into sub-groups according to type and mass. At the most detailed level in the ARTEMIS model the sub-groups are divided into emission legislation classes. Three levels of vehicle load are taken into consideration: 0%, 50% and 100%, and seven gradient classes are included: -6%, -4%, -2%, 0%, +2+, +4% and +6%.

For the UK, it is recommended that HGV emission factors for 0% gradient and 56% load[8] are adopted. In the case of buses and coaches, the emission factors were calculated for 0% gradient and 50% load. The emission factors for other gradients and loads can be used where suitable input data are available, and if the user of the

[7] http://www.cordis.lu/cost-transport/src/cost-346.htm

[8] This represents the average HGV load in the UK (DfT, 2007). The emission factor for 56% load is interpolated linearily from the emission factors at 50% load and 100% load.

emission functions wishes to calculate emissions for a specific vehicle load or gradient, the values can be interpolated.

The database of emission factors which was compiled in this project was not used to derive any functions directly, but it was used to provide adjustments to the ARTEMIS model predictions where appropriate. In most cases the ARTEMIS predictions matched the UK data at a level which was taken to be acceptable (an example is shown in Figure 4). However, in a number of cases the match was poorer (an example is shown in Figure 5). In such cases, a single adjustment factor was used to scale the ARTEMIS prediction to give an approximate match to the UK data. These adjustment factors are given in Table 40.

As with light-duty vehicles, emission factors were developed for vehicles complying with emission standards from pre-Euro I to Euro VI. The ARTEMIS model contains emission factors for vehicles certified up to and including the Euro V standard. The emission factors for Euro VI vehicles were calculated from those for Euro V, again based on ratios of type approval limits. The limits corresponding to the European Transient Cycle (ETC) were used, as shown in Table 41.

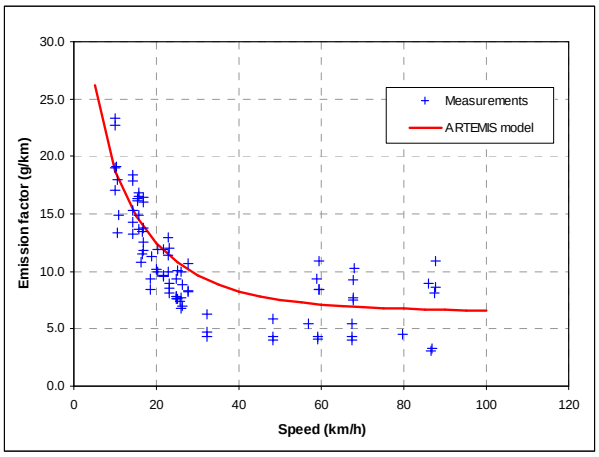

Figure 4: Comparison between ARTEMIS emission factors and UK data for Euro II buses between 15 and 18 tonnes GVW.

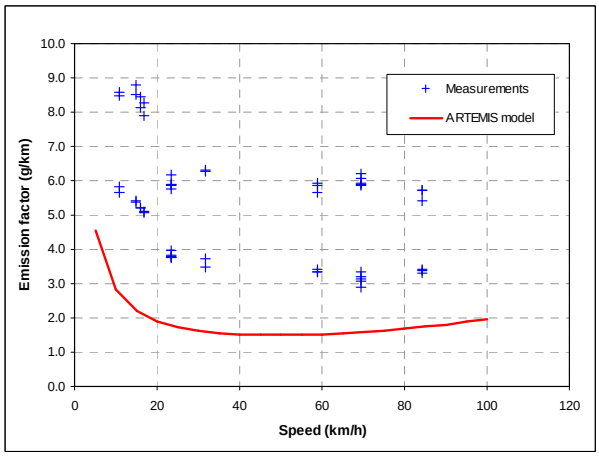

Figure 5: Comparison between ARTEMIS emission factors and UK data for Euro IV rigid HGVs between 3.5 and 7.5 tonnes GVW.

Table 40: Scaling factors used to adjust ARTEMIS model predictions to match UK data.

Code	Vehicle type	Fuel	Maximum GVW range	Emission standard	Adjustment factors (multipliers to ARTEMIS emission factors)		
					CO	HC	PM
R113	HGV - rigid	Diesel	3.5-7.5 t	Euro I	2		
R114	HGV - rigid	Diesel	3.5-7.5 t	Euro II	2		
R116	HGV - rigid	Diesel	3.5-7.5 t	Euro IV	10		
R133	HGV - rigid	Diesel	14-20 t	Pre-Euro I			2
R137	HGV - rigid	Diesel	14-20 t	Euro IV	15		
R193	HGV - artic	Diesel	34-40 t	Euro IV	3		
R199	HGV - artic	Diesel	40-50 t	Euro III	0.5		
R203	Bus	Diesel	<15 t	Pre-Euro I	0.4	0.3	0.4
R205	Bus	Diesel	<15 t	Euro II	0.5		0.6
R206	Bus	Diesel	<15 t	Euro III	0.3		0.5
R221	Bus	Diesel	>18 t	Euro IV			2

Table 41: Type approval emission limits – heavy-duty vehicle ETC test.

		CO	THC	NO_x	PM
Euro V	g/kWh	4.00	0.55	2.00	0.03
Euro VI	g/kWh	4.00	0.16	0.40	0.01
Euro VI:V	Ratio	1.000	0.291	0.200	0.333

Modification of NO_x emission functions

Many of the ARTEMIS emission functions for heavy-duty vehicles exhibited a reduction in emissions for any increase in speed (an example of this is shown in Figure 6). This contradicts the accepted view that emissions should increase at very high speeds as a result of greater air resistance. This may be due to insufficient high-speed emission tests.

Consequently, and at the request of DfT, the emission factor curves for heavy-duty vehicles were modified. For all HGVs, buses and coaches, the emissions were evaluated from the functions at speeds from 5 km/h to 90 km/h. The resulting emissions were inspected after the 60 km/h value. Where values were found to be decreasing, the g/km values were modified as follows:

- For HGVs, the values were modified so as to increase slightly at higher speeds.
- For buses and coaches, the values were modified to level out at higher speeds.

Table 42 shows the NO_x emissions for the vehicle shown in Figure 6 (HGV – rigid, 28-32 t, Euro I), including the values derived from the original function and the modified values at speeds higher than 60 km/h. Values are given in both g/h and g/km. The modified g/h values were used to obtain a new curve. The resulting values derived from the new function are also shown in the Table. The original and revised emission curves are also shown in Figure 7.

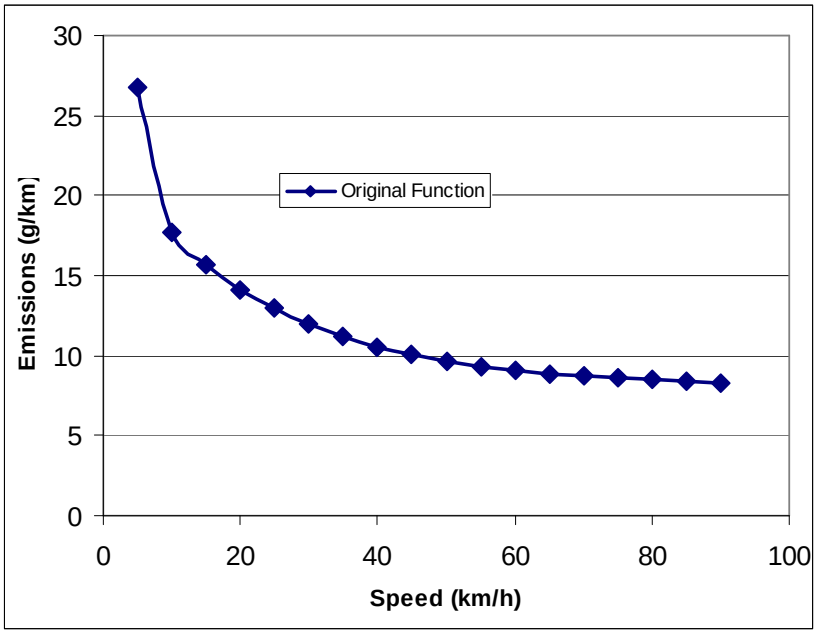

Figure 6: ARTEMIS NO_x emission factors for rigid HGVs, 28-32 t, Euro I.

Table 42: NO_x emissions at various speeds – original values, modified values (after 60 km/h) and resulting curve fit values.

Speed	Original function		Modified values		Curve fit	
km/h	g/h	g/km	g/h	g/km	g/h	g/km
5	133.65	26.73	133.65	26.73	133.08	26.62
10	177.41	17.74	177.41	17.74	180.16	18.02
15	234.88	15.66	234.88	15.66	231.92	15.46
20	282.96	14.15	282.96	14.15	281.27	14.06
25	323.52	12.94	323.52	12.94	324.80	12.99
30	359.15	11.97	359.15	11.97	361.84	12.06
35	391.80	11.19	391.80	11.19	393.50	11.24
40	422.81	10.57	422.81	10.57	421.98	10.55
45	453.12	10.07	453.12	10.07	449.88	10.00
50	483.37	9.67	483.37	9.67	479.77	9.60
55	513.96	9.34	513.96	9.34	513.72	9.34
60	**545.15**	**9.09**	**545.15**	**9.09**	**553.12**	9.22
65	577.08	8.88	597.97	9.20	598.48	9.21
70	609.79	8.71	652.01	9.31	649.46	9.28
75	643.31	8.58	707.32	9.43	704.97	9.40
80	677.61	8.47	763.90	9.55	763.39	9.54
85	712.63	8.38	821.79	9.67	822.97	9.68
90	748.32	8.31	881.01	9.79	882.27	9.80

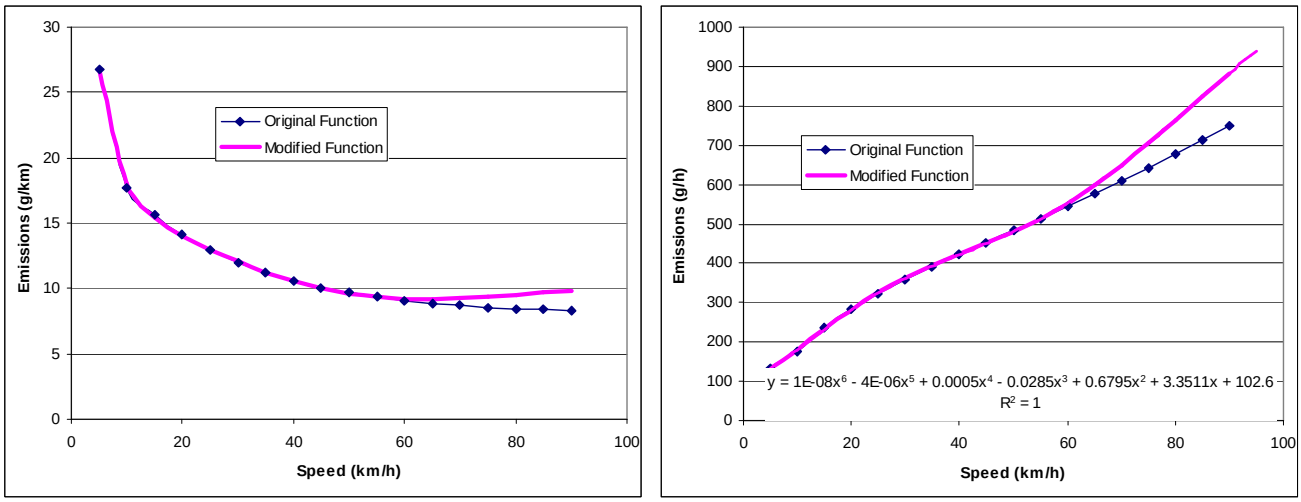

Figure 7: Original and modified curves (NO_x, rigid HGVs, 28-32 t, Euro I).

Effects of diesel particulate filters

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

5.1.3 Two-wheel vehicles

The emission factors for mopeds are taken from COPERT 4[9]. Average-speed emission factors for motorcycles (CO, HC, NO_x) were taken from ARTEMIS (Elst *et. al*, 2006). The emission factors were determined in the following way:

- For each vehicle, the on-line emission and vehicle speed data were analysed. The data were divided into three-minute intervals for which modal emissions (in g/h) and test cycle parameters were calculated. Engine idling was treated separately.
- The results were plotted against average vehicle speed, giving a function for each two-wheel vehicle.
- The vehicles were grouped into categories.
- The functions for each group of two-wheel vehicles were plotted against vehicle speed, and outliers were removed.
- From the individual functions, an average function was determined for each vehicle category.

Average-speed functions were derived for each pollutant and each vehicle category. The emission functions for a certain vehicle category were used to predict the emissions for test cycles for which no measurement results were available. Emission factors for traffic situations and aggregated emission factors for urban, rural and motorway driving were also determined. The emission factors of the different levels of detail had to be consistent, and were therefore developed using the same input (real-world data and emission test results) and methodology.

In ARTEMIS the average speed function for each vehicle category and pollutant was determined by fitting the following regression model to the measured emission factors using the least squares method:

$$E = \mathbf{a} \cdot v^5 + \mathbf{b} \cdot v^4 + \mathbf{c} \cdot v^3 + \mathbf{d} \cdot v^2 + \mathbf{e} \cdot v + \mathbf{f} \qquad \text{(Equation 3)}$$

Where: E is the emission factor in g/km
v is the vehicle speed in km/h
a to **f** are coefficients

5.2 Carbon dioxide

5.2.1 Cars

For most categories of petrol and diesel car the CO_2 emission functions which were derived from the LDV-regulated database showed little or no difference between all Euro categories. An example of this is shown in Figure 8. Although CO_2 emissions are not explicitly regulated at vehicle type approval, they are measured to enable fuel consumption to be calculated. Consequently, a large amount of CO_2 data exists. However, in contrast to the database, the type approval data for new cars, and publications by the European Commission and car manufacturers, indicate that new car CO_2 emissions are decreasing with time (European Commission, 2007). Consequently, and again at the request of DfT, an alternative approach to generating CO_2 emission functions was used which took into account the reduction in emissions from new cars, based on the type approval test, and this is described below.

The principal reason for basing the CO_2 functions primarily on the type approval data was that the sample size was much larger than that in the database of measurements over real-world driving cycles. Whilst at one level this is clearly not consistent with the approach used for other pollutants, whereby type approval data are rejected, it could be argued with some justification that CO_2 is less susceptible to differences between real-world cycles and the NEDC than other pollutants.

CO_2 emission factors for new cars

Average new car CO_2 emission factors, based on data provided by DfT and weighted by sales, are shown in Table 43. The values in italics have been estimated from the known values, based on the average ratios between the sub-categories and 'All' or 'Total' in the available data. The data are also plotted in Figure 9 and Figure 10.

[9] http://lat.eng.auth.gr/copert/

The available data ranges from years 1992 to 2007. To estimate future emissions, the following improvements were used:

- From 2008 to 2015, a 2.4% improvement per annum (due to the requirement to achieve the target of 130 g/km by 2015). This represents a 23.8% improvement in CO_2 emissions by 2015 compared to 2007.
- From 2016 to 2020, a 1.5% improvement per annum (assuming that improvements will slow down once the target is met). Euro 6 might result in a slowdown (or stop) in diesel CO_2 reduction at its year of introduction, but the CO_2 targets for 2020 are likely to be confirmed at some stage, driving further improvement. Post-2015 CO_2 will need to be reviewed once the 2020 CO_2 targets are confirmed.

The percentage improvements are all relative to the 2007 emissions. To predict pre-1992 CO_2 emissions, the emissions were incremented by 1% each previous year.

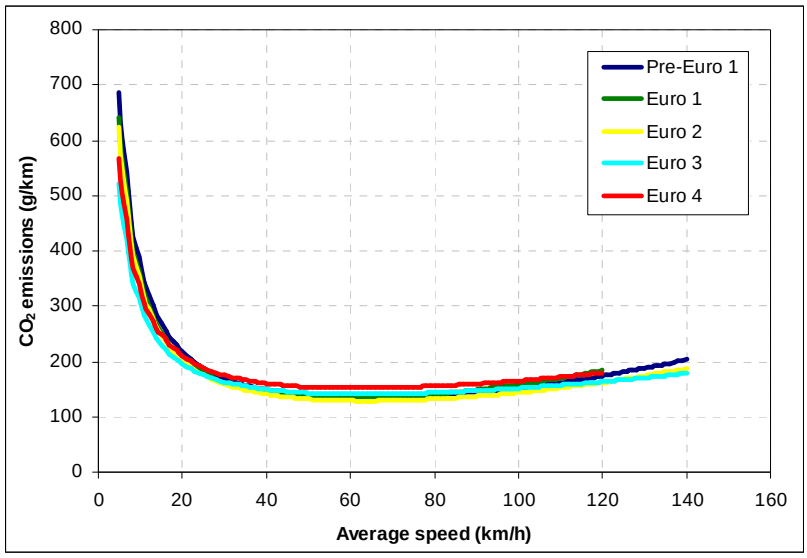

Figure 8: CO_2 emission factor as a function of average speed, based on measurements in LDV-regulated database (petrol car <2.5 tonnes, <1.4 litres).

Table 43: New car sales-weighted average CO_2 figures for UK.

Year	Petrol (g/km)				Diesel (g/km)				Total
	Under 1400 cc	1400 to 2000 cc	Over 2000 cc	All	Under 1400 cc	1400 to 2000 cc	Over 2000 cc	All	
2007	142.18	175.04	256.22	*166.25*	122.06	150.39	207.59	*163.54*	165.09
2006	142.55	177.61	259.16	168.92	120.98	152.70	209.75	166.17	167.74
2005	144.91	180.86	262.66	172.51	118.90	152.39	213.41	165.08	169.70
2004	147.03	183.91	262.34	174.84	117.82	152.03	215.67	163.95	171.28
2003	148.43	185.41	256.86	175.65	116.54	152.66	215.46	164.39	172.58
2002	151.26	187.77	256.41	178.50	116.22	152.01	215.37	162.60	175.39
2001	*152.48*	*190.16*	*269.59*	180.78	*118.24*	*152.57*	*214.24*	164.66	177.80
2000	*154.52*	*192.70*	*273.19*	183.20	*120.43*	*155.39*	*218.20*	167.70	181.00
1999	*157.30*	*196.17*	*278.11*	186.50	*126.25*	*162.89*	*228.74*	175.80	185.00
1998	*159.67*	*199.11*	*282.29*	189.30	*131.78*	*170.03*	*238.76*	183.50	188.40
1997	*160.59*	*200.27*	*283.93*	190.40	*134.07*	*172.99*	*242.92*	186.70	189.80
1996	*161.18*	*201.01*	*284.97*	191.10	*134.51*	*173.55*	*243.71*	187.30	*190.50*
1995	*162.37*	*202.48*	*287.06*	192.50	*135.51*	*174.85*	*245.53*	188.70	*191.89*
1994	*163.46*	*203.85*	*289.00*	193.80	*136.52*	*176.14*	*247.35*	190.10	*193.19*
1993	*163.38*	*203.74*	*288.85*	193.70	*136.44*	*176.05*	*247.22*	190.00	*193.09*
1992	*163.21*	*203.53*	*288.55*	193.50	*136.23*	*175.77*	*246.83*	189.70	*192.89*

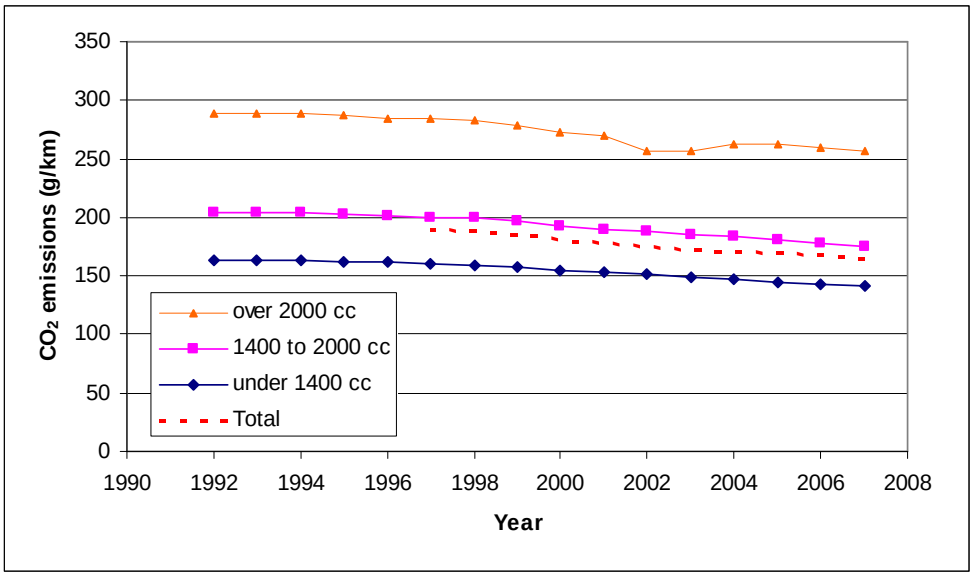

Figure 9: CO_2 emission factors for new petrol cars.

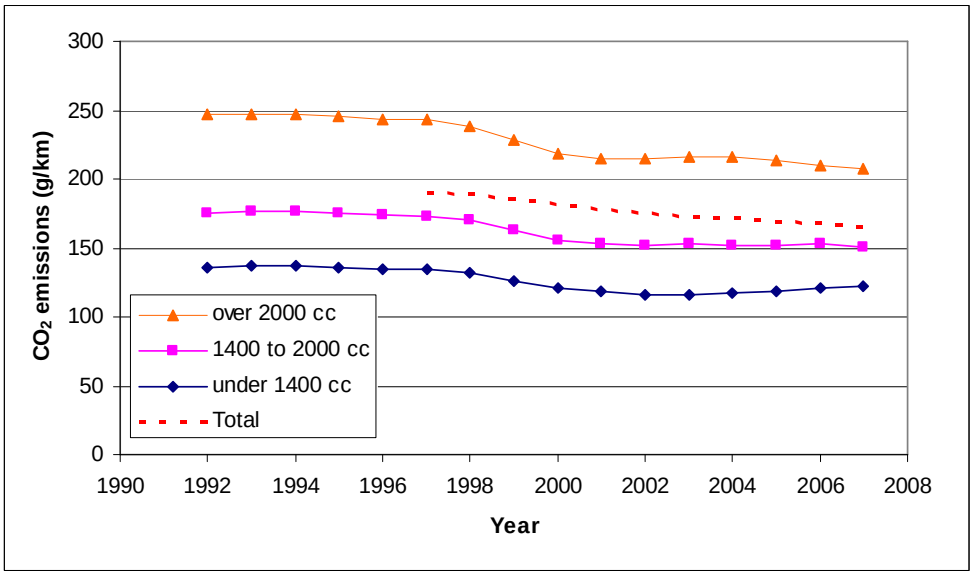

Figure 10: CO_2 emission factors for new diesel cars.

The emissions, based on the available data and the estimates are shown listed in Table 44, by year and by Euro class. For the Euro classification, it is assumed that the majority of cars will comply with the new legislation at the "new registrations" date rather than the earlier "new model type approval" date. The average emission factors for each emission standard are shown plotted in Figure 11 and Figure 12.

Table 44: Estimated CO_2 emission factors (g/km) by year and Euro class.

Emission standard	Year	Petrol			Diesel			Petrol			Diesel		
		under 1400 cc	1400 to 2000 cc	over 2000 cc	under 1400 cc	1400 to 2000 cc	over 2000 cc	under 1400 cc	1400 to 2000 cc	over 2000 cc	under 1400 cc	1400 to 2000 cc	over 2000 cc
	2020	104.22	128.30	187.81	89.47	110.24	152.16						
Euro 6	2019	106.35	130.93	191.65	91.30	112.49	155.28	110.62	136.18	199.34	94.96	117.00	161.51
	2018	108.48	133.56	195.50	93.13	114.75	158.39						
	2017	110.62	136.18	199.34	94.96	117.00	161.51						
	2016	112.75	138.81	203.18	96.79	119.26	164.62						
	2015	114.88	141.43	207.03	98.62	121.52	167.73						
Euro 5	2014	118.29	145.63	213.18	101.55	125.12	172.71	123.41	151.93	222.40	105.95	130.54	180.19
	2013	121.71	149.83	219.32	104.48	128.73	177.70						
	2012	125.12	154.04	225.47	107.41	132.34	182.68						
	2011	128.53	158.24	231.62	110.34	135.95	187.66						
Euro 4	2010	131.94	162.44	237.77	113.27	139.56	192.64	138.16	170.51	249.43	118.33	146.52	202.04
	2009	135.36	166.64	243.92	116.20	143.17	197.63						
	2008	138.77	170.84	250.07	119.13	146.78	202.61						
	2007	142.18	175.04	256.22	122.06	150.39	207.59						
	2006	142.55	177.61	259.16	120.98	152.70	209.75						
Euro 3	2005	144.91	180.86	262.66	118.90	152.39	213.41	148.82	185.62	261.57	117.54	152.33	214.83
	2004	147.03	183.91	262.34	117.82	152.03	215.67						
	2003	148.43	185.41	256.86	116.54	152.66	215.46						
	2002	151.26	187.77	256.41	116.22	152.01	215.37						
	2001	152.48	190.16	269.59	118.24	152.57	214.24						
Euro 2	2000	154.52	192.70	273.19	120.43	155.39	218.20	158.02	197.06	279.38	128.13	165.33	232.16
	1999	157.30	196.17	278.11	126.25	162.89	228.74						
	1998	159.67	199.11	282.29	131.78	170.03	238.76						
	1997	160.59	200.27	283.93	134.07	172.99	242.92						
Euro 1	1996	161.18	201.01	284.97	134.51	173.55	243.71	162.60	202.77	287.47	135.74	175.15	245.95
	1995	162.37	202.48	287.06	135.51	174.85	245.53						
	1994	163.46	203.85	289.00	136.52	176.14	247.35						
	1993	163.38	203.74	288.85	136.44	176.05	247.22						
pre-Euro 1	1992	163.21	203.53	288.55	136.23	175.77	246.83	166.51	207.64	294.38	138.98	179.32	251.81
	1991	164.84	205.57	291.44	137.59	177.53	249.30						
	1990	166.49	207.62	294.35	138.97	179.31	251.79						
	1989	168.15	209.70	297.29	140.36	181.10	254.31						
	1988	169.84	211.80	300.27	141.76	182.91	256.85						

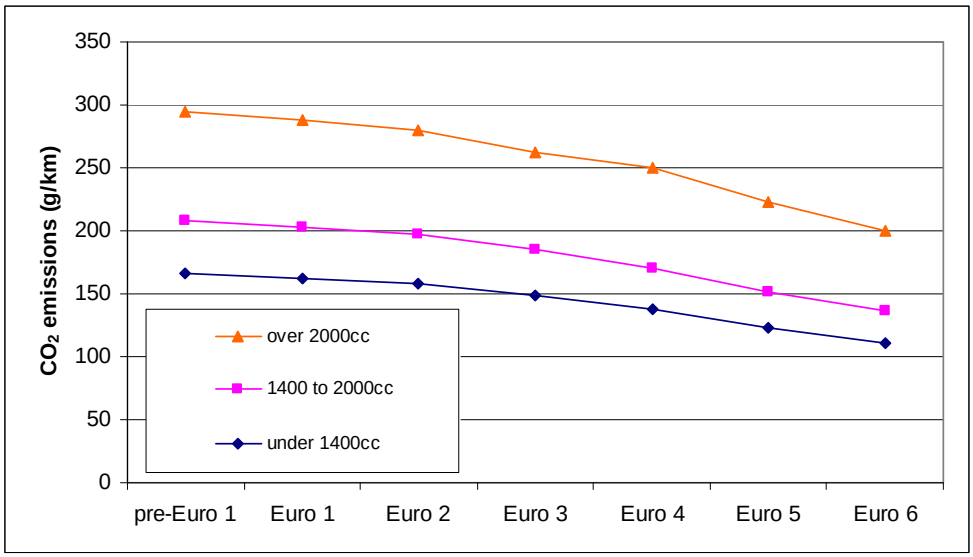

Figure 11: CO_2 emission factors by emission standard for petrol cars.

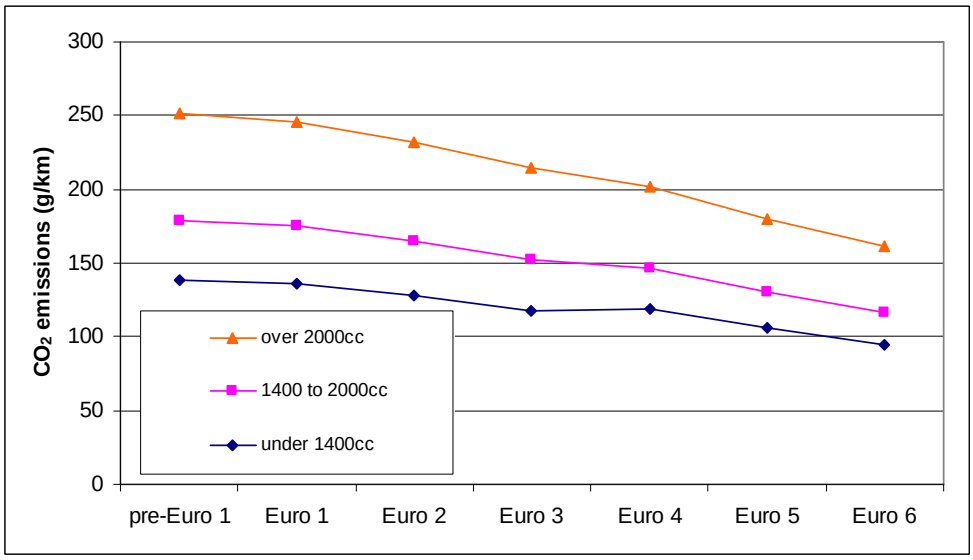

Figure 12: CO_2 emission factors by emission standard for diesel cars.

Generation of scaled exhaust emission functions

The first step in the generation of the scaled exhaust emission functions was the derivation of a generic CO_2 emission factor curve. All the measured CO_2 emissions data were plotted against average speed, and a cubic regression function was fitted to the data.

In the case of petrol cars, where there was a large amount of data, curves were generated for each of the engine size categories: small (< 1.4l), medium (1.4 to 2.0l) and large (> 2.0l). However, far fewer data were available for diesel vehicles (mainly for medium-size vehicles), and therefore only one curve was generated for all diesel cars.

In each case, for the purpose of generating the curve shape all data were included, regardless of the Euro specification of the vehicle. Examples of the fitted curves for medium petrol cars are shown in Figure 13 and Figure 14.

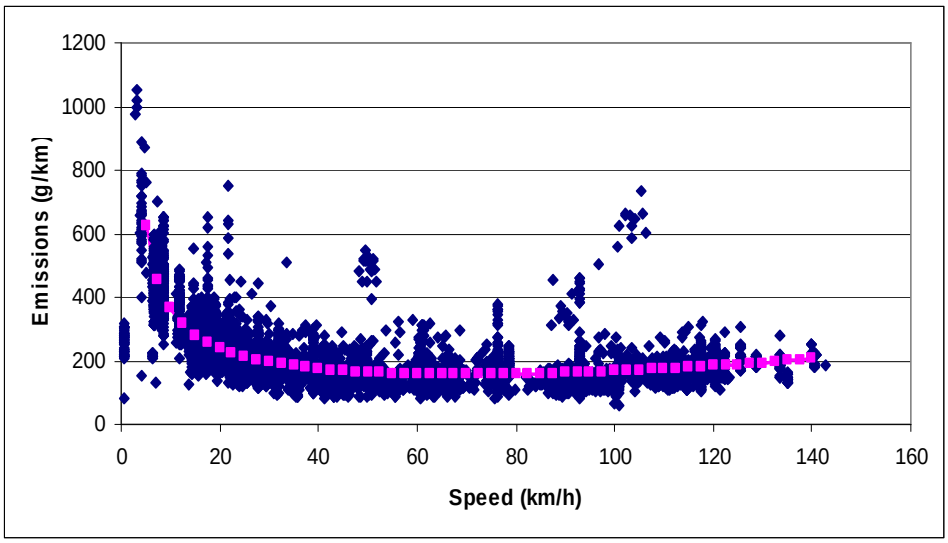

Figure 13: All CO_2 emission factors in g/km for medium petrol cars.

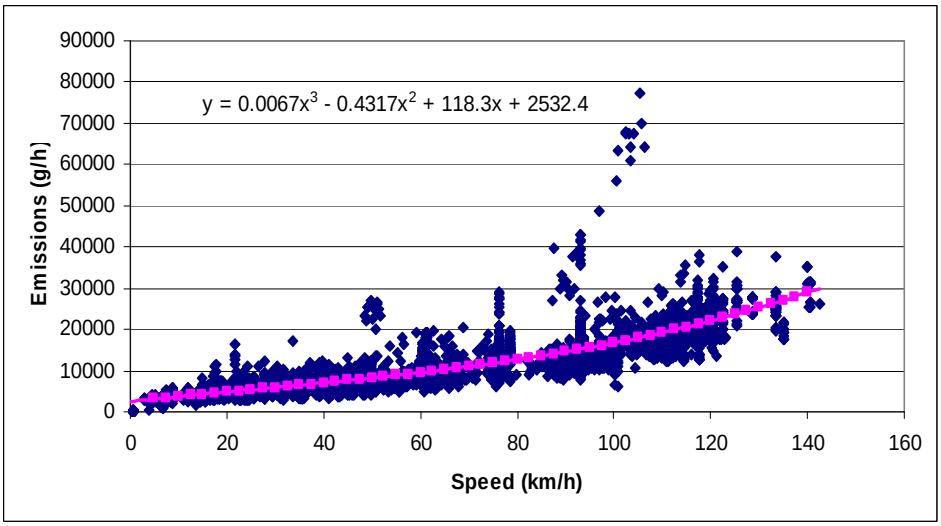

Figure 14: All CO_2 emission rates in g/h for medium petrol cars.

The generic curves were then fitted to the derived emission factors, based on the new car average for each vehicle category. The generic functions were used to calculate the emission factor for a speed of 33.6 km/h (the average speed of the NEDC), and the result was compared with the derived average new car emission factor. The difference between the two values was then used to adjust the entire curve (in g/km) up or down. Finally, the function for the g/h curve was then re-calculated. This process was repeated for each vehicle category and emission standard.

Comparisons between the emissions curve based on the LDV-regulated database ('previous EF'), the new curve, the emissions data in the database and the average new car CO_2 emissions are shown in Figure 15 and Figure 16 for medium-size Euro 1 petrol cars.

It should be noted that the CO_2 data which form the basis of these calculations do not fully reflect real-world vehicle operation. For example, real-world CO_2 emissions are affected by a number of factors, including the use of auxiliaries (headlights, radios, air conditioning, *etc.*), the prevalence of 'eco-driving' and level of maintenance. In fact, for cars a combined 'uplift' factor of +15% on NEDC-based CO_2 emission factors has been agreed between DfT and DEFRA to take into account the various real-world effects (DEFRA, 2007). Otherwise, models are available to allow factors such as air conditioning to be taken into account (*e.g.* Roujol, 2005).

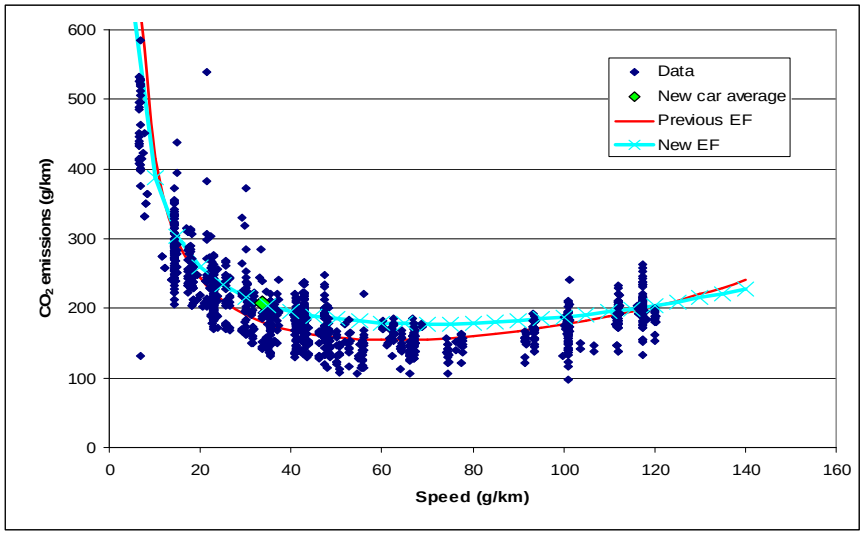

Figure 15: Comparison between the g/km curves with the data and new car average for medium-size Euro 1 petrol cars.

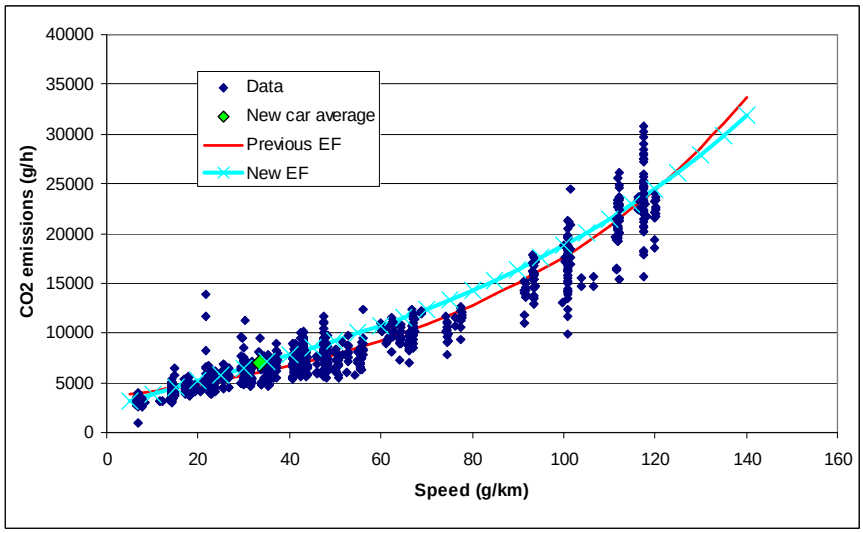

Figure 16: Comparison of the g/h curves with the data and new car average for medium-size Euro 1 petrol cars.

Calculation of ultimate CO_2 emission factors

The analysis described in the previous section relates to the tailpipe emissions. In order to derive the ultimate CO_2 emissions, emissions of all other pollutants which are subsequently oxidised to CO_2 in the atmosphere also need to be taken into consideration, and the resulting additional CO_2 added to the tailpipe values.

As the effect is typically very small for modern vehicles, the average potential CO_2 emissions have been evaluated for each car category and simply added as a constant to the emissions curve.

The procedure included the following steps for each car category:

- From the CO emission, the carbon content (=16/28 × CO) was calculated for the urban, rural and motorway emissions.
- From the HC emission, the carbon content (assumed to be 88.6%) was calculated for the urban, rural and motorway emissions.

- From the PM emission, the carbon content (assumed to be 88.6%) was calculated for the urban, rural and motorway emissions.
- The additional carbon emissions for urban, rural and motorway situations were summated, and an average value was derived.
- This additional carbon was converted to a CO_2-equivalent mass (= 44/12 × carbon).
- The tailpipe CO_2 emission curve was adjusted accordingly.

An example showing the effect on the emissions curve is shown in Figure 17. For modern petrol and diesel cars the effect is very small – an increase of 1% or less. However, for pre-Euro 1 petrol cars, which produce higher quantities of CO and HC, the effect is greater.

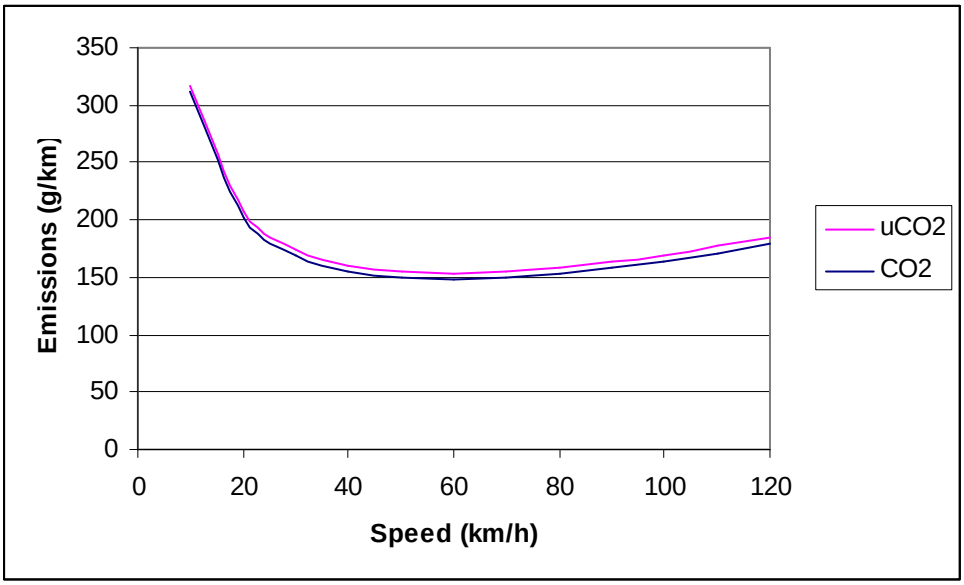

Figure 17: Tailpipe and ultimate CO2 emissions for a Euro 1, < 1400cc petrol car.

5.2.2 Taxis

As with regulated pollutants, the CO_2 emission factors for N1(III) LGVs were used to represent emissions from taxis.

5.2.3 LGVs

Only a limited amount of emissions data was available for LGVs, and therefore various assumptions had to be made. Small LGVs (N1, class I) are mainly car-based vans. For this category, the CO_2 emission factors were taken from the equivalent medium-sized cars. A small adjustment was added to the function to allow for the higher vehicle weight of an in-use van.

For larger vans, data were available for some Euro classes but not all. Curves were generated based on the existing data. The emission factors for the remaining categories were based on the known functions, modified by assumptions on the likely change in emissions between Euro classes.

5.2.4 Heavy-duty vehicles

For heavy-duty vehicles, the CO_2 functions were based on those from the ARTEMIS project (Boulter and Barlow, 2005).

5.2.5 Two-wheel vehicles

The CO_2 emission factors for mopeds are taken from COPERT 4. As for regulated pollutants, the CO_2 emission factors (ultimate CO_2) for motorcycles were taken from ARTEMIS (Elst *et al.*, 2006). These emission factors were also developed using the methodology described for regulated pollutants.

5.3 Unregulated pollutants

The unregulated pollutants considered were methane (CH_4), 1,3-butadiene, benzene, nitrous oxide (N_2O), ammonia (NH_3), polycyclic aromatic hydrocarbons (PAHs), nitrogen dioxide (NO_2) and PM size fractions.

Emission factors were calculated according to the availability of data. If sufficient measurements were available across the whole speed range, average-speed functions were developed. If sufficient measurements were available for specific driving cycles, then emission factors for urban, rural and motorway conditions were calculated. In the case of PAHs, single emission factors were used for all driving conditions. As far as possible, the emission factors were derived from the databases. Where little or no information existed, the emission factors from COPERT 4 were used, or assumptions were made based on the type approval limit values for total hydrocarbons.

In addition, a simplified version of the vehicle fleet structure for regulated pollutants was used[10]. This was to enable the pooling of the smaller quantities of data for unregulated pollutants. The vehicle fleet structure for unregulated pollutants is shown in Table 45, Table 46 and Table 47.

Table 45: Vehicle fleet structure for unregulated pollutants (light-duty vehicles).

Code	Vehicle category	Fuel	Emission standard	Code	Vehicle category	Fuel	Emission standard
U01	Car (all)+LGV N1(I)+LGV N1(II) +taxi	Petrol	Pre-Euro 1	**U21**	LGV N1(III)	Petrol	Pre-Euro 1
U02		Petrol	Euro 1	**U22**	LGV N1(III)	Petrol	Euro 1
U03		Petrol	Euro 2	**U23**	LGV N1(III)	Petrol	Euro 2
U04		Petrol	Euro 3	**U24**	LGV N1(III)	Petrol	Euro 3
U05		Petrol	Euro 4	**U25**	LGV N1(III)	Petrol	Euro 4
U06		Petrol	Euro 5	**U26**	LGV N1(III)	Petrol	Euro 5
U07		Petrol	Euro 6	**U27**	LGV N1(III)	Petrol	Euro 6
U08		Diesel	Pre-Euro 1	**U28**	LGV N1(III)	Diesel	Pre-Euro 1
U09		Diesel	Euro 1	**U29**	LGV N1(III)	Diesel	Euro 1
U10		Diesel	Euro 2	**U30**	LGV N1(III)	Diesel	Euro 2
U11		Diesel	Euro 3	**U31**	LGV N1(III)	Diesel	Euro 3
U12		Diesel	Euro 4	**U32**	LGV N1(III)	Diesel	Euro 4
U13		Diesel	Euro 5	**U33**	LGV N1(III)	Diesel	Euro 5
U14		Diesel	Euro 6	**U34**	LGV N1(III)	Diesel	Euro 6
U15		LPG	Euro 1				
U16		LPG	Euro 2				
U17		LPG	Euro 3				
U18		LPG	Euro 4				
U19		LPG	Euro 5				
U20		LPG	Euro 6				

[10] The exception to this was 1,3-butadiene for which, on account of the calculation method used, the fleet structure for regulated pollutants was retained.

Table 46: Vehicle fleet structure for unregulated pollutants (diesel heavy-duty vehicles).

Code	Vehicle category	Fuel	Emission standard	Code	Vehicle category	Fuel	Emission standard
U35	HGV - rigid	Diesel	Pre-Euro I	**U49**	Buses and coaches	Diesel	Pre-Euro I
U36	HGV - rigid	Diesel	Euro I	**U50**	Buses and coaches	Diesel	Euro I
U37	HGV - rigid	Diesel	Euro II	**U51**	Buses and coaches	Diesel	Euro II
U38	HGV - rigid	Diesel	Euro III	**U52**	Buses and coaches	Diesel	Euro III
U39	HGV - rigid	Diesel	Euro IV	**U53**	Buses and coaches	Diesel	Euro IV
U40	HGV - rigid	Diesel	Euro V	**U54**	Buses and coaches	Diesel	Euro V
U41	HGV - rigid	Diesel	Euro VI	**U55**	Buses and coaches	Diesel	Euro VI
U42	HGV - artic	Diesel	Pre-Euro I				
U43	HGV - artic	Diesel	Euro I				
U44	HGV - artic	Diesel	Euro II				
U45	HGV - artic	Diesel	Euro III				
U46	HGV - artic	Diesel	Euro IV				
U47	HGV - artic	Diesel	Euro V				
U48	HGV - artic	Diesel	Euro VI				

Table 47: Vehicle fleet structure for unregulated pollutants (petrol two-wheel vehicles).

Code	Engine capacity and type	Emission standard	Code	Engine capacity and type	Emission standard
U56	<50 cc	Pre-Euro 1	**U68**	250-750 cc 4-stroke	Pre-Euro 1
U57	<50 cc	Euro 1	**U69**	250-750 cc 4-stroke	Euro 1
U58	<50 cc	Euro 2	**U70**	250-750 cc 4-stroke	Euro 2
U59	<50 cc	Euro 3	**U71**	250-750 cc 4-stroke	Euro 3
U60	>50 cc 2-stroke	Pre-Euro 1	**U72**	>750 cc 4-stroke	Pre-Euro 1
U61	>50 cc 2-stroke	Euro 1	**U73**	>750 cc 4-stroke	Euro 1
U62	>50 cc 2-stroke	Euro 2	**U74**	>750 cc 4-stroke	Euro 2
U63	>50 cc 2-stroke	Euro 3	**U75**	>750 cc 4-stroke	Euro 3
U64	<250 cc 4-stroke	Pre-Euro 1			
U65	<250 cc 4-stroke	Euro 1			
U66	<250 cc 4-stroke	Euro 2			
U67	<250 cc 4-stroke	Euro 3			

For CH_4, 1,3-butadiene, benzene, N_2O and NH_3 the types of emission factor which were developed in the project, are shown in Table 48. Average-speed functions could only be derived for methane and benzene, and even in these cases only for petrol and diesel light-duty vehicles. For two-wheel vehicles no emission factors were available for 1,3-butadiene and benzene. For LPG cars no emission factors were available for benzene and ammonia.

The average speed functions were developed using the method described earlier for regulated pollutants. The urban, rural and motorway emission factors were calculated as average values, based either on the allocation of the driving cycle use in a test to one of these driving conditions, or using the average-speed functions and the mean speeds of the urban, rural and motorway cycles in the database.

Table 48: Types of emission factor for unregulated pollutants.

Pollutant	Vehicle category	Fuel	Average speed function	Urban/rural/motorway emission factors
Methane	Car, LGV N1(I), LGV N1(II), taxi	Petrol	✓	✓
		Diesel	✓	✓
		LPG	×	✓
	LGV N1(III)	Petrol	✓	✓
		Diesel	✓	✓
	Rigid HGV, artic. HGV, bus, coach	Diesel	×	✓
	Two-wheel vehicle	Petrol	×	✓
1,3-butadiene	Car, LGV N1(I), LGV N1(II), taxi	Petrol	×	✓
		Diesel	×	✓
		LPG	×	✓
	LGV N1(III)	Petrol	×	✓
		Diesel	×	✓
	Rigid HGV, artic. HGV, bus, coach	Diesel	×	✓
	Two-wheel vehicle	Petrol	×	×
Benzene	Car, LGV N1(I), LGV N1(II), taxi	Petrol	✓	✓
		Diesel	✓	✓
		LPG	×	×
	LGV N1(III)	Petrol	✓	✓
		Diesel	✓	✓
	Rigid HGV, artic. HGV, bus, coach	Diesel	×	✓
	Two-wheel vehicle	Petrol	×	×
N_2O	Car, LGV N1(I), LGV N1(II), taxi	Petrol	×	✓
		Diesel	×	✓
		LPG	×	✓
	LGV N1(III)	Petrol	×	✓
		Diesel	×	✓
	Rigid HGV, artic. HGV, bus, coach	Diesel	×	✓
	Two-wheel vehicles	Petrol	×	✓
NH_3	Car, LGV N1(I), LGV N1(II), taxi	Petrol	×	✓
		Diesel	×	✓
		LPG	×	×
	LGV N1(III)	Petrol	×	✓
		Diesel	×	✓
	Rigid HGV, artic. HGV, bus, coach	Diesel	×	✓
	Two-wheel vehicles	Petrol	×	✓

The emission factors for 1,3-butadiene were developed using NMHC speciation data from COPERT 4, together with HC and CH_4 emission factors for urban, rural and motorway conditions.

In the case of NO_2, the proportions of NO_x emitted as primary NO_2 were taken from COPERT 4, although again no information was available for two-wheel vehicles. The average proportions of PM_{10}, $PM_{2.5}$ and PM_1 in the PM emitted by Euro 2 and Euro 3 petrol and diesel cars/LGVs were calculated from the LDV-regulated database. There was little variation in the proportions with average speed.

It is worth noting that there were a number of inconsistencies and general 'difficulties' associated with the data. This has often been observed in the past with unregulated pollutants, and is one reason why the analysis of these pollutants is so problematic. Some rather subjective decisions are often required. An example of this is shown in Figure 18. Here, the quotient of the emission factors for 1,3-butadiene and total hydrocarbons has been calculated for each test in one particular programme. Clearly, it is nonsensical to have an emission factor for 1,3-butadiene which is 20 times higher than that for total hydrocarbons. This should not be taken as a criticism of the laboratory concerned – it is one of the

consequences of measuring low concentrations of pollutants using different techniques – but it is fairly typical of the type of problem which is encountered.

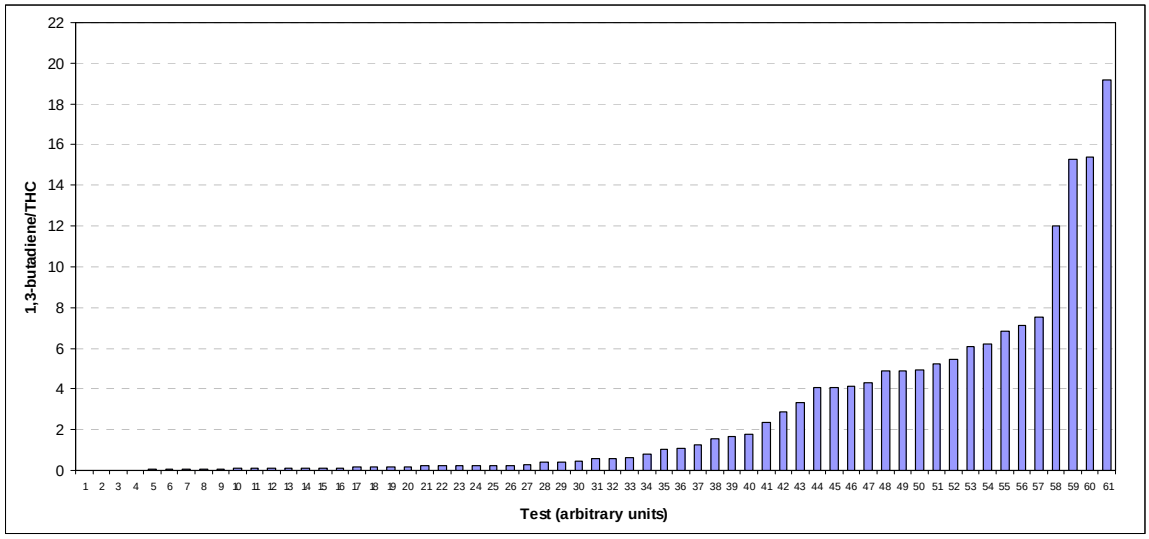

Figure 18: Quotient of emission factors for 1,3-butadiene and total hydrocarbons for Euro III diesel LGVs (data from Emission Factors 2003 project – ID 111 in Table 11).

In this case, the problem of subjectivity relates to which measurements should be rejected, and which should be retained. It is evident that some of the data cannot be used to develop emission factors, but questions remain concerning the results which are not ostensibly incorrect (*i.e.* the tests in which the quotient of 1,3-butadiene and total hydrocarbons was low). For example, should these data be retained? Should a cut-off point be introduced? If they are rejected, should all the measurements using this method be rejected? Such questions are difficult to address systematically, and it is therefore inevitable that there will be some unusual patterns in the resulting emission factors.

5.4 Simplification of the emission functions

During the curve fitting process, a variety of different functions were used in order to produce the best possible fit and the best curve shape. This resulted in several different types of function. The final step in the process was to fit a 6^{th}-order polynomial to the values calculated using each regression curve. This enabled to the speed-emission curves for most vehicle categories to be calculated using the same basic functional form.

Having generated the curve shape, it was then possible to generalise all of the functions as polynomials. The process involved, for each function:

1. Calculate the emissions throughout the valid speed range in steps of 5 km/h.
2. Start with a polynomial order of 1 (*i.e.* a straight line).
    - Fit a polynomial curve through the data,.
    - Evaluate the value of R^2.
    - If R^2 is greater than 0.999999 then accept the results.
    - Otherwise, increase polynomial order by 1 and repeat the process.
3. Stop when an acceptable R^2 value is obtained or a 6^{th} order polynomial is reached.

An example is shown in Figure 19 of the CO_2 emissions from a HGV (rigid, 7.5-12 t, Euro IV).

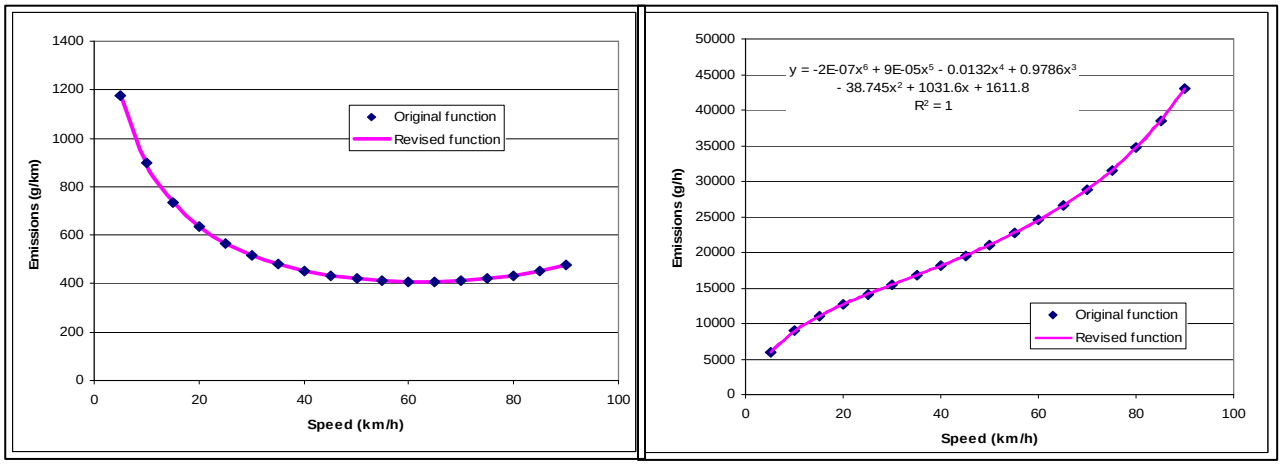

Figure 19: Original and modified curves (CO_2 emissions from a rigid HGV, 7.5-12 t, Euro IV).

The original function for this vehicle category and pollutant was of the form was:

Reciprocal quadratic model: $y = k/(c \cdot x^2 + b \cdot x + a)$

The variable k was introduced into each equation to allow a simple adjustment to an existing equation where an emission factor was required for a vehicle category having no emissions data (*e.g.* future vehicle categories). The revised function was a 6th order polynomial, with an exact fit. Using the results, the emissions can then be expressed as either:

Emissions [g/km] = $k*(a + bx + cx^2 + dx^3 + ex^4 + fx^5 + gx^6)/x$ or

Emissions [g/h] = $k*(a + bx + cx^2 + dx^3 + ex^4 + fx^5 + gx^6)$

In cases where a lower polynomial order gives an acceptable fit, then the higher coefficients are just zero. In all cases the curve shape has been maintained in this conversion.

6 Basic emission factors

This Chapter of the Report summarises the basic emission factors for road vehicles which are recommended for use in the UK. The Chapter is divided into two Sections relating to regulated pollutants and unregulated pollutants.

> ***Important**: The emission functions and factors presented here are also available as a spreadsheet on the DfT web site. Where modelling work is to be conducted, it is strongly recommended that this work is conducted using the spreadsheet, rather than using the information presented here. The use of the coefficients given in this report may lead to rounding errors and incorrect functions, and there may be errors of transcription. In addition, to reduce table size, some of the unregulated emissions are reported here by simplified vehicle categories. The corresponding data for all the vehicle categories are contained in the spreadsheet.*

6.1 Regulated pollutants

The basic emission factors for regulated pollutants are given by vehicle category in Appendix D. As stated earlier, the variable *k* was introduced into each equation to allow a simple adjustment to an existing equation where an emission factor was required for a vehicle category having no emissions data.

Once again, it should be noted that these emission factors should not be used independently, but in conjunction with scaling factors which are designed to address, for example, the variation of actual mileage with vehicle category and year, the effects of alternative fuels, and the effects of specific emission-control technologies. These scaling factors will be covered in other Task Reports in the project.

For vehicle categories which are not specifically addressed here, modellers are referred to the COPERT 4 model. These vehicle categories include:

- Light-duty vehicles which are compliant with specific levels of pre-Euro 1 legislation.
- Hybrid petrol cars
- Petrol-fuelled heavy-duty vehicles
- CNG-fuelled buses

Similarly, COPERT includes emission factors for some pollutants which are not addressed here, including particle surface area, particle number, specific PAHs and POPs, and dioxins and furans.

6.2 Carbon dioxide

The basic CO_2 emission functions are tabulated in Appendix E. The formats of the functions are the same as those for the regulated emissions.

6.3 Unregulated pollutants

The basic emission factors for some selected unregulated pollutants (CH_4, 1,3-butadiene, benzene, N_2O, NH_3, and PAHs) are given by vehicle category in Appendix F. There are no scaling factors for these pollutants.

Information is also presented in Appendix F for NO_2 (as a proportion of NO_x) and PM size fractions.

As noted earlier, the proportions of NO_x emitted as primary NO_2 are taken from COPERT 4. The authors recommend that modellers use these values unless they have access to more appropriate

information. In addition, some further assumptions will be required for the vehicle categories which are not covered here (*e.g.* for two-wheel vehicles, Euro 5/6 light-duty vehicles, light-duty vehicles and Euro IV heavy-duty vehicles equipped with catalysed DPFs).

For PM_{10} and $PM_{2.5}$ it is recommended that modellers do not use the values in Table F26, as they are rather limited in scope. Instead, the baseline functions for total PM mass should be used. In other words, it is assumed that all exhaust PM is $PM_{2.5}$. This is in line with the recommendation from COPERT 4, given that there is no physical process occurring in an engine that could produce primary particles as large as 2.5 µm. Any coarse particles measured in tests probably result from the sampling system walls and not primary engine exhaust (Ntziachristos, 2008). No emission factors are available for PM_1.

There is clearly some conflict here between the approach in COPERT 4 and the measurements presented in Table F26, with the latter indicating that the $PM_{2.5}$ proportion is lower than stated in COPERT. It is recommended that more data be collected to test the assumption of COPERT.

6.4 Uncertainty

The uncertainty associated with the emission factors presented here has not been evaluated. However, it is anticipated that DfT will commission further work to enable the uncertainty to be quantified. For a qualitative indication of the uncertainty on the emission factors for various vehicle types and pollutants, the reader should refer to the COPERT 4 documentation.

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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).
CH_4	Methane.
CO	Carbon monoxide.
CO_2	Carbon dioxide.
uCO_2	'Ultimate' CO_2.
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 diesel (FTD)	Fischer-Tropsch diesel is a premium diesel product with a very high cetane number (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.
N_2O	Nitrous oxide.
NH_3	Ammonia.
NMVOC	Non-methane volatile organic compounds.
NO	Nitric oxide.
NO_2	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.
PM_{10}	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 characteristics	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.
SO_2	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.
TRAMAQ	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	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: Driving cycles in the LDV database

Table B1: Driving cycle codes – LDVs.

Cycle ID	Description	Defined cycle			URM
		Duration (s)	Distance (km)	Speed (km/h)	
10010000	ARTEMIS urban, including start	993	4.87	17.7	U
10010198	ARTEMIS urban, start	72	0.40	19.9	U
10010201	ARTEMIS urban (all, parts 1-5)	921	4.47	17.5	U
10010302	ARTEMIS urban, part 1	236	1.02	15.5	U
10010402	ARTEMIS urban, part 2	198	1.75	31.8	U
10010502	ARTEMIS urban, part 3	243	0.59	8.7	U
10010602	ARTEMIS urban, part 4	128	0.42	11.8	U
10010702	ARTEMIS urban, part 5	116	0.70	21.7	U
10020000	ARTEMIS rural, including 'pre' and 'post' parts	1082	17.27	57.5	R
10020199	ARTEMIS rural, 'pre' part	101	0.83	29.6	R
10020201	ARTEMIS rural (all, parts 1-5)	862	14.72	61.5	R
10020302	ARTEMIS rural, part 1	240	3.33	49.9	R
10020402	ARTEMIS rural, part 2	171	3.15	66.2	R
10020502	ARTEMIS rural, part 3	183	2.20	43.4	R
10020602	ARTEMIS rural, part 4	177	3.88	78.9	R
10020702	ARTEMIS rural, part 5	91	2.24	88.6	R
10020899	ARTEMIS rural, 'post' part	119	1.74	52.6	R
10030000	ARTEMIS motorway 150 km/h, incl. 'pre' and 'post' parts	1068	29.55	99.6	M
10030199	ARTEMIS motorway 150 km/h, 'pre' part	176	2.57	52.6	M
10030201	ARTEMIS motorway 150 km/h (all, parts 1-4)	736	24.63	120.5	M
10030302	ARTEMIS motorway 150 km/h, part 1	272	9.28	122.9	M
10030402	ARTEMIS motorway 150 km/h, part 2	173	5.00	104.1	M
10030502	ARTEMIS motorway 150 km/h, part 3	182	6.37	125.9	M
10030602	ARTEMIS motorway 150 km/h, part 4	109	4.08	134.9	M
10030799	ARTEMIS motorway 150 km/h, 'post' part	156	2.40	55.5	M
10040000	ARTEMIS motorway 130 km/h limited, inc. 'pre' and 'post' parts	1068	28.74	96.9	M
10040201	ARTEMIS motorway 130 km/h limited, 150_1+150_2+130_3+130_4	736	23.82	116.5	M
10040502	ARTEMIS motorway 130 km/h limited, part 3	182	5.98	118.2	M
10040602	ARTEMIS motorway 130 km/h limited, part 4	109	3.66	120.9	M
10050001	ARTEMIS.urban+rural+motorway_150 not weighted	3143	51.69	59.2	R
10070201	ARTEMIS high power - urban, main part (urban_1/_2/_3/_4/_5)	918	4.92	19.3	U
10070302	ARTEMIS high power - urban, part 1	224	1.11	17.8	U
10070402	ARTEMIS high power - urban, part 2	244	2.01	29.6	U
10070502	ARTEMIS high power - urban, part 3	225	0.71	11.4	U
10070602	ARTEMIS high power - urban, part 4	111	0.38	12.2	U
10070702	ARTEMIS high power - urban, part 5	114	0.72	22.6	U
10080201	ARTEMIS high power - urban dense, main part	730	2.91	14.3	U
10080302	ARTEMIS high power - urban dense, part 1	301	1.71	20.4	U
10080402	ARTEMIS high power - urban dense, part 2	282	0.78	10.0	U
10080502	ARTEMIS high power - urban dense, part 3	147	0.42	10.2	U
10090201	ARTEMIS high power - urban free-flow, main part	710	4.78	24.2	U
10090302	ARTEMIS high power - urban free-flow, part 1	236	1.05	16.0	U
10090402	ARTEMIS high power - urban free-flow, part 2	257	2.17	30.4	U
10090502	ARTEMIS high power - urban free-flow, part 3	217	1.56	25.9	U
10100201	ARTEMIS high power - rural, main part	844	14.22	60.7	R
10100302	ARTEMIS high power - rural, part 1	255	3.46	48.9	R

10100402	ARTEMIS high power - rural, part 2	131	2.43	66.8	R
10100502	ARTEMIS high power - rural, part 3	201	2.47	44.2	R
10100602	ARTEMIS high power - rural, part 4	181	4.02	79.9	R
10100702	ARTEMIS high power - rural, part 5	76	1.92	91.0	R
10110201	ARTEMIS high power - motorway, main part	750	25.41	122.0	M
10110302	ARTEMIS high power - motorway, part 1	271	9.55	126.8	M
10110402	ARTEMIS high power - motorway, part 2	184	5.26	103.0	M
10110502	ARTEMIS high power - motorway, part 3	179	6.27	126.1	M
10110602	ARTEMIS high power - motorway, part 4	116	4.43	137.6	M
10120201	ARTEMIS low power - urban, main part	945	4.80	18.3	U
10120302	ARTEMIS low power - urban, part 1	234	1.07	16.5	U
10120402	ARTEMIS low power - urban, part 2	216	1.85	30.9	U
10120502	ARTEMIS low power - urban, part 3	235	0.65	10.0	U
10120602	ARTEMIS low power - urban, part 4	122	0.32	9.4	U
10120702	ARTEMIS low power - urban, part 5	138	0.90	23.6	U
10130201	ARTEMIS low power - urban dense, main part	711	2.94	14.9	U
10130302	ARTEMIS low power - urban dense, part 1	276	1.72	22.5	U
10130402	ARTEMIS low power - urban dense, part 2	278	0.73	9.5	U
10130502	ARTEMIS low power - urban dense, part 3	157	0.48	11.0	U
10140201	ARTEMIS low power - urban fluide, main part	710	4.82	24.4	U
10140302	ARTEMIS low power - urban fluide, part 1	230	1.07	16.7	U
10140402	ARTEMIS low power - urban fluide, part 2	211	1.81	30.8	U
10140502	ARTEMIS low power - urban fluide, part 3	269	1.95	26.0	U
10150201	ARTEMIS low power - rural, main part	821	13.15	57.7	R
10150302	ARTEMIS low power - rural, part 1	243	3.24	48.0	R
10150402	ARTEMIS low power - rural, part 2	125	2.28	65.7	R
10150502	ARTEMIS low power - rural, part 3	236	2.67	40.7	R
10150602	ARTEMIS low power - rural, part 4	136	3.02	80.0	R
10150702	ARTEMIS low power - rural, part 5	81	2.01	89.2	R
10160201	ARTEMIS low power - motorway, main part	729	24.12	119.1	M
10160302	ARTEMIS low power - motorway, part 1	272	9.21	121.9	M
10160402	ARTEMIS low power - motorway, part 2	181	5.22	103.9	M
10160502	ARTEMIS low power - motorway, part 3	181	6.27	124.7	M
10160602	ARTEMIS low power - motorway, part 4	95	3.52	133.2	M
10170201	ARTEMIS low power - motorway 130 km/h limited	736	23.74	116.1	M
11010101	EMPA.A1 r-w-cycle A - bag 1 (FTP75-1, cold)	505	5.78	41.2	U
11010201	EMPA.A2 r-w-cycle A - bag 2 (FTP75-2)	870	6.21	25.7	U
11010301	EMPA.A3 r-w cycle A - bag 3 (FTP75-3 = FTP75-1, warm)	505	5.78	41.2	U
11020101	EMPA.B1 r-w cycle B - bag 1 (NEDC1 = ECE)	819	4.06	17.8	U
11020201	EMPA.B2 r-w cycle B - bag 2 (NEDC2 = EUDC)	399	6.96	62.8	R
11020301	EMPA.B3 r-w cycle B - bag 3 (highway)	763	16.51	77.9	M
11020402	EMPA.B3_255 r-w cycle B - bag 3 (highway), seconds 1 to 255	255	4.84	68.3	M
11020502	EMPA.B3_511 r-w cycle B - bag 3 (highway), seconds 256 to 511	255	6.06	85.6	M
11020602	EMPA.B3_765 r-w cycle B - bag 3 (highway), seconds 512 to 765	249	5.56	80.3	M
11030001	EMPA Bundesautobahn (BAB)	1000	32.65	117.5	M
11030102	EMPA BAB437 (Bundesautobahn, seconds 1 to 437)	437	12.96	106.8	M
11030202	EMPA BAB736 (Bundesautobahn, seconds 448 to 736)	299	9.56	115.1	M
11030302	EMPA BAB1000 (Bundesautobahn, seconds 737 to 1000)	29	1.15	142.8	M
11040101	EMPA.Beschl._I artificial acceleration - bag 1, v*b = 15 m2/s3	187	1.54	29.7	R
11040201	EMPA.Beschl._II artificial acceleration - bag 2, v*b = 10 m2/s3	209	1.94	33.3	U

11040301	EMPA.Beschl._III artificial acceleration - bag 3, v*b = 5 m2/s3	188	1.90	36.3	U
11060101	EMPA.C-1_I cold start urban - bag 1	258	0.22	3.1	U
11060201	EMPA.C-1_II cold start urban - bag 2	258	0.22	3.1	U
11060301	EMPA.C-1_III cold start urban - bag 3	258	0.22	3.1	U
11070101	EMPA.C-2_I cold start rural - bag 1	258	5.55	77.5	R
11070201	EMPA.C-2_II cold start rural - bag 2	258	5.55	77.5	R
11080101	EMPA.C-3_I cold start highway - bag 1, incl. 10s idling & accel & decel	258	8.53	119.0	M
11090201	EMPA.C-4_II cold start - bag 2, incl. 10s bridge from bag 1	258	2.30	32.1	U
11090301	EMPA.C-4_III cold start - bag 3, incl. 10s bridge from bag 2	258	2.30	32.1	U
11120101	EMPA.EL1.1_I auxiliaries test_1.1 - bag 1, headlights only	528	17.39	118.5	M
11120201	EMPA.EL1.1_II auxiliaries test_1.1 - bag 2, headlights only	257	7.19	100.7	M
11120301	EMPA.EL1.1_III auxiliaries test_1.1 - bag 3, headlights only	258	5.55	77.5	R
11130101	EMPA.EL1.2_I auxiliaries test_1.2 - bag 1, all aux. w/o AC	528	17.39	118.5	M
11130201	EMPA.EL1.2_II auxiliaries test_1.2 - bag 2, all aux. w/o AC	257	7.19	100.7	M
11130301	EMPA.EL1.2_III auxiliaries test_1.2 - bag 3, all aux. w/o AC	258	5.55	77.5	R
11140101	EMPA.EL2.1_I auxiliaries test_2.1 - bag 1, headlights only	528	7.78	53.0	R
11140201	EMPA.EL2.1_II auxiliaries test_2.1 - bag 2, headlights only	528	4.93	33.6	U
11140301	EMPA.EL2.1_III auxiliaries test_2.1 - bag 3, headlights only	528	0.61	4.1	U
11150101	EMPA.EL2.2_I auxiliaries test_2.2 - bag 1, all aux. w/o AC	528	7.78	53.0	R
11150201	EMPA.EL2.2_II auxiliaries test_2.2 - bag 2, all aux. w/o AC	528	4.93	33.6	U
11150301	EMPA.EL2.2_III auxiliaries test_2.2 - bag 3, all aux. w/o AC	528	0.61	4.1	U
11160101	EMPA.K1_I compressed C+D - bag 1	775	21.38	99.3	M
11160201	EMPA.K1_II compressed C+D - bag 2	539	13.22	88.3	R
11160301	EMPA.K1_III compressed C+D - bag 3	522	10.26	70.8	R
11170101	EMPA.K2_I compressed E+F - bag 1	487	6.84	50.6	R
11170201	EMPA.K2_II compressed E+F - bag 2	555	5.94	38.5	U
11170301	EMPA.K2_III compressed E+F - bag 3	632	2.39	13.6	U
11180001	EMPA.Kreisel traffic lights vs. roundabouts - roundabout part	513	4.88	34.3	U
11190101	EMPA.L1_I legislative_1 - bag 1 (FTP75-1, cold)	505	5.78	41.2	U
11190201	EMPA.L1_II legislative_1 - bag 2 (FTP75-2)	870	6.21	25.7	U
11190301	EMPA.L1_III legislative_1 - bag 3 (FTP75-3 = FTP75-1, warm)	505	5.78	41.2	U
11200000	EMPA.L2 legislative_2 - bag 1+bag 2+bag 3	2290	44.64	70.2	R
11200101	EMPA.L2_I legislative_2 - bag 1 (NEDC1 = ECE)	819	4.06	17.8	U
11200201	EMPA.L2_II legislative_2 - bag 2 (NEDC2 = EUDC)	399	6.96	62.8	R
11200301	EMPA.L2_III legislative_2 - bag 3 (Bundesautobahn)	1000	32.67	117.6	M
11210001	EMPA.LSA traffic lights vs. roundabouts - traffic light part	770	6.07	28.4	U
11220101	EMPA.M1_I EMPA/TÜV MODEM_1 - bag 1 (MODEM urban 1)	428	1.71	14.3	U
11220201	EMPA.M1_II EMPA/TÜV MODEM_1 - bag 2 (MODEM road)	712	8.49	42.9	R
11230101	EMPA.M2_I EMPA/TÜV MODEM_2 - bag 1 (MODEM urban 2)	355	2.25	22.8	U
11230201	EMPA.M2_II EMPA/TÜV MODEM_2 - bag 2 (MODEM motorway)	452	12.68	101.0	M
11240101	EMPA.Pendel_I artificial oscillation - bag 1, v*b = 0 m2/s3 (constant)	192	2.95	55.3	R
11240201	EMPA.Pendel_II artificial oscillation - bag 2, v*b = 5 m2/s3	217	3.38	56.1	R
11240301	EMPA.Pendel_III artificial oscillation - bag 3, v*b = 10 m2/s3	200	3.12	56.2	R
11250101	EMPA.RX_I ecodrive gear change 2000 rpm / max gear in cruise - bag 1	259	3.78	52.5	R
11250201	EMPA.RX_II ecodrive gear change 2000 rpm / max gear in cruise - bag 2	259	2.31	32.1	U
11250301	EMPA.RX_III ecodrive gear change 2000 rpm / max gear in cruise - bag 3	529	4.94	33.6	U
11260101	EMPA.RY_I ecodrive gear change 3000 rpm - bag 1 (LE3)	259	3.78	52.5	R
11260201	EMPA.RY_II ecodrive gear change 3000 rpm - bag 2 (LE5)	259	2.31	32.1	U
11260301	EMPA.RY_III ecodrive gear change 3000 rpm - bag 3 (LE6)	529	4.94	33.6	U
11270001	EMPA.T85	399	9.42	85.0	M

11280001	EMPA.T100	399	11.09	100.0	M
11290001	EMPA.T115	399	12.75	115.0	M
11300001	EMPA.T120	399	12.75	120.0	M
11310001	EMPA.T130	399	14.41	130.0	M
12010200	Handbook R1 - AE1 + tr1 + AE2 + tr2 + A3	1334	40.97	110.6	M
12010301	Handbook R1 - bag 1 (AE1)	528	17.39	118.5	M
12010501	Handbook R1 - bag 2 (AE2)	528	15.82	107.9	M
12010701	Handbook R1 - bag 3 (A3)	258	7.22	100.7	M
12020200	Handbook R2 - A4 + tr1 + LE1 + tr2 + LE2s	1064	22.03	74.5	R
12020301	Handbook R2 - bag 1 (A4)	258	6.44	89.9	R
12020501	Handbook R2 - bag 2 (LE1)	258	5.55	77.5	R
12020701	Handbook R2 - bag 3 (LE2s)	528	9.64	65.7	R
12030200	Handbook R3 - LE2u + tr1 + LE3 + tr2 + LE5	1064	14.04	47.5	R
12030301	Handbook R3 - bag 1 (LE2u)	528	7.78	53.0	R
12030501	Handbook R3 - bag 2 (LE3)	258	3.77	52.6	R
12030701	Handbook R3 - bag 3 (LE5)	258	2.30	32.1	U
12040200	Handbook R4 - LE6 + tr1 + StGoHW + tr2 + StGoUrb	1334	6.10	16.5	U
12040301	Handbook R4 - bag 1 (LE6)	528	4.93	33.6	U
12040501	Handbook R4 - bag 2 (StGoHW)	258	0.51	7.1	U
12040701	Handbook R4 - bag 3 (StGoUrb)	528	0.61	4.1	U
12050101	Handbook provisory S1 - bag 1 (AE1)	809	26.70	118.8	M
12050201	Handbook provisory S1 - bag 2 (AE2)	819	24.83	109.1	M
12050301	Handbook provisory S1 - bag 3 (A3)	809	21.83	97.1	M
12060101	Handbook provisory S2 - bag 1 (A4)	801	19.58	88.0	R
12060201	Handbook provisory S2 - bag 2 (LE1)	818	17.30	76.2	R
12060301	Handbook provisory S2 - bag 3 (LE2s)	818	15.51	68.3	R
12070101	Handbook provisory S3 - bag 1 (LE2u)	773	11.35	52.9	R
12070201	Handbook provisory S3 - bag 2 (LE3)	818	12.17	53.6	R
12070301	Handbook provisory S3 - bag 3 (LE5)	846	6.98	29.7	U
12080101	Handbook provisory S4 - bag 1 (LE6)	804	7.54	33.7	U
12080201	Handbook provisory S4 - bag 2 (StGoHW)	819	1.69	7.4	U
12080301	Handbook provisory S1 - bag 3 (StGoUrb)	814	0.99	4.4	U
13020000	INRETS - route court (rural short), repeated 15 times	126	1.44	41.1	R
13020102	INRETS - route court (rural short) 1	126	1.44	41.1	R
13020202	INRETS - route court (rural short) 2	126	1.44	41.1	R
13020302	INRETS - route court (rural short) 3	126	1.44	41.1	R
13020402	INRETS - route court (rural short) 4	126	1.44	41.1	R
13020502	INRETS - route court (rural short) 5	126	1.44	41.1	R
13020602	INRETS - route court (rural short) 6	126	1.44	41.1	R
13020702	INRETS - route court (rural short) 7	126	1.44	41.1	R
13020802	INRETS - route court (rural short) 8	126	1.44	41.1	R
13020902	INRETS - route court (rural short) 9	126	1.44	41.1	R
13021002	INRETS - route court (rural short) 10	126	1.44	41.1	R
13021102	INRETS - route court (rural short) 11	126	1.44	41.1	R
13021202	INRETS - route court (rural short) 12	126	1.44	41.1	R
13021302	INRETS - route court (rural short) 13	126	1.44	41.1	R
13021402	INRETS - route court (rural short) 14	126	1.44	41.1	R
13021502	INRETS - route court (rural short) 15	126	1.44	41.1	R
13030101	INRETS - route court (rural short), bag 1 (repetitions 1 to 5)	126	1.44	41.1	R
13030201	INRETS - route court (rural short), bag 2 (repetitions 6 to 10)	126	1.44	41.1	R

13030301	INRETS - route court (rural short), bag 3 (repetitions 11 to 15)	126	1.44	41.1	R
13040000	INRETS - urbain fluide court (urban free-flow short) repeated 15 times	189	1.00	19.0	U
13040102	INRETS - urbain fluide court (urban free-flow short), repetition 1	189	1.00	19.0	U
13040202	INRETS - urbain fluide court (urban free-flow short), repetition 2	189	1.00	19.0	U
13040302	INRETS - urbain fluide court (urban free-flow short), repetition 3	189	1.00	19.0	U
13040402	INRETS - urbain fluide court (urban free-flow short), repetition 4	189	1.00	19.0	U
13040502	INRETS - urbain fluide court (urban free-flow short), repetition 5	189	1.00	19.0	U
13040602	INRETS - urbain fluide court (urban free-flow short), repetition 6	189	1.00	19.0	U
13040702	INRETS - urbain fluide court (urban free-flow short), repetition 7	189	1.00	19.0	U
13040802	INRETS - urbain fluide court (urban free-flow short), repetition 8	189	1.00	19.0	U
13040902	INRETS - urbain fluide court (urban free-flow short), repetition 9	189	1.00	19.0	U
13041002	INRETS - urbain fluide court (urban free-flow short), repetition 10	189	1.00	19.0	U
13041102	INRETS - urbain fluide court (urban free-flow short), repetition 11	189	1.00	19.0	U
13041202	INRETS - urbain fluide court (urban free-flow short), repetition 12	189	1.00	19.0	U
13041302	INRETS - urbain fluide court (urban free-flow short), repetition 13	189	1.00	19.0	U
13041402	INRETS - urbain fluide court (urban free-flow short), repetition 14	189	1.00	19.0	U
13041502	INRETS - urbain fluide court (urban free-flow short), repetition 15	189	1.00	19.0	U
13050101	INRETS - urbain fluide court (urban free-flow short), repetitions 1 to 5	189	1.00	19.0	U
13050201	INRETS - urbain fluide court (urban free-flow short), repetitions 6 to 10	189	1.00	19.0	U
13050301	INRETS - urbain fluide court (urban free-flow short), repetitions 11 to 15	189	1.00	19.0	U
13060000	INRETS - urbain fluide court (as IUFC15, but last 45s missing)	189	1.00	19.0	U
13070001	INRETS - urbain lent 2	814	1.67	7.4	U
13080001	INRETS - urbain route 2	809	9.27	41.3	U
13090001	INRETS - urbain fluide 2	1054	5.62	19.2	U
13150001	INRETS - motorway 1	734	15.13	74.2	M
13170102	INRETS - lent court (urban slow short), repetition 1	208	0.42	7.3	U
13170202	INRETS - lent court (urban slow short), repetition 2	208	0.42	7.3	U
13170302	INRETS - lent court (urban slow short), repetition 3	208	0.42	7.3	U
13170402	INRETS - lent court (urban slow short), repetition 4	208	0.42	7.3	U
13170502	INRETS - lent court (urban slow short), repetition 5	208	0.42	7.3	U
13170602	INRETS - lent court (urban slow short), repetition 6	208	0.42	7.3	U
13170702	INRETS - lent court (urban slow short), repetition 7	208	0.42	7.3	U
13170802	INRETS - lent court (urban slow short), repetition 8	208	0.42	7.3	U
13170902	INRETS - lent court (urban slow short), repetition 9	208	0.42	7.3	U
13171002	INRETS - lent court (urban slow short), repetition 10	208	0.42	7.3	U
13171102	INRETS - lent court (urban slow short), repetition 11	208	0.42	7.3	U
13171202	INRETS - lent court (urban slow short), repetition 12	208	0.42	7.3	U
13171302	INRETS - lent court (urban slow short), repetition 13	208	0.42	7.3	U
13171402	INRETS - lent court (urban slow short), repetition 14	208	0.42	7.3	U
13171502	INRETS - lent court (urban slow short), repetition 15	208	0.42	7.3	U
13180000	INRETS - lent court (urban slow short), repeated 15 times	208	0.42	7.3	U
13190101	INRETS - route court (rural short), bag 1 (repet. 1-3)	126	1.44	41.1	R
13190201	INRETS - route court (rural short), bag 2 (repet. 4 to 9)	126	1.44	41.1	R
13190301	INRETS - route court (rural short), bag 3 (repet. 10 to 15)	126	1.44	41.1	R
13200101	INRETS - urbain fluide court (urban free-flow short), bag 1 (repet. 1-2)	189	1.00	19.0	U
13200201	INRETS - urbain fluide court (urban free-flow short), bag 2 (repet. 3-9)	189	1.00	19.0	U
13200301	INRETS - urbain fluide court (urban free-flow short), bag 3 (repet. 10-15)	189	1.00	19.0	U
14010000	Legislative.NEDC ECE15+EUDC measured in one bag	1220	11.01	32.5	-
14010101	Legislative.ECE ECE15 (incl 40 s) (NEDC bag 1)	820	4.06	17.8	U
14010202	Legislative.ECE_1 ECE15 - urban sub-cycle 1 (40s idle)	235	1.02	15.6	U

14010302	Legislative.ECE_12 ECE15 - urban sub-cycles 1 & 2 (40s idle)	389	2.03	18.8	U
14010402	Legislative.ECE_23 ECE15 - urban sub-cycles 2 & 3	389	2.03	18.8	U
14010502	Legislative.ECE_34 ECE15 - urban sub-cycles 3 & 4	389	2.03	18.8	U
14010602	Legislative.ECE_4 ECE15 - urban sub-cycles 4	194	1.02	18.8	U
14010603	Legislative.ECE_1 no idle ECE15 - urban sub-cycles 1 (no idle)	195	1.02	18.7	U
14010604	Legislative.ECE_2 ECE15 - urban sub-cycles 2	195	1.02	18.7	U
14010605	Legislative.ECE_3 ECE15 - urban sub-cycles 3	195	1.02	18.7	U
14010701	Legislative.EUDC Extra-urban Driving Cycle (NEDC bag 2)	400	6.96	62.6	R
14020000	Legislative.NEDC_2000 ECE15(Euro-3)+EUDC measured in one bag	1180	11.01	33.6	-
14020101	Legislative.ECE_2000 ECE15 Euro-3 (without 40 s) (bag 1)	780	4.06	18.7	U
14030000	Legislative.US_FTP FTP75, bag 1+bag 2+bag 3	1375	11.99	31.4	U
14030101	Legislative.US_FTP1 FTP75, bag 1 (cold)	505	5.78	41.2	U
14030201	Legislative.US_FTP2 FTP75, bag 2	870	6.21	25.7	U
14030301	Legislative.US_FTP3 FTP75, bag 3 (=FTP75-1, warm)	505	5.78	41.2	U
14040001	Legislative.US_HWAY highway U.S. driving cycle	765	16.50	77.7	M
14040102	Legislative.US_HWAY255 highway U.S. driving cycle, s 1 to 255	255	4.83	68.2	R
14040202	Legislative.US_HWAY511 highway U.S. driving cycle, s 256 to 511	256	6.08	85.5	M
14040302	Legislative.US_HWAY765 highway U.S. driving cycle, s 512 to 765	254	5.64	79.9	M
14050001	Legislative.US06 US06 driving cycle	600	12.89	77.3	R
15010001	MODEM1+MODEM2+MODEM3+MODEM4	1217	5.81	17.2	U
15010102	MODEM.urban1	635	3.45	19.5	U
15010202	MODEM.urban2	168	0.88	18.8	U
15010302	MODEM.urban3	282	1.08	13.8	U
15010402	MODEM.urban4	132	0.41	11.1	U
15020001	MODEM5+MODEM6+MODEM7	1218	7.30	21.6	U
15020102	MODEM.urban5	1027	6.33	22.2	U
15020202	MODEM.urban6	91	0.13	5.2	U
15020302	MODEM.urban7	100	0.84	30.2	U
15030001	MODEM8+MODEM9+MODEM10	775	3.18	14.8	U
15030102	MODEM.urban8	250	1.11	15.9	U
15030202	MODEM.urban9	95	0.20	7.6	U
15030302	MODEM.urban10	430	1.87	15.6	U
15040001	MODEM11	962	11.35	42.5	U
15040102	MODEM.urban11	962	11.35	42.5	U
15050001	MODEM12	423	2.44	20.8	U
15050102	MODEM.urban12	423	2.44	20.8	U
15060001	MODEM13+MODEM14	909	6.03	23.9	U
15060102	MODEM.urban13	526	2.62	17.9	U
15060202	MODEM.urban14	383	3.41	32.1	U
15070001	MODEM.urban5713 MODEM - urb5b + 2urb7 + urb13b parts	1426	9.08	22.9	U
15070102	MODEM.urban5b MODEM - part urban 5b	700	4.78	24.6	U
15070202	MODEM.urban2x7 MODEM - part urban 7, twice	199	1.68	30.4	U
15070302	MODEM.urban13b MODEM - part urban 13b	525	2.62	18.0	U
16010001	MODEM Hyzem urban	560	3.47	22.3	U
16020000	MODEM Hyzem - road, pre + main part	843	11.22	47.9	R
16020199	MODEM Hyzem - road, pre part	100	0.54	19.6	U
16020201	MODEM Hyzem - road, main part	742	10.68	51.8	R
16030201	MODEM Hyzem - motorway	1494	42.90	103.4	M
16030202	MODEM Hyzem - motorway _ part 1	907	26.98	107.1	M
16040001	MODEM Hyzem - urban1	720	4.19	20.9	U

16050001	MODEM Hyzem - urban3	583	2.91	18.0	U
16060201	MODEM Hyzem - road1, main parts	583	6.96	43.0	R
16070201	MODEM Hyzem - road2, main parts	1090	23.11	76.3	R
16080201	MODEM Hyzem - motorway1, Main part	1280	36.94	103.9	M
16090001	2 * MODEM Hyzem - urban	560	3.47	22.3	U
17010001	MODEM motorway	452	12.68	101.0	M
17020001	MODEM Road	712	8.49	42.9	R
17030001	MODEM urban Free Flow	355	2.25	22.8	U
17040001	MODEM urban Slow	428	1.71	14.3	U
17050001	MODEM short	255	2.25	31.7	U
18010001	MTC - Essingeleden, congested	1049	1.43	4.9	U
18020001	MTC - Essingeleden, free-flow	506	9.61	68.4	U
19010001	Napoli.6_17 Napoli - C3 urban few disturb. + CH extra-urban few disturb.	1038	16.47	57.1	U
19010102	Napoli.6 Napoli - C3 urban few disturbance	446	7.16	57.8	U
19010202	Napoli.17 Napoli - CH extra-urban few disturbance	591	9.31	56.7	R
19020001	Napoli.10_23 Napoli - C5 urban strong disturb. + CA urban cong. stop&go	1081	3.36	11.2	U
19020102	Napoli.10 Napoli - C5 urban strong disturbance	526	2.90	19.8	U
19020202	Napoli.23 Napoli - CA urban congested stop & go	554	0.47	3.0	U
19030001	Napoli.15_18_21 Napoli -C3 urb.+CB urb.stop & go+CE urb. strong disturb.	1070	4.47	15.0	U
19030102	Napoli.15 Napoli - C3 urban	178	1.23	24.9	U
19030202	Napoli.18 Napoli - CB urban stop & go	371	0.35	3.4	U
19030302	Napoli.21 Napoli - CE urban strong disturbance	519	2.89	20.1	U
20010001	Particulates.50, constant-speed cycle - 50 km/h			50.0	R
20030001	Particulates.50-HL, constant speed cycle - 50 km/h with high load			50.0	R
20040001	Particulates.90, constant speed cycle - 90 km/h			90.0	M
20090001	Particulates.120, constant speed cycle - 120 km/h			120.0	M
21010001	LDV_PVU.2.5 tonnes, vans-loaded.urban1	548	2.58	16.9	U
21020001	LDV_PVU.2.5 tonnes, vans-loaded.urban2	817	5.73	25.3	U
21030001	LDV_PVU.2.5 tonnes, vans-Empty.urban1	546	2.58	17.0	U
21040001	LDV_PVU.2.5 tonnes, vans-Empty.urban2	640	4.75	26.7	U
21050201	LDV_PVU.2.5 tonnes, vans-loaded.rural	612	10.11	59.5	R
21060201	LDV_PVU.2.5 tonnes, vans-Empty.rural	486	7.88	58.3	R
21070201	LDV_PVU.2.5 tonnes, vans-loaded.motorway	955	25.26	95.2	M
21080201	LDV_PVU.2.5 tonnes, vans-Empty.motorway	754	20.52	98.0	M
21090102	LDV_PVU.2.5 tonnes, vans.delivery1	109	0.40	13.3	U
21090202	LDV_PVU.2.5 tonnes, vans.delivery2	218	0.85	14.0	U
21090302	LDV_PVU.2.5 tonnes, vans.delivery3	304	1.17	13.9	U
21100001	LDV_PVU.3.5 tonnes, vans.free-flow_urban	467	2.89	22.3	U
21110001	LDV_PVU.3.5 tonnes, vans-load10%.slow_urban	649	2.19	12.2	U
21120201	LDV_PVU.3.5 tonnes, vans-load10%.rural	544	9.65	63.9	R
21130201	LDV_PVU.3.5 tonnes, vans-load10%.motorway	1225	30.74	90.3	M
21130302	LDV_PVU.3.5 tonnes, vans-load10%.motorway_part1	585	14.28	87.9	M
21130402	LDV_PVU.3.5 tonnes, vans-load10%.motorway_part2	639	16.46	92.7	M
21140001	LDV_PVU.3.5 tonnes, vans.delivery	546	1.59	10.5	U
21140302	LDV_PVU.3.5 tonnes, vans.delivery3	246	0.61	9.0	U
21150001	LDV_PVU commercial cars urban_1	583	3.32	20.5	U
21160001	LDV_PVU commercial cars urban_2	476	3.72	28.2	U
21170001	LDV_PVU commercial cars urban_3	502	2.48	17.8	U
21180000	LDV_PVU commercial cars road_total	917	14.08	55.3	R
21180199	LDV_PVU commercial cars road_pre	917	14.08	55.3	R

21180201	LDV_PVU commercial cars road PVU commerciale, main part	810	13.51	60.1	R
21180399	LDV_PVU commercial cars road, post part	106	0.57	19.4	U
21210001	LDV_PVU light vans, loaded urban1	832	3.24	14.0	U
21220001	LDV_PVU light vans, empty urban1	680	2.30	12.2	U
21230001	LDV_PVU light vans, loaded urban2	516	2.92	20.3	U
21240001	LDV_PVU light vans, empty urban2	526	2.92	20.0	U
21250001	LDV_PVU light vans, loaded road	482	5.81	43.4	R
21260001	LDV_PVU light vans, empty road	483	5.02	37.4	U
21270201	LDV_PVU light vans, loaded motorway	662	15.38	83.7	M
21280201	LDV_PVU light vans, empty motorway	622	15.54	90.0	R
21290001	LDV_PVU.3.5 tonne vans load 50% slow urban	649	2.19	12.2	U
21300201	LDV_PVU.3.5 tonne vans load 50% rural, main part	544	9.65	63.9	R
21310201	LDV_PVU.3.5 tonne vans load 50% motorway, main part	1225	30.74	90.3	M
22010102	TRRL 1.1 = TRRL 2.4	580	4.46	27.7	U
22010202	TRRL 1.2	551	11.66	76.2	R
22010302	TRRL 1.3	566	12.02	76.4	R
22020102	TRRL 1.4 = TRRL 2.1	573	6.21	39.0	U
22020202	TRRL 2.2	532.1	13.73	92.9	M
22020302	TRRL 2.3	505	13.05	93.0	M
22030001	WSL urban	1207	6.15	18.3	U
22040001	WSL Suburban & rural	1079	16.45	54.9	R
22040102	WSL Suburban	481	5.51	41.3	U
22040202	WSL rural	588	10.93	66.9	R
22050001	WSL combined motorway 90 and 113	586	16.64	102.2	M
22050102	WSL motorway 90	307	7.99	93.7	M
22050202	WSL motorway 113	256	8.00	112.5	M
22050203	WSL motorway 90 (x2)	616	15.99	93.4	M
22050204	WSL motorway 113 (x2)	514	16.01	112.1	M
22060001	WSL congested traffic	1029	1.92	6.7	U
22070101	TRL motorway M25 high-speed	3500	98.58	101.4	M
24010201	ARTEMIS urban modified : const. engine speed gearshift	921	4.47	17.5	U
24010302	ARTEMIS urban_1 modified : const. eng. spd. gearshift	236	1.02	15.5	U
24010402	ARTEMIS urban_2 modified : const. eng. spd. gearshift	198	1.75	31.8	U
24010502	ARTEMIS urban_3 modified : const. eng. spd. gearshift	243	0.59	8.7	U
24010602	ARTEMIS urban_4 modified : const. eng. spd. gearshift	128	0.42	11.8	U
24010702	ARTEMIS urban_5 modified : const. eng. spd. gearshift	116	0.70	21.7	U
24020201	ARTEMIS rural modified : const. eng. spd. gearshift	862	14.72	61.5	R
24020302	ARTEMIS rural_1 modified : const. eng. spd. gearshift	240	3.33	49.9	R
24020402	ARTEMIS rural_2 modified : const. eng. spd. gearshift	171	3.15	66.2	R
24020502	ARTEMIS rural_3 modified : const. eng. spd. gearshift	183	2.20	43.4	R
24020602	ARTEMIS rural_4 modified : const. eng. spd. gearshift	177	3.88	78.9	R
24020702	ARTEMIS rural_5 modified : const. eng. spd. gearshift	91	2.24	88.6	R
24030201	ARTEMIS urban modified : const. speed gearshift	921	4.47	17.5	U
24030302	ARTEMIS urban_1 modified : const. speed gearshift	236	1.02	15.5	U
24030402	ARTEMIS urban_2 modified : const. speed gearshift	198	1.75	31.8	U
24030502	ARTEMIS urban_3 modified : const. speed gearshift	243	0.59	8.7	U
24030602	ARTEMIS urban_4 modified : const. speed gearshift	128	0.42	11.8	U
24030702	ARTEMIS urban_5 modified : const. speed gearshift	116	0.70	21.7	U
24040201	ARTEMIS rural modified : const. speed gearshift	862	14.72	61.5	R
24040302	ARTEMIS rural_1 modified : const. speed gearshift	240	3.33	49.9	R

24040402	ARTEMIS rural_2 modified : const. speed gearshift	171	3.15	66.2	R
24040502	ARTEMIS rural_3 modified : const. speed gearshift	183	2.20	43.4	R
24040602	ARTEMIS rural_4 modified : const. speed gearshift	177	3.88	78.9	R
24040702	ARTEMIS rural_5 modified : const. speed gearshift	91	2.24	88.6	R
24050201	ARTEMIS urban modified : free gearshift	921	4.47	17.5	U
24050302	ARTEMIS urban_1 modified for : free gearshift	236	1.02	15.5	U
24050402	ARTEMIS urban_2 modified for : free gearshift	198	1.75	31.8	U
24050502	ARTEMIS urban_3 modified for : free gearshift	243	0.59	8.7	U
24050602	ARTEMIS urban_4 modified for : free gearshift	128	0.42	11.8	U
24050702	ARTEMIS urban_5 modified for : free gearshift	116	0.70	21.7	U
24060201	ARTEMIS rural modified : free gearshift	862	14.72	61.5	R
24060302	ARTEMIS rural_1 modified for : free gearshift	240	3.33	49.9	R
24060402	ARTEMIS rural_2 modified for : free gearshift	171	3.15	66.2	R
24060502	ARTEMIS rural_3 modified for : free gearshift	183	2.20	43.4	R
24060602	ARTEMIS rural_4 modified for : free gearshift	177	3.88	78.9	R
24060702	ARTEMIS rural_5 modified for : free gearshift	91	2.24	88.6	R
24070201	ARTEMIS urban modified : recorded values of gearshift	921	4.47	17.5	U
24070302	ARTEMIS urban_1 modified for : recorded values of gearshift	236	1.02	15.5	U
24070402	ARTEMIS urban_2 modified for : recorded values of gearshift	198	1.75	31.8	U
24070502	ARTEMIS urban_3 modified for : recorded values of gearshift	243	0.59	8.7	U
24070602	ARTEMIS urban_4 modified for : recorded values of gearshift	128	0.42	11.8	U
24070702	ARTEMIS urban_5 modified for : recorded values of gearshift	116	0.70	21.7	U
24080201	ARTEMIS rural modified : recorded values of gearshift	862	14.72	61.5	R
24080302	ARTEMIS rural_1 modified for : recorded values of gearshift	240	3.33	49.9	R
24080402	ARTEMIS rural_2 modified for : recorded values of gearshift	171	3.15	66.2	R
24080502	ARTEMIS rural_3 modified for : recorded values of gearshift	183	2.20	43.4	R
24080602	ARTEMIS rural_4 modified for : recorded values of gearshift	177	3.88	78.9	R
24080702	ARTEMIS rural_5 modified for : recorded values of gearshift	91	2.24	88.6	R
24090201	ARTEMIS.HighMot_urban modified, constant eng.spd. gearshift	918	4.92	19.3	U
24090302	ARTEMIS.HighMot_urban_1 modified, constant eng.spd. gearshift	224	1.11	17.8	U
24090402	ARTEMIS.HighMot_urban_2 modified, constant eng.spd. gearshift	244	2.01	29.6	U
24090502	ARTEMIS.HighMot_urban_3 modified, constant eng.spd. gearshift	225	0.71	11.4	U
24090602	ARTEMIS.HighMot_urban_4 modified, constant eng.spd. gearshift	111	0.38	12.2	U
24090702	ARTEMIS.HighMot_urban_5 modified, constant eng.spd. gearshift	114	0.72	22.6	U
24100201	ARTEMIS.HighMot_rural modified, constant eng.spd. gearshift	844	14.22	60.7	R
24100302	ARTEMIS.HighMot_rural_1 modified, constant eng.spd. gearshift	255	3.46	48.9	R
24100402	ARTEMIS.HighMot_rural_2 modified, constant eng.spd. gearshift	131	2.43	66.8	R
24100502	ARTEMIS.HighMot_rural_3 modified, constant eng.spd. gearshift	201	2.47	44.2	R
24100602	ARTEMIS.HighMot_rural_4 modified, constant eng.spd. gearshift	181	4.02	79.9	R
24100702	ARTEMIS.HighMot_rural_5 modified, constant eng.spd. gearshift	76	1.92	91.0	R
24110201	ARTEMIS.HighMot_motorway modified, constant eng.spd. gearshift	750	25.41	122.0	M
24110302	ARTEMIS.HighMot_motorway_1 modified, constant eng.spd. gearshift	271	9.55	126.8	M
24110402	ARTEMIS.HighMot_motorway_2 modified, constant eng.spd. gearshift	184	5.26	103.0	M
24110502	ARTEMIS.HighMot_motorway_3 modified, constant eng.spd. gearshift	179	6.27	126.1	M
24110602	ARTEMIS.HighMot_motorway_4 modified, constant eng.spd. gearshift	116	4.43	137.6	M
24120201	ARTEMIS.LowMot_urban modified, constant eng.spd. gearshift	945	4.80	18.3	U
24120302	ARTEMIS.LowMot_urban_1 modified, constant eng.spd. gearshift	234	1.07	16.5	U
24120402	ARTEMIS.LowMot_urban_2 modified, constant eng.spd. gearshift	216	1.85	30.9	U
24120502	ARTEMIS.LowMot_urban_3 modified, constant eng.spd. gearshift	235	0.65	10.0	U
24120602	ARTEMIS.LowMot_urban_4 modified, constant eng.spd. gearshift	122	0.32	9.4	U

24120702	ARTEMIS.LowMot_urban_5 modified, constant eng.spd. gearshift	138	0.90	23.6	U
24130201	ARTEMIS.LowMot_rural modified, constant eng.spd. gearshift	821	13.15	57.7	R
24130302	ARTEMIS.LowMot_rural_1 modified, constant eng.spd. gearshift	243	3.24	48.0	R
24130402	ARTEMIS.LowMot_rural_2 modified, constant eng.spd. gearshift	125	2.28	65.7	R
24130502	ARTEMIS.LowMot_rural_3 modified, constant eng.spd. gearshift	236	2.67	40.7	U
24130602	ARTEMIS.LowMot_rural_4 modified, constant eng.spd. gearshift	136	3.02	80.0	R
24130702	ARTEMIS.LowMot_rural_5 modified, constant eng.spd. gearshift	81	2.01	89.2	R
24140201	ARTEMIS.LowMot_motorway modified : const. eng. speed gearshift	729	24.12	119.1	M
24140302	ARTEMIS.LowMot_motorway_1 modified : const. eng. speed gearshift	272	9.21	121.9	M
24140402	ARTEMIS.LowMot_motorway_2 modified : const. eng. speed gearshift	181	5.22	103.9	M
24140502	ARTEMIS.LowMot_motorway_3 modified : const. eng. speed gearshift	181	6.27	124.7	M
24140602	ARTEMIS.LowMot_motorway_4 modified : const. eng. speed gearshift	95	3.52	133.2	M
24160201	ARTEMIS.HighMot_urban modified: const. speed gearshift	918	4.92	19.3	U
24160302	ARTEMIS.HighMot_urban_1 modified: const. speed gearshift	224	1.11	17.8	U
24160402	ARTEMIS.HighMot_urban_2 modified: const. speed gearshift	244	2.01	29.6	U
24160502	ARTEMIS.HighMot_urban_3 modified: const. speed gearshift	225	0.71	11.4	U
24160602	ARTEMIS.HighMot_urban_4 modified: const. speed gearshift	111	0.38	12.2	U
24160702	ARTEMIS.HighMot_urban_5 modified: const. speed gearshift	114	0.72	22.6	U
24170201	ARTEMIS.HighMot_rural modified: const. speed gearshift	844	14.22	60.7	R
24170302	ARTEMIS.HighMot_rural_1 modified: const. speed gearshift	255	3.46	48.9	R
24170402	ARTEMIS.HighMot_rural_2 modified: const. speed gearshift	131	2.43	66.8	R
24170502	ARTEMIS.HighMot_rural_3 modified: const. speed gearshift	201	2.47	44.2	R
24170602	ARTEMIS.HighMot_rural_4 modified: const. speed gearshift	181	4.02	79.9	R
24170702	ARTEMIS.HighMot_rural_5 modified: const. speed gearshift	76	1.92	91.0	R
24180201	ARTEMIS.HighMot_motorway modified: const. speed gearshift	750	25.41	122.0	M
24180302	ARTEMIS.HighMot_motorway_1 modified: const. speed gearshift	271	9.55	126.8	M
24180402	ARTEMIS.HighMot_motorway_2 modified: const. speed gearshift	184	5.26	103.0	M
24180502	ARTEMIS.HighMot_motorway_3 modified: const. speed gearshift	179	6.27	126.1	M
24180602	ARTEMIS.HighMot_motorway_4 modified: const. speed gearshift	116	4.43	137.6	M
24190201	ARTEMIS.LowMot_urban modified: const. speed gearshift	945	4.80	18.3	U
24190302	ARTEMIS.LowMot_urban_1 modified: const. speed gearshift	234	1.07	16.5	U
24190402	ARTEMIS.LowMot_urban_2 modified: const. speed gearshift	216	1.85	30.9	U
24190502	ARTEMIS.LowMot_urban_3 modified: const. speed gearshift	235	0.65	10.0	U
24190602	ARTEMIS.LowMot_urban_4 modified: const. speed gearshift	122	0.32	9.4	U
24190702	ARTEMIS.LowMot_urban_5 modified: const. speed gearshift	138	0.90	23.6	U
24200201	ARTEMIS.LowMot_rural modified: const. speed gearshift	821	13.15	57.7	R
24200302	ARTEMIS.LowMot_rural_1 modified : const. speed gearshift	243	3.24	48.0	R
24200402	ARTEMIS.LowMot_rural_2 modified : const. speed gearshift	125	2.28	65.7	R
24200502	ARTEMIS.LowMot_rural_3 modified : const. speed gearshift	236	2.67	40.7	U
24200602	ARTEMIS.LowMot_rural_4 modified : const. speed gearshift	136	3.02	80.0	R
24200702	ARTEMIS.LowMot_rural_5 modified : const. speed gearshift	81	2.01	89.2	R
24210201	ARTEMIS.LowMot_motorway modified: const. speed gearshift	729	24.12	119.1	M
24210302	ARTEMIS.LowMot_motorway_1 modified : const. speed gearshift	272	9.21	121.9	M
24210402	ARTEMIS.LowMot_motorway_2 modified : const. speed gearshift	181	5.22	103.9	M
24210502	ARTEMIS.LowMot_motorway_3 modified : const. speed gearshift	181	6.27	124.7	M
24210602	ARTEMIS.LowMot_motorway_4 modified : const. speed gearshift	95	3.52	133.2	M
24230201	ARTEMIS.HighMot_urban modified : free gearshift	918	4.92	19.3	U
24230302	ARTEMIS.HighMot_urban_1 modified : free gearshift	224	1.11	17.8	U
24230402	ARTEMIS.HighMot_urban_2 modified : free gearshift	244	2.01	29.6	U
24230502	ARTEMIS.HighMot_urban_3 modified : free gearshift	225	0.71	11.4	U

24230602	ARTEMIS.HighMot_urban_4 modified : free gearshift	111	0.38	12.2	U
24230702	ARTEMIS.HighMot_urban_5 modified : free gearshift	114	0.72	22.6	U
24240201	ARTEMIS.HighMot_rural modified : free gearshift	844	14.22	60.7	R
24240302	ARTEMIS.HighMot_rural_1 modified : free gearshift	255	3.46	48.9	R
24240402	ARTEMIS.HighMot_rural_2 modified : free gearshift	131	2.43	66.8	R
24240502	ARTEMIS.HighMot_rural_3 modified : free gearshift	201	2.47	44.2	R
24240602	ARTEMIS.HighMot_rural_4 modified : free gearshift	181	4.02	79.9	R
24240702	ARTEMIS.HighMot_rural_5 modified : free gearshift	76	1.92	91.0	R
24250201	ARTEMIS.HighMot_motorway modified : free gearshift	750	25.41	122.0	M
24250302	ARTEMIS.HighMot_motorway_1 modified : free gearshift	271	9.55	126.8	M
24250402	ARTEMIS.HighMot_motorway_2 modified : free gearshift	184	5.26	103.0	M
24250502	ARTEMIS.HighMot_motorway_3 modified : free gearshift	179	6.27	126.1	M
24250602	ARTEMIS.HighMot_motorway_4 modified : free gearshift	116	4.43	137.6	M
24260201	ARTEMIS.LowMot_urban modified : free gearshift	945	4.80	18.3	U
24260302	ARTEMIS.LowMot_urban_1 modified : free gearshift	234	1.07	16.5	U
24260402	ARTEMIS.LowMot_urban_2 modified : free gearshift	216	1.85	30.9	U
24260502	ARTEMIS.LowMot_urban_3 modified : free gearshift	235	0.65	10.0	U
24260602	ARTEMIS.LowMot_urban_4 modified : free gearshift	122	0.32	9.4	U
24260702	ARTEMIS.LowMot_urban_5 modified : free gearshift	138	0.90	23.6	U
24270201	ARTEMIS.LowMot_rural modified : free gearshift	821	13.15	57.7	R
24270302	ARTEMIS.LowMot_rural_1 modified : free gearshift	243	3.24	48.0	R
24270402	ARTEMIS.LowMot_rural_2 modified : free gearshift	125	2.28	65.7	R
24270502	ARTEMIS.LowMot_rural_3 modified : free gearshift	236	2.67	40.7	U
24270602	ARTEMIS.LowMot_rural_4 modified : free gearshift	136	3.02	80.0	R
24270702	ARTEMIS.LowMot_rural_5 modified : free gearshift	81	2.01	89.2	R
24280201	ARTEMIS.LowMot_motorway modified : free gearshift	729	24.12	119.1	M
24280302	ARTEMIS.LowMot_motorway_1 modified : free gearshift	272	9.21	121.9	M
24280402	ARTEMIS.LowMot_motorway_2 modified : free gearshift	181	5.22	103.9	M
24280502	ARTEMIS.LowMot_motorway_3 modified : free gearshift	181	6.27	124.7	M
24280602	ARTEMIS.LowMot_motorway_4 modified : free gearshift	95	3.52	133.2	M
25100201	ARTEMIS.rural modified for road gradient and vehicle load	862	14.72	61.5	R
25100302	ARTEMIS.rural_1 modified : Road gradient and vehicle load	240	3.33	49.9	R
25100402	ARTEMIS.rural_2 modified : Road gradient and vehicle load	171	3.15	66.2	R
25100502	ARTEMIS.rural_3 modified : Road gradient and vehicle load	183	2.20	43.4	R
25100602	ARTEMIS.rural_4 modified : Road gradient and vehicle load	177	3.88	78.9	R
25100702	ARTEMIS.rural_5 modified : Road gradient and vehicle load	91	2.24	88.6	R
25110000	ARTEMIS.rural_incl_pre_post_5% modified for road gradient	1082	17.27	57.5	R
25110199	ARTEMIS.rural_pre_5% modified for road gradient	101	0.83	29.6	R
25110302	ARTEMIS.rural_1_5% modified : Road gradient	240	3.33	49.9	R
25110402	ARTEMIS.rural_2_5% modified : Road gradient	171	3.15	66.2	R
25110502	ARTEMIS.rural_3_5% modified : Road gradient	183	2.20	43.4	R
25110602	ARTEMIS.rural_4_5% modified : Road gradient	177	3.88	78.9	R
25110702	ARTEMIS.rural_5_5% modified : Road gradient	91	2.24	88.6	R
25110899	ARTEMIS.rural_post_5% modified for road gradient	119	1.74	52.6	R
25120000	ARTEMIS.rural_incl_pre_post_gvwr modified for vehicle load	1082	17.27	57.5	R
25120199	ARTEMIS.rural_pre_gvwr modified : vehicle load	101	0.83	29.6	U
25120302	ARTEMIS.rural_1_gvwr modified : vehicle load	240	3.33	49.9	R
25120402	ARTEMIS.rural_2_gvwr modified : vehicle load	171	3.15	66.2	R
25120502	ARTEMIS.rural_3_gvwr modified : vehicle load	183	2.20	43.4	R
25120602	ARTEMIS.rural_4_gvwr modified : vehicle load	177	3.88	78.9	R

25120702	ARTEMIS.rural_5_gvwr modified : vehicle load	91	2.24	88.6	R
25120899	ARTEMIS.rural_post_gvwr modified for vehicle load	119	1.74	52.6	R
25130201	ARTEMIS.rural_gvwr_0% modified for road gradient and vehicle load	862	14.72	61.5	R
25130302	ARTEMIS.rural_1_gvwr_0% modified : road grad. and vehicle load	240	3.33	49.9	R
25130402	ARTEMIS.rural_2_gvwr_0% modified : road grad. and vehicle load	171	3.15	66.2	R
25130502	ARTEMIS.rural_3_gvwr_0% modified : road grad. and vehicle load	183	2.20	43.4	R
25130602	ARTEMIS.rural_4_gvwr_0% modified : road grad. and vehicle load	177	3.88	78.9	R
25130702	ARTEMIS.rural_5_gvwr_0% modified : road grad. and vehicle load	91	2.24	88.6	R
25140201	ARTEMIS.rural_gvwr_5% modified: road grad. and vehicle load	862	14.72	61.5	R
25140302	ARTEMIS.rural_1_gvwr_5% modified : road grad. and vehicle load	240	3.33	49.9	R
25140402	ARTEMIS.rural_2_gvwr_5% modified : road grad. and vehicle load	171	3.15	66.2	R
25140502	ARTEMIS.rural_3_gvwr_5% modified : road grad. and vehicle load	183	2.20	43.4	R
25140602	ARTEMIS.rural_4_gvwr_5% modified : road grad. and vehicle load	177	3.88	78.9	R
25140702	ARTEMIS.rural_5_gvwr_5% modified : road grad. and vehicle load	91	2.24	88.6	R
25150001	TUG.Ries_road_gradient_-10% modified for : gradient = -10%	510	6.84	48.3	R
25160001	TUG.Ries_road_gradient_-5% modified for : gradient = -5%	510	6.84	48.3	R
25170001	TUG.Ries_road_gradient_-2% modified for : gradient = -2%	510	6.84	48.3	R
25180001	TUG.Ries_road_gradient_0% TUG.road_gradient	510	6.84	48.3	R
25190001	TUG.Ries_road_gradient_2% modified for : gradient = 2%	510	6.84	48.3	R
25200001	TUG.Ries_road_gradient_5% modified for : gradient = 5%	510	6.84	48.3	R
25210001	TUG.Ries_road_gradient_10% modified for : gradient = 10%	510	6.84	48.3	R
25220001	TUG.Ries_road_gradient_15% modified for : gradient = 15%	510	6.84	48.3	R
26010000	ARTEMIS.urban_incl_start modified for : A/C in use	993	4.87	17.7	U
26010198	ARTEMIS.urban_start modified for : A/C in use	72	0.40	19.9	U
26010201	ARTEMIS.urban modified : A/C in use	921	4.47	17.5	U
26010302	ARTEMIS.urban_1 modified : A/C in use	236	1.02	15.5	U
26010402	ARTEMIS.urban_2 modified : A/C in use	198	1.75	31.8	U
26010502	ARTEMIS.urban_3 modified : A/C in use	243	0.59	8.7	U
26010602	ARTEMIS.urban_4 modified : A/C in use	128	0.42	11.8	U
26010702	ARTEMIS.urban_5 modified : A/C in use	116	0.70	21.7	U
26020201	ARTEMIS.rural modified : A/C in use	862	14.72	61.5	R
26020302	ARTEMIS.rural_1 modified : A/C in use	240	3.33	49.9	R
26020402	ARTEMIS.rural_2 modified : A/C in use	171	3.15	66.2	R
26020502	ARTEMIS.rural_3 modified : A/C in use	183	2.20	43.4	R
26020602	ARTEMIS.rural_4 modified : A/C in use	177	3.88	78.9	R
26020702	ARTEMIS.rural_5 modified : A/C in use	91	2.24	88.6	R
26030201	ARTEMIS.motorway_130 modified : A/C in use	736	24.63	120.5	M
26030302	ARTEMIS.motorway_150_1 modified : A/C in use	272	9.28	122.9	M
26030402	ARTEMIS.motorway_150_2 modified : A/C in use	173	5.00	104.1	M
26030502	ARTEMIS.motorway_130_3 modified : A/C in use	1068	28.74	96.9	M
26030602	ARTEMIS.motorway_130_4 modified : A/C in use	736	23.82	116.5	M
26040102	ECE_2000, modified for ARTEMIS : A/C in use	780	4.06	18.7	U
26040202	EUDC, modified for ARTEMIS : A/C in use	400	6.96	62.6	R
27010001	OSCAR.C speed (km/h): 30-45; traffic density: 0-35; average dyn	401	3.97	35.7	U
27020001	OSCAR.D1 speed (km/h): 15-30; traffic density: 0-40; low dyn	429	2.69	22.6	U
27030001	OSCAR.D2 speed (km/h): 15-30; traffic density: 0-40; average dyn	363	2.33	23.1	U
27040001	OSCAR.E speed (km/h): 15-30; traffic density: 40-70; average dyn	371	2.05	19.9	U
27050001	OSCAR.F speed (km/h): 5-15; traffic density: 15-40; average dyn	423	1.60	13.6	U
27060001	OSCAR.G1 speed (km/h): 5-15; traffic density: 40-70; average dyn	455	1.55	12.3	U
27070001	OSCAR.G2 speed (km/h): 5-15; traffic density: 40-70; high dyn	350	1.12	11.6	U

27080001	OSCAR.H1 speed (km/h): 5-15; traffic density: 100-125; low dyn	370	0.80	7.8	U
27090001	OSCAR.H2 speed (km/h): 5-15; traffic density: 100-125; average dyn	424	0.95	8.0	U
27100001	OSCAR.H3 speed (km/h): 5-15; traffic density: 100-125; high dyn	374	0.85	8.2	U
27110001	OSCAR idle cycle	0	0.00	0.0	U
28010001	TUV-A	200	1.97	35.5	U
30000000	140 km/h steady speed			140	M
40000000	TRL - traffic Calming 1 - After	903	8.77	34.97	U
40000001	TRL - traffic Calming 1 - Before	1204	16.96	50.71	U
40000002	TRL - traffic Calming 2 - After	632	4.68	26.65	U
40000003	TRL - traffic Calming 2 - Before	434	5.29	43.91	U
40000004	TRL - traffic Calming 3 - After	678	5.75	30.53	U
40000005	TRL - traffic Calming 3 - Before	547	6.45	42.46	U
40000006	TRL - traffic Calming 4 - After	454	4.59	36.39	U
40000007	TRL - traffic Calming 4 - Before	422	5.40	46.05	U
40000008	TRL - traffic Calming 5 - After	587	4.17	25.56	U
40000009	TRL - traffic Calming 5 - Before	465	5.31	41.08	U
40000010	TRL - traffic Calming 6 - After	480	5.43	40.73	U
40000011	TRL - traffic Calming 6 - Before	429	6.63	55.61	U
40000012	TRL - traffic Calming 7 - After	679	6.49	34.43	U
40000013	TRL - traffic Calming 7 - Before	401	4.86	43.64	U
40000014	TRL - traffic Calming 8 - After	316	2.57	29.27	U
40000015	TRL - traffic Calming 8 - Before	401	4.86	43.64	U
40000016	TRL - traffic Calming 9 - After	464	4.35	33.77	U
40000017	TRL - traffic Calming 9 - Before	331	4.62	50.2	U
50000000	IM240	240	3.16	47.4	R
60000000	CGV			64	R
70000000	FIGE urban	600	3.87	23.30	U
70000001	FIGE Suburban	600	11.56	69.30	R
70000002	FIGE motorway	600	14.06	84.40	M
70000003	FIGE Total	1800	29.49	58.99	-
80000000	Millbrook Heathrow Taxi Cycle - Total	1656	24.82	53.95	-
80000001	Millbrook Heathrow Taxi Cycle - urban	774	9.62	44.77	U
80000002	Millbrook Heathrow Taxi Cycle - City	759	2.88	13.66	U
80000003	Millbrook Heathrow Taxi Cycle - Heathrow	897	21.94	88.03	-

Appendix C: Measurements of unregulated pollutants

Table C1: Number of hydrocarbon measurements by LDV category and pollutant (part 1).

Pollutant	Car <2.5 tonnes																	N1(I)	N1(II)	N1(III)				Taxi	
	Petrol					Diesel					LPG		Hybrid	Ethanol				Diesel	Diesel	Diesel				Diesel	
	E0	E1	E2	E3	E4	E0	E1	E2	E3	E4	E2	E3	E4	E2	E3	E4	E2	E3	E0	E1	E2	E3	E2	E3
Methane	682	366	380	457	43	222	122	153	164		16			13	14	13			2	2	2		14	
Ethene	14	15	188	333	7	5	10	149	160		16								2	2	2		14	
Ethyne	71	37	174	262		1	36	121	157		16						1		2	2	4		14	
Ethane	14	25	217	365	5	5	8	154	162		16								2	2	2		14	
Propene	7	19	188	329	4	6	10	149	162		16								2	2	2		14	
Propane	14	22	26	64	9	5	10	32	5										2	2	2			
Propadiene	6	10	6	8															2	2	2			
2M-Propane	14	25	41	76		5	8	32	5										2	2	2			
2M-Propene	6	10	6	54	3		4												2	2	2			
1-Butene	6	18	15	31		6	8	24	3										2	2	2			
1,3-Butadiene	13	10	185	300	15		4	135	157	15	16	30	15	13	14	13	14	14	2	2	43	69	14	15
Butane	14	16	27	74			4	14	2										2	2	2			
t-2-Butene	6	14	14	26		6	4	24	3										2	2	2			
1-Butyne	6	6	6																2	2	2			
c-2-Butene	6	15	22	32		6	6	30	5										2	2	2			
3M-1-Butene	6	10	6	5			4												2	2	2			
2M-Butane	14	16	32	77				2	6										2	2	2			
1-Pentene	6	19	20	17		6	10	30	5										2	2	2			
2M-1-Butene	6	10	6	16															2	2	2			
Pentane	14	25	42	76		5	10	30	7										2	2	2			
2M-1,3-Butadiene	6	6	6																2	2	2			
t-2-Pentene	6	6	6	7															2	2	2			
3,3-DM-1-Butene	6	6	6																2	2	2			
c-2-Pentene	6	6	6	3															2	2	2			
2M-2-Butene	6	10	6	18			4												2	2	2			
Cyclopentadiene	6	6	6																2	2	2			
2,2-DM-Butane	6	17	20	42		4	7	21	4										2	2	2			
Cyclopentene	6	6	6																2	2	2			
2,3-DM-Butane	6	6	6																2	2	2			
2M-Pentane	14	16	15	50		2		1											2	2	2			
4M-t-2-Pentene	6	6	6	2															2	2	2			
3M-Pentane	14	17	14	44		1	4	4											2	2	2			
2M-1-Pentene	6	6	6	2															2	2	2			
1-Hexene	6	11	20	12		6	5	28	4										2	2	2			

Table C2: Number of hydrocarbon measurements by LDV category and pollutant (part 2).

Pollutant	Car <2.5 tonnes																	N1(I)	N1(II)	N1(III)			Taxi		
	Petrol					Diesel					LPG		Hybrid	Ethanol				Diesel	Diesel	Diesel			Diesel		
	E0	E1	E2	E3	E4	E0	E1	E2	E3	E4	E2	E3	E4	E2	E3	E4	E2	E3	E0	E1	E2	E3	E2	E3
Hexane	14	16	21	47				1	1										2	2	2			
c-3-Hexene	6	6	6																2	2	2			
t-2-Hexene	6	6	6																2	2	2			
3M-t-2-Pentene	6	6	6																2	2	2			
2M-2-Pentene	6	6	6	3															2	2	2			
c-2-Hexene	6	6	6																2	2	2			
3M-c-2-Pentene	6	6	6																2	2	2			
M-Cyclopentane	14	10	20	35				2											2	2	2			
2,4-DM-Pentane	6	6	6	20															2	2	2			
2,2,3-TM-Butane	6	6	6																2	2	2			
3,4-DM-1-Pentene	6	6	6																2	2	2			
Benzene	193	24	160	251	25	1	9	331	6	15	16	30	15	11	14	12	14	14	2	2	43	69	18	15
3,3-DM-Pentane	6	6	6																2	2	2			
Cyclohexane	6	10	12	21		4	4	6											2	2	2			
2M-Hexane	6	10	6				4												2	2	2			
2,3-DM-Pentane	6	6	6																2	2	2			
Cyclohexene	6	6	6																2	2	2			
3M-Hexane	6	10	6	35			4												2	2	2			
c-1,3-DM-CycPentane	6	6	6																2	2	2			
3E-Pentane	6	6	6																2	2	2			
2,2,4-TM-Pentane	14	12	24	40				2											2	2	2			
t-3-Heptene	6	6	6																2	2	2			
Heptane	14	15	24	44			4	5											2	2	2			
2M-2-Hexene	6	6	6																2	2	2			
t-2-Heptene	6	10	6																2	2	2			
3E-c-2-Pentene	6	6	6																2	2	2			
2,4,4-TM-1-Pentene	6	6	6																2	2	2			
c-2-Heptene	6	6	6																2	2	2			
M-Cyclohexane	6	6	6	19															2	2	2			
2,2-DM-Hexane	6	6	6	12															2	2	2			
2,4,4-TM-2-Pentene	6	6	6																2	2	2			
2,5-DM-Hexane	6	6	6	23															2	2	2			
2,4-DM-Hexane	6	6	6	23															2	2	2			
3,3-DM-Hexane	6	6	6																2	2	2			
2,3,4-TM-Pentane	6	6	6	14															2	2	2			

Table C3: Number of hydrocarbon measurements by LDV category and pollutant (part 3).

Pollutant	Car <2.5 tonnes																	N1(I)	N1(II)	N1(III)			Taxi	
	Petrol					Diesel					LPG		Hybrid		Ethanol			Diesel	Diesel	Diesel			Diesel	
	E0	E1	E2	E3	E4	E0	E1	E2	E3	E4	E2	E3	E4	E2	E3	E4	E2	E3	E0	E1	E2	E3	E2	E3
Toluene	193	24	162	233	25	5	12	288	9		16								2	2	2		18	
2,3-DM-Hexane	6	6	6	19															2	2	2			
2M-Heptane	6	10	6	23															2	2	2			
4M-Heptane	6	6	6	16															2	2	2			
3M-Heptane	6	10	6	24			4												2	2	2			
c-1,3-DM-CycHexane	6	6	6																2	2	2			
c-1,4-DM-CycHexane		2	6	2		3		8	1															
t-1,4-DM-CycHexane	6	10	13	7		2	1	8											2	2	2			
2,2,5-TM-Hexane	6	6	6	9															2	2	2			
1-Octene	6	6	6																2	2	2			
t-4-Octene	6	6	6																2	2	2			
Octane	6	10	6	28			5												2	2	2			
t-2-Octene	6	6	6																2	2	2			
t-1,3-DM-CycHexane	6	6	6																2	2	2			
c-2-Octene	6	6	6																2	2	2			
2,3,5-TM-Hexane	6	6	6																2	2	2			
2,4-DM-Heptane	6	6	6																2	2	2			
c-1,2-DM-CycHexane	6	12	12	7		4	2	17	3										2	2	2			
t-1,2-DM-CycHexane		4	11	2		4	4	19	2															
E-Cyclohexane	6	6	6																2	2	2			
3,5-DM-Heptane	6	6	6																2	2	2			
E-Benzene	6	17	130	56	2	5	11	117	5		16								2	2	2		18	
2,3-DM-Heptane	6	6	6																2	2	2			
m-Xylene			3	6	4																			
m&p-Xylene	6	18	111	55		5	12	114	5		16								2	2	2		18	
2M-Octane	6	6	6																2	2	2			
3M-Octane	6	6	6																2	2	2			
Styrene	6	10	6	24			4												2	2	2			
o-Xylene	6	18	112	57	3	5	11	109	6		16								2	2	2		18	
1-Nonene	6	6	6	0															2	2	2			
Nonane	6	10	17	12		4	1	11											2	2	2			
i-Propylbenzene	6	12	11	5			5	5	3										2	2	2			
2,2-DM-Octane	6	6	6																2	2	2			
2,4-DM-Octane	6	6	6																2	2	2			

Table C4: Number of hydrocarbon measurements by LDV category and pollutant (part 4).

Pollutant	Car <2.5 tonnes																	N1(I)	N1(II)	N1(III)				Taxi	
	Petrol					Diesel					LPG		Hybrid	Ethanol				Diesel	Diesel	Diesel				Diesel	
	E0	E1	E2	E3	E4	E0	E1	E2	E3	E4	E2	E3	E4	E2	E3	E4	E2	E3	E0	E1	E2	E3	E2	E3
n-Propylbenzene	6	16	18	31		2	9	13	3										2	2	2			
1M-3E-Benzene	6	6	6																2	2	2			
1M-4E-Benzene	6	6	6																2	2	2			
1,3,5-TM-Benzene	6	14	15	44		2	9	12	4										2	2	2			
1E-2M-Benzene	6	6	6																2	2	2			
1,2,4-TM-Benzene	6	12	16	50		2	4	11	2										2	2	2			
Decane	6	12	18	6		4	9	19	4										2	2	2			
i-Butylbenzene	6	7	6	1		1	1	2											2	2	2			
s-Butylbenzene	6	6	6					1											2	2	2			
1M-3-i-PropBenzene	6	6	6																2	2	2			
1,2,3-TM-Benzene	6	10	6	36			4												2	2	2			
1M-4-i-PropBenzene	6	6	6																2	2	2			
Indane	6	10	6	20															2	2	2			
1,3-DE-Benzene	6	7	10	11		1		3	1										2	2	2			
1,4-DE-Benzene	6	9	16	4		1	2	12	2										2	2	2			
1M-3-n-PropBenzene	6	6	6																2	2	2			
1M-4-n-PropBenzene	6	6	6																2	2	2			
1,2-DE-Benzene	6	6	6																2	2	2			
1M-2-n-PropBenzene	6	6	6																2	2	2			
1,4-DM-2-E-Benzene	6	6	6																2	2	2			
1,3-DM-4-E-Benzene	6	6	6																2	2	2			
1,2-DM-4-E-Benzene	6	6	6																2	2	2			
1,3-DM-2-E-Benzene	6	6	6																2	2	2			
Undecane	6	15	19	7		4	9	17	3										2	2	2			
1,2-DM-3-E-Benzene	6	6	6																2	2	2			
1,2,4,5-TetMBenzene	6	6	8	18				1	1										2	2	2			
2M-ButylBenzene	6	6	6																2	2	2			
1,2,3,5-TetMBenzene	6	7	9	20			1	1	2										2	2	2			
tert-1B-2M-Benzene	6	6	6																2	2	2			
1,2,3,4-TetMBenzene	6	6	6																2	2	2			
n-PentBenzene	6	6	6																2	2	2			
tert-1B-3,5-DM-Benz	6	6	6																2	2	2			
Dodecane	6	13	20	7		4	10	21	4										2	2	2			
NMHC			80	230				82	109		16												14	

Table C5: Number of measurements of oxygen-containing compounds by LDV category and pollutant.

Pollutant	Car <2.5 tonnes																	N1(I)	N1(II)	N1(III)			Taxi	
	Petrol					Diesel					LPG		Hybrid	Ethanol				Diesel	Diesel	Diesel			Diesel	
	E0	E1	E2	E3	E4	E0	E1	E2	E3	E4	E2	E3	E4	E2	E3	E4	E2	E3	E0	E1	E2	E3	E2	E3
Formaldehyde	33	42	163	372	13	14	25	135	178		16			13	14	13			2	2	2		14	
Acetaldehyde	33	42	71	100	2	14	25	53	21					8	12	4			2	2	2			
Acetone	18	23	40	45		14	13	36	5										2	2	2			
Acrolein	18	15	21	31		13	11	28											2	2	2			
Propionaldehyde	32	41	53	56		14	25	51	18										2	2	2			
Crotonaldehyde	33	23	35	60		12	21	30	17										2	2	2			
Butanone	24	23	45	43		14	13	41	19										2	2	2			
Methacrolein	18	18	24	11		14	8	22	1										2	2	2			
Butyraldehyde	20	25	39	26		14	13	42	17										2	2	2			
m-Tolualdehyde	20	16	20			8	12	16																
o-Tolualdehyde			14																					
p-Tolualdehyde	6	19	19	7		6	13	26	1										2	2	2			
Hexanal	33	35	49	15		14	25	48	14										2	2	2			
Benzaldehyde	33	38	45	77		14	22	42	16										2	2	2			
MTBE	6	6	6																2	2	2			

Table C6: Number of measurements of PAHs (particle phase) by LDV category and pollutant.

Pollutant	Car <2.5 tonnes																N1(I)	N1(II)	N1(III)				Taxi	
	Petrol					Diesel					LPG		Hybrid	Ethanol			Diesel	Diesel	Diesel				Diesel	
	E0	E1	E2	E3	E4	E0	E1	E2	E3	E4	E2	E3	E4	E2	E3	E4	E2	E3	E0	E1	E2	E3	E2	E3
Naphthalene		6	8	5		4	4	22	3	12		14					14	14			37	67		12
2-Methylnaphthalene								14		11		11					14	14			37	67		8
1-Methylnaphthalene								14		7		11					14	14			37	67		11
Acenaphthene		7	12	11		6	5	33				3					14	14			37	67		3
Acenaphthylene		1				2		14				6					14	14			37	67		5
Acenaphthene + Acenaphthylene																								
Fluorene		6	7	8		6	6	31	6	4		7					14	14			37	67		6
Phenanthrene		7	17	12		6	9	44	5	9		10					14	14			37	67		4
Anthracene		7	16	12		6	9	39	5	14		9					14	14			37	67		7
Fluoranthene		9	17	12		6	9	44	6	1		7					14	14			37	67		4
Pyrene		9	16	12		6	9	44	6			1					14	14			37	67		1
Benzo(a)anthracene		6	11	8		6	9	43	4			5					14	14			37	67		4
Chrysene		9	12	11		6	9	43	6			6					14	14			37	67		5
Benzo(b)Fluoranthene		8	10	8		6	9	42	2			5					14	14			37	67		2
Benzo(b+j)fluoranthene								14				3					14	14			37	67		2
Dibenz(a,h)Anthracene		2	5	2		6	5	18									14	14			37	67		
Benzo(k)fluoranthene		6	12	11		6	9	27	4															
Benzo(a)pyrene		7	8	9		6	8	37	1			1					14	14			37	67		2
Benzo(ghi)perylene		6	7	8		6	9	31				3					14	14			37	67		2
Indeno(1,2,3cd)Pyrene		1	1	2		6	2	18				1					14	14			37	67		
Perylene																								

Table C7: Number of measurements of PAHs (vapour phase) by LDV category and pollutant.

Pollutant	Car <2.5 tonnes																N1(I)	N1(II)	N1(III)				Taxi	
	Petrol					Diesel					LPG		Hybrid	Ethanol			Diesel	Diesel	Diesel				Diesel	
	E0	E1	E2	E3	E4	E0	E1	E2	E3	E4	E2	E3	E4	E2	E3	E4	E2	E3	E0	E1	E2	E3	E2	E3
Naphthalene		5	120	87		5	4	101	43	14	6	14					14	14			37	67	6	14
2-Methylnaphthalene			108	80				83	40	14	6	14					14	14			37	67	6	14
1-Methylnaphthalene			108	80				83	40	14	6	14					14	14			37	67	6	14
Acenaphthene		5	14	12		6	6	36	5	14		13					14	14			37	67		12
Acenaphthylene		1	2	2		3	1	20		1		7					14	14			37	67		6
Acenaphthene + Acenaphthylene			108	80				69	40		6												6	
Fluorene		5	118	89		6	5	102	45	14	6	13					14	14			37	67	6	14
Phenanthrene		7	124	91		6	8	105	44	10	6	11					14	14			37	67	6	7
Anthracene		4	124	90		6	6	100	43	13	6	7					14	14			37	67	6	5
Fluoranthene		6	119	89		6	8	111	45	2	6	5					14	14			37	67	6	2
Pyrene		9	118	90		6	9	107	43		6	2					14	14			37	67	6	1
Benzo(a)anthracene		7	124	90		5	9	110	46		6	1					14	14			37	67	6	2
Chrysene		7	122	88		6	8	105	44		6	1					14	14			37	67	6	
Benzo(b)Fluoranthene		3	114	84		6	8	94	40	14	6	13					14	14			37	67	6	14
Benzo(b+j)fluoranthene				80				14	40	12		13					14	14			37	67		13
Dibenz(a,h)Anthracene			111	80			2	84	40		6						14	14			37	67	6	
Benzo(k)fluoranthene		5	111	6		6	7	82			6												6	
Benzo(a)pyrene		4	108	81		6	5	90	40	1	6	6					14	14			37	67	6	8
Benzo(ghi)perylene		1	108	82		6	5	90	40	1	6	6					14	14			37	67	6	6
Indeno(1,2,3cd)Pyrene			108	80				83	40		6	2					14	14			37	67	6	4
Perylene																								

Table C8: Number of measurements of PAHs (particle and vapour phases combined) by LDV category and pollutant.

Pollutant	Car <2.5 tonnes																N1(I)	N1(II)	N1(III)				Taxi	
	Petrol					Diesel					LPG		Hybrid	Ethanol			Diesel	Diesel	Diesel				Diesel	
	E0	E1	E2	E3	E4	E0	E1	E2	E3	E4	E2	E3	E4	E2	E3	E4	E2	E3	E0	E1	E2	E3	E2	E3
Naphthalene	14	7	39	107			5	45	67	14		14					14	14	2	2	39	67		14
2-Methylnaphthalene		1	8	32			5	21	47	14		14					14	14			37	67		14
1-Methylnaphthalene		1	8	32			5	21	47	14		14					14	14			37	67		14
Acenaphthene	8	6	9	34				21	19	14		13					14	14			37	67		12
Acenaphthylene	8	6	9	33				22	17	1		7					14	14			37	67		7
Acenaphthene + Acenaphthylene			8	32					46															
Fluorene	8	6	17	66				22	66	14		13					14	14			37	67		14
Phenanthrene	8	6	17	65				22	66	10		11					14	14			37	67		7
Anthracene	8	6	17	65				22	66	14		9					14	14			37	67		8
Fluoranthene	8	6	17	66				21	66	3		8					14	14			37	67		4
Pyrene	8	6	17	66				21	66			2					14	14			37	67		2
Benzo(a)anthracene	8	6	17	66				21	66			5					14	14			37	67		4
Chrysene	8	6	17	64				21	66			6					14	14			37	67		5
Benzo(b)Fluoranthene			8	32				14	46	14		13					14	14			37	67		14
Benzo(b+j)fluoranthene	8	6	9	32				21	20	12		13					14	14			37	67		13
Dibenz(a,h)Anthracene	8	6	11	57				21	59								14	14			37	67		
Benzo(k)fluoranthene			8	32					46															
Benzo(a)pyrene	8	6	27	66				38	66	1		6					14	14			37	67		8
Benzo(ghi)perylene	8	6	15	66				21	67	1		6					14	14			37	67		6
Indeno(1,2,3cd)Pyrene	8	6	15	65				20	67			2					14	14			37	67		4
Perylene	8	6	8	20			0	8	13															

Table C9: Number of measurements of other unregulated pollutants by LDV category and pollutant.

Pollutant	Car <2.5 tonnes																		N1(I)	N1(II)	N1(III)				Taxi	
	Petrol					Diesel					LPG		Hybrid	Ethanol			Diesel	Diesel		Diesel				Diesel	
	E0	E1	E2	E3	E4	E0	E1	E2	E3	E4	E2	E3	E4	E2	E3	E4	E2	E3	E0	E1	E2	E3	E2	E3
NO (as NO_2)			166	232				121	157		16												14	
NO_2			166	232				121	157		16												14	
NOx (as NO_2)			165	232				121	157		16												14	
N_2O	373		167	267	10	120		135	157	15	16	30	15	6	5	8	14	14			41	69	14	15
NH_3			194	273	12			151	157	15	16	30	15	12	13	12	14	14			41	69	14	15
SO_2			88	254				82	152		16												14	
H_2S			8	24					43															
PM			62	88				42	64		6												6	
PM_{10}			32	88				12	64															
$PM_{2.5}$			32	88				12	64															
PM_1			32	88				12	64															

Table C10: Number of hydrocarbon measurements by rigid HGV category and pollutant (part 1).

Fuel type	Diesel																										CNG				
Max GVW range	3.5-7.5 t					7.5-12 t					14-20 t					20-26 t					28-32 t					>32 t					14-20 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Methane		16	40	52	14						28	14	137	16	3			16	15				16	15											
Ethene		16	40	52	14						14	4	127	16	3			16	15				16	15											
Ethyne		16	40	52	14						14	4	127	16	3			16	15				16	15											
Ethane		16	40	52	14						28	18	141	16	3			16	15				16	15											
Propene		16	40	52	14						28	18	141	16	3			16	15				16	15											
Propane					14						4	2			3																				
Propadiene											4	4	4																						
Propyne											3																								
2M-Propane											4	4	4																						
2M-Propene											4	4	4																						
1-Butene											4	4	4																						
1,3-Butadiene		16	48	60	14			8	8		28	18	145	20	3			16	19				16	15				8	8					4	
Butane											4	4	4																						
t-2-Butene											4	4	4																						
1-Butyne											3																								
c-2-Butene											4	4	4																						
3M-1-Butene											4	4	4																						
2M-Butane											4	4	4																						
1-Pentene											4	4	4																						
2M-1-Butene											4	4	4																						
Pentane											4	4	4																						
2M-1,3-Butadiene											4	4	4																						
t-2-Pentene											4	4	4																						
c-2-Pentene											4	4	2																						
2M-2-Butene											4																								
Cyclopentadiene											2																								
2,2-DM-Butane											3																								
Cyclopentene											4	4	4																						
3M-1-Pentene											3	2																							
Cyclopentane											3	3	4																						
2,3-DM-Butane											2	2																							
2M-Pentane											4	4	4																						
4M-t-2-Pentene											4	4																							
3M-Pentane											4	4	4																						
2M-1-Pentene											2																								
1-Hexene											4	4	4																						

Table C11: Number of hydrocarbon measurements by rigid HGV category and pollutant (part 2).

Fuel type	Diesel																										CNG				
Max GVW range	3.5-7.5 t					7.5-12 t					14-20 t					20-26 t					28-32 t					>32 t					14-20 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Hexane											4	4	4																					
c-3-Hexene											3																							
t-2-Hexene											4	3																						
3M-t-2-Pentene											4	4	3																					
2M-2-Pentene											4	2																						
c-2-Hexene											3																							
3M-c-2-Pentene											4	2	3																					
M-Cyclopentane											4	3	3																					
2,4-DM-Pentane											2																							
2,2,3-TM-Butane											2																							
3,4-DM-1-Pentene											4																							
Benzene			10	4				8	7		4	4	20					4									8	7					4		
3,3-DM-Pentane											3																							
Cyclohexane											4	4	4																					
2M-Hexane											4	4	3																					
2,3-DM-Pentane											3																							
Cyclohexene											4	4	4																					
3M-Hexane											4	3	4																					
c-1,3-DM-CycPentane												2	2																					
3E-Pentane											4	4																						
2,2,4-TM-Pentane											4		2																					
t-3-Heptene											4																							
Heptane											4	4	4																					
2M-2-Hexene											2																							
t-2-Heptene											4	3																						
3E-c-2-Pentene											4																							
2,4,4-TM-1-Pentene											4	3																						
c-2-Heptene											3																							
M-Cyclohexane											4	4	4																					
2,2-DM-Hexane											4																							
2,4,4-TM-2-Pentene											3	2																						
2,5-DM-Hexane											2	3	4																					
2,4-DM-Hexane											4	3	4																					
3,3-DM-Hexane											3																							
2,3,4-TM-Pentane											4	4	4																					

Table C12: Number of hydrocarbon measurements by rigid HGV category and pollutant (part 3).

Fuel type	Diesel																										CNG				
Max GVW range	3.5-7.5 t					7.5-12 t					14-20 t					20-26 t					28-32 t					>32 t					14-20 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Toluene			6		14						4	4	16		3																			
2,3-DM-Hexane											4	3	2																					
2M-Heptane											4	4	4																					
4M-Heptane												2																						
3M-Heptane											4	4	4																					
c-1,3-DM-CycHexane											4	4	4																					
t-1,4-DM-CycHexane												4	4																					
2,2,5-TM-Hexane											4	4	3																					
1-Octene											4	4	4																					
t-4-Octene											3	2																						
Octane											4	4	4																					
t-2-Octene											2																							
t-1,3-DM-CycHexane											4	3	2																					
c-2-Octene											3	3																						
2,4-DM-Heptane											3	3	2																					
c-1,2-DM-CycHexane											3	4	4																					
E-Cyclohexane											4	4	4																					
3,5-DM-Heptane											4	4	4																					
E-Benzene			6								4	4	16																					
2,3-DM-Heptane											4	4	4																					
m&p-Xylene			6								4	4	16																					
2M-Octane											4	4	4																					
3M-Octane											4	4	4																					
Styrene											4	4	4																					
o-Xylene			6								4	4	16																					
1-Nonene											4	4	4																					
Nonane											4	4	4																					
i-Propylbenzene											4	4	4																					
2,2-DM-Octane											4	4	3																					
2,4-DM-Octane											4	4	4																					

Table C13: Number of hydrocarbon measurements by rigid HGV category and pollutant (part 4).

Fuel type	Diesel																										CNG				
Max GVW range	3.5-7.5 t					7.5-12 t					14-20 t					20-26 t					28-32 t					>32 t					14-20 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
n-Propylbenzene											4	4	4																					
1M-3E-Benzene											4	3	4																					
1M-4E-Benzene											4	4	4																					
1,3,5-TM-Benzene											4	4	4																					
1E-2M-Benzene											4	4	4																					
1,2,4-TM-Benzene											4	4	4																					
Decane											4	4	4																					
i-Butylbenzene											2	4	4																					
s-Butylbenzene											4	4	4																					
1M-3-i-PropBenzene											4	3	4																					
1,2,3-TM-Benzene											4	4	4																					
1M-4-i-PropBenzene											4	4	4																					
Indane											4	4	4																					
1,3-DE-Benzene											4	3	4																					
1,4-DE-Benzene											4	4	4																					
1M-3-n-PropBenzene											4	4	4																					
1M-4-n-PropBenzene											4	4	4																					
1,2-DE-Benzene											4	4	4																					
1M-2-n-PropBenzene											4	4	4																					
1,4-DM-2-E-Benzene											4	4	4																					
1,3-DM-4-E-Benzene											4	4	4																					
1,2-DM-4-E-Benzene											4	4	4																					
1,3-DM-2-E-Benzene											4	4	4																					
Undecane											4	4	4																					
1,2-DM-3-E-Benzene											3	4	4																					
1,2,4,5-TetMBenzene											2	4																						
2M-ButylBenzene											3	2	4																					
1,2,3,5-TetMBenzene											4	4	4																					
tert-1B-2M-Benzene											4	4	4																					
1,2,3,4-TetMBenzene											4	4	4																					
n-PentBenzene											4	4	4																					
tert-1B-3,5-DM-Benzene											4	4	4																					
Dodecane											4	4	4																					

Table C14: Number of measurements of oxygen-containing compounds by rigid HGV category and pollutant.

Fuel type	Diesel																										CNG				
Max GVW range	3.5-7.5 t					7.5-12 t					14-20 t					20-26 t					28-32 t					>32 t					14-20 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Formaldehyde		16	40	52	14						28	18	141	16	3			16	15				16	15										
Acetaldehyde		16	40	52	14						28	18	141	16	3			16	15				16	15										
Acetone											4	4	4																					
Acrolein											4	4	4																					
Propionaldehyde											4	4	4																					
Crotonaldehyde											4	4	4																					
Butanone												3	2																					
Methacrolein											4	4	4																					
Butyraldehyde											4	4	4																					
m-Tolualdehyde											4	4	4																					
o-Tolualdehyde											4	4	4																					
p-Tolualdehyde											4	4	4																					
Hexanal											4	4	4																					
Benzaldehyde												4	4																					
MTBE											3																							

Table C15: Number of measurements of PAHs (all phases) by rigid HGV category and pollutant.

Fuel type	Diesel																										CNG				
Max GVW range	3.5-7.5 t					7.5-12 t					14-20 t					20-26 t					28-32 t					>32 t					14-20 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Naphthalene			3	3				6	3		4	4	11					3									6	3					3		
2-Methylnaphthalene			11	3				6	3				19					3									6	3					3		
1-Methylnaphthalene			11	3				6	3				19					3									6	3					3		
Acenaphthene			3	2				5	3				3					3									5	3					2		
Acenaphthylene			3	3				6	3				3					3									6	3					3		
Acenaphthene + Acenaphthy			2										11																					
Fluorene			11	3				6	3				18					3									6	3					3		
Phenanthrene			11	3				6	3				19					3									6	3					3		
Anthracene			10	3				1	3				16					2									1	3					2		
Fluoranthene			11	3				5	3				17					3									5	3							
Pyrene			11	3				4	3				17					2									4	3							
Benzo(a)anthracene			10						2				16															2							
Chrysene			8										15																					
Benzo(b)Fluoranthene			11	3				6	3				19					3									6	3					2		
Dibenz(a,h)Anthracene			3	3				4	3				3					1									4	3							
Benzo(k)fluoranthene			8										16																					
Benzo(a)pyrene			9	3				6	3				19					3									6	3					2		
Benzo(ghi)perylene			6	2				4	2				19					2									4	2					2		
Indeno(1,2,3cd)Pyrene			3	2				4	3				5					2									4	3					2		

Table C16: Number of measurements of other unregulated pollutants by rigid HGV category and pollutant.

Fuel type	Diesel																										CNG				
Max GVW range	3.5-7.5 t					7.5-12 t					14-20 t					20-26 t					28-32 t					>32 t					14-20 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
NMHC		16	40	52							24	14	137	16				16	15				16	15											
NO (as NO2)		16	48	64	28			8	8		24	14	141	20	10			16	19				16	15				8	8					4	
NO2		16	48	64	28			8	8		24	14	141	20	10			16	19				16	15				8	8					4	
N2O		16	48	59	14			6	8		24	14	141	20	3			16	19				16	15				6	8					4	
NH3		16	48	60	14			8	8		24	14	141	20	3			16	19				16	15				8	8					4	
SO2		16	40	52	14						24	14	137	16	3			16	15				16	15											

Table C17: Number of hydrocarbon measurements by articulated HGV category and pollutant.

Fuel type	Diesel															CNG									
Max GVW range	28-34 t					34-40 t					40-50 t					28-34 t					34-40 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Methane				16	16		32	32	16	16			16	32											
Ethene				16	16		32	32	16	16			16	32											
Ethyne				16	16		32	32	16	16			16	32											
Ethane				16	16		32	32	16	16			16	32											
Propene				16	16		32	32	16	16			16	32											
1,3-Butadiene				16	16		32	40	24	16			16	32									4		
Benzene								4															4		

Table C18: Number of measurements of PAHs (all phases) by articulated HGV category and pollutant.

Fuel type	Diesel															CNG									
Max GVW range	28-34 t					34-40 t					40-50 t					28-34 t					34-40 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Naphthalene								2															3		
2-Methylnaphthalene								2															3		
1-Methylnaphthalene								2															3		
Acenaphthene								2															3		
Acenaphthylene								2															3		
Fluorene								2															3		
Phenanthrene								2															3		
Anthracene								2															3		
Fluoranthene								2															3		
Pyrene								1															3		
Chrysene																							2		
Benzo(b)Fluoranthene								2															3		
Dibenz(a,h)Anthracene																							3		
Benzo(a)pyrene								2															3		
Benzo(ghi)perylene								2															3		
Indeno(1,2,3cd)Pyrene								2															3		

Table C19: Number of measurements of other unregulated pollutants by articulated HGV category and pollutant.

Fuel type	Diesel															CNG									
Max GVW range	28-34 t					34-40 t					40-50 t					28-34 t					34-40 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
NMHC				16	16		32	32	16	16			16	32											
NO (as NO2)				16	16		32	40	24	16			16	32									4		
NO2				16	16		32	40	24	16			16	32									4		
N2O				16	16		32	35	21	16			16	32									4		
NH3				16	16		32	40	24	16			16	32									4		
SO2				16	16		32	32	16	16			16	32											

Table C20: Number of hydrocarbon measurements by bus category and pollutant (part 1).

Fuel type	Diesel															LPG				
Max GVW range	<15 t					15-18 t					>18 t					>18 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Methane	17	56	46	43		30		42	31											
Ethene	3	43	31	43		30		42	31											
Ethyne	3	43	32	43		30		42	31											
Ethane	16	56	45	43		30		42	31											
Propene	17	57	46	43		30		42	31											
Propane	2	3	2																	
Propadiene	3	3																		
Propyne		2																		
2M-Propane	2																			
2M-Propene	3	4	2																	
1-Butene	3	4	2																	
1,3-Butadiene	17	57	53	43		30		56	60											
Butane	3	1																		
t-2-Butene	3	4	2																	
1-Butyne	3																			
c-2-Butene	3																			
3M-1-Butene	3																			
2M-Butane	3	3	2																	
1-Pentene	3	4	2																	
2M-1-Butene	3	2	2																	
Pentane	3	2																		
2M-1,3-Butadiene	3	3																		
t-2-Pentene	3	2																		
2M-2-Butene	3	2																		
2,2-DM-Butane	2																			
Cyclopentene	3																			
3M-1-Pentene	3																			
Cyclopentane	2																			
2M-Pentane	3	4	2																	
3M-Pentane	3	4	2																	
1-Hexene	3	4	2																	

Table C21: Number of hydrocarbon measurements by bus category and pollutant (part 2).

Fuel type	Diesel															LPG				
Max GVW range	<15 t					15-18 t					>18 t					>18 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Hexane	3																			
3M-t-2-Pentene	3																			
M-Cyclopentane	3																			
2,4-DM-Pentane	2																			
Benzene	3	4	9					14	29											
Cyclohexane	3	4	2																	
2M-Hexane	3	2																		
Cyclohexene	3																			
c-1,3-DM-CycPentane	3																			
2,2,4-TM-Pentane	3	4	2																	
Heptane	3																			
M-Cyclohexane	3	3	2																	
2,3,4-TM-Pentane	2																			
Toluene	3	4	2																	
2M-Heptane	3																			
3M-Heptane	3																			
c-1,3-DM-CycHexane	3																			
t-1,4-DM-CycHexane	3																			
2,2,5-TM-Hexane	3																			
1-Octene	3	4	1																	
Octane	3	4	2																	
t-1,3-DM-CycHexane	2																			
c-1,2-DM-CycHexane	3																			
E-Cyclohexane	3																			
3,5-DM-Heptane	3																			
E-Benzene	3	4	2																	
2,3-DM-Heptane	3																			
m&p-Xylene	3	4	2																	
2M-Octane	3																			
3M-Octane	3																			
Styrene	3	4	2																	
o-Xylene	3	4	2																	
1-Nonene	3	4	2																	
Nonane	3	4	2																	
i-Propylbenzene	3																			
2,2-DM-Octane	3																			
2,4-DM-Octane	3	4	2																	

Table C22: Number of hydrocarbon measurements by bus category and pollutant (part 3).

Fuel type	Diesel															LPG				
Max GVW range	<15 t					15-18 t					>18 t					>18 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
n-Propylbenzene	3																			
1M-3E-Benzene	3	4	2																	
1M-4E-Benzene	3	4	2																	
1,3,5-TM-Benzene	3	4	2																	
1E-2M-Benzene	3	2	2																	
1,2,4-TM-Benzene	3	4	2																	
Decane	3	4	2																	
i-Butylbenzene	3																			
s-Butylbenzene	3																			
1M-3-i-PropBenzene	3	2	2																	
1,2,3-TM-Benzene	3	4	2																	
1M-4-i-PropBenzene	3	4	2																	
Indane	3																			
1,3-DE-Benzene	3	4	2																	
1,4-DE-Benzene	3																			
1M-3-n-PropBenzene	3	4	2																	
1M-4-n-PropBenzene	3	4	2																	
1,2-DE-Benzene	3	4	2																	
1M-2-n-PropBenzene	3	4	2																	
1,4-DM-2-E-Benzene	3	4	2																	
1,3-DM-4-E-Benzene	3																			
1,2-DM-4-E-Benzene	3	3	2																	
1,3-DM-2-E-Benzene	3	3	2																	
Undecane	3	4	2																	
1,2-DM-3-E-Benzene	3	2	2																	
1,2,4,5-TetMBenzene	2		2																	
2M-ButylBenzene	3	1	2																	
1,2,3,5-TetMBenzene	3	4	2																	
tert-1B-2M-Benzene	3	4	2																	
1,2,3,4-TetMBenzene	3	3	2																	
n-PentBenzene	3	3	2																	
tert-1B-3,5-DM-Benz	3	4	2																	
Dodecane	3	4	2																	

Table C23: Number of measurements of oxygen-containing compounds by bus category and pollutant.

Fuel type	Diesel															LPG				
Max GVW range	<15 t					15-18 t					>18 t					>18 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Formaldehyde	17	57	46	43		30		42	31											
Acetaldehyde	17	57	46	43		30		42	31											
Acetone	3	4	2																	
Acrolein	3	4	2																	
Propionaldehyde	3	4	2																	
Crotonaldehyde	3	4	2																	
Butanone	2	3	2																	
Methacrolein	3	2																		
Butyraldehyde	3	4	2																	
m-Tolualdehyde	3	4	2																	
o-Tolualdehyde	3	4	2																	
p-Tolualdehyde		2	2																	
Hexanal	3	3	1																	
Benzaldehyde	3																			

Table C24: Number of measurements of PAHs (all phases) by bus category and pollutant.

Fuel type	Diesel															LPG				
Max GVW range	<15 t					15-18 t					>18 t					>18 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Naphthalene	3	4	8					3	15											
2-Methylnaphthalene			6					3	15											
1-Methylnaphthalene			6					3	15											
Acenaphthene			5					3	15											
Acenaphthylene			6					3	15											
Fluorene			6					3	15											
Phenanthrene			6					3	15											
Anthracene			4					3	11											
Fluoranthene			5					3	13											
Pyrene			4					3	12											
Benzo(a)anthracene			2					2	7											
Chrysene								1	6											
Benzo(b)Fluoranthene			6					3	15											
Dibenz(a,h)Anthracene			1					3	11											
Benzo(a)pyrene			6					3	15											
Benzo(ghi)perylene			5					3	12											
Indeno(1,2,3cd)Pyrene			5					2	11											

Table C25: Number of measurements of other unregulated pollutants by bus category and pollutant.

Fuel type	Diesel															LPG				
Max GVW range	<15 t					15-18 t					>18 t					>18 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
NMHC	14	53	44	43		30		42	31											
NO (as NO2)	14	53	51	43	7	30		64	60											
NO2	14	53	51	43	7	30		64	60											
NOx (as NO2)	14	53	51	43	7	30		64	60											
N2O	14	53	51	43		30		56	55											
NH3	14	53	51	43		30		56	60											
SO2	14	53	44	43		30		42	31											

Table C26: Number of hydrocarbon measurements by coach category and pollutant (part 1).

Fuel type	Diesel									
Max GVW range	15-18 t					>18 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Methane			7							
Ethene			7							
Ethyne			7							
Ethane			7							
Propene			7							
Propane			7							
1,3-Butadiene			7							
Toluene			7							

Table C27: Number of measurements of oxygen-containing compounds by coach category and pollutant.

Fuel type	Diesel									
Max GVW range	15-18 t					>18 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
Formaldehyde			7							
Acetaldehyde			7							

Table C28: Number of measurements of other unregulated pollutants by coach category and pollutant.

Fuel type	Diesel									
Max GVW range	15-18 t					>18 t				
Emission standard	Pre E-I	E-I	E-II	E-III	E-IV	Pre E-I	E-I	E-II	E-III	E-IV
NO (as NO2)			14							
NO2			14							
N2O			7							
NH3			7							
SO2			7							

Appendix D: Basic emission factors for regulated pollutants (CO, HC, NO_x, PM)

All emission factors are stated in the following form:

$$y = \mathbf{k}*(\mathbf{a} + \mathbf{b}x + \mathbf{c}x^2 + \mathbf{d}x^3 + \mathbf{e}x^4 + \mathbf{f}x^5 + \mathbf{g}x^6)/x$$

where: y = Emission factor in g/km

x = Speed in km/h

k, **a**, **b**, **c**, **d**, **e**, **f** and **g** are coefficients

D1 Cars and minibuses < 2.5 tonnes

Table D1: CO emission factors for petrol cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R001	Petrol	<1400	Pre-Euro 1	5.1982E+02	5.6485E-02	1.7898E-02	0	0	0	0	1.000	5	140
R002	Petrol	<1400	Euro 1	1.5643E-10	1.4995E+01	-3.6040E-01	2.4000E-03	0	0	0	1.000	5	120
R003	Petrol	<1400	Euro 2	1.1642E-10	4.0292E+00	-1.0120E-01	8.0000E-04	0	0	0	1.000	5	140
R004	Petrol	<1400	Euro 3	6.6605E+00	-3.0823E-01	3.2383E-02	-9.7346E-04	1.6499E-05	-1.2746E-07	4.4713E-10	1.000	5	140
R005	Petrol	<1400	Euro 4	6.6605E+00	-3.0823E-01	3.2383E-02	-9.7346E-04	1.6499E-05	-1.2746E-07	4.4713E-10	1.000	5	140
R006	Petrol	<1400	Euro 5	6.6605E+00	-3.0823E-01	3.2383E-02	-9.7346E-04	1.6499E-05	-1.2746E-07	4.4713E-10	0.822	5	140
R007	Petrol	<1400	Euro 6	6.6605E+00	-3.0823E-01	3.2383E-02	-9.7346E-04	1.6499E-05	-1.2746E-07	4.4713E-10	0.822	5	140
R008	Petrol	1400-2000	Pre-Euro 1	3.8138E+02	1.3731E+00	5.2002E-03	0	0	0	0	1.000	5	140
R009	Petrol	1400-2000	Euro 1	2.8261E+01	1.5410E+00	9.7686E-04	0	0	0	0	1.000	5	120
R010	Petrol	1400-2000	Euro 2	5.6750E+01	-2.2582E+00	2.6667E-02	0	0	0	0	1.000	5	140
R011	Petrol	1400-2000	Euro 3	3.5040E+01	-1.8003E+00	2.4874E-02	0	0	0	0	1.000	5	140
R012	Petrol	1400-2000	Euro 4	2.2627E+01	-6.8548E-01	1.4443E-02	0	0	0	0	1.000	5	140
R013	Petrol	1400-2000	Euro 5	2.2627E+01	-6.8548E-01	1.4443E-02	0	0	0	0	0.822	5	140
R014	Petrol	1400-2000	Euro 6	2.2627E+01	-6.8548E-01	1.4443E-02	0	0	0	0	0.822	5	140
R015	Petrol	>2000	Pre-Euro 1	2.4755E+02	-1.3425E-01	8.4491E-03	0	0	0	0	1.000	5	140
R016	Petrol	>2000	Euro 1	6.6143E+01	-2.5248E+00	2.1116E-01	-7.6690E-03	1.3628E-04	-1.1706E-06	3.9577E-09	1.000	5	120
R017	Petrol	>2000	Euro 2	1.3865E+01	-3.7476E-01	3.0886E-02	-9.7635E-04	1.5924E-05	-1.2318E-07	4.0811E-10	1.000	5	140
R018	Petrol	>2000	Euro 3	2.6266E+01	-1.1827E+00	1.5337E-02	0	0	0	0	1.000	5	140
R019	Petrol	>2000	Euro 4	7.4154E+00	6.4264E-03	-3.7477E-04	1.0618E-05	7.4126E-07	0	0	1.000	5	120
R020	Petrol	>2000	Euro 5	7.4154E+00	6.4264E-03	-3.7477E-04	1.0618E-05	7.4126E-07	0	0	0.822	5	120
R021	Petrol	>2000	Euro 6	7.4154E+00	6.4264E-03	-3.7477E-04	1.0618E-05	7.4126E-07	0	0	0.822	5	120

Table D2: CO emission factors for diesel cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R022	Diesel	<1400	Pre-Euro 1	2.1807E+01	1.0741E-01	6.8371E-04	0	0	0	0	1.000	5	120
R023	Diesel	<1400	Euro 1	1.3561E+01	2.9399E-02	0	0	0	0	0	1.000	5	120
R024	Diesel	<1400	Euro 2	8.2874E+00	-6.2268E-03	0	0	0	0	0	1.000	5	120
R025	Diesel	<1400	Euro 3	3.2855E+00	-3.3729E-03	6.7841E-07	0	0	0	0	1.000	5	140
R026	Diesel	<1400	Euro 4	3.1897E+00	5.5195E-04	-6.1566E-05	-5.3770E-07	7.5075E-10	0	0	1.000	5	140
R027	Diesel	<1400	Euro 5	3.1897E+00	5.5195E-04	-6.1566E-05	-5.3770E-07	7.5075E-10	0	0	0.798	5	140
R028	Diesel	<1400	Euro 6	3.1897E+00	5.5195E-04	-6.1566E-05	-5.3770E-07	7.5075E-10	0	0	0.798	5	140
R029	Diesel	1400-2000	Pre-Euro 1	2.1807E+01	1.0741E-01	6.8371E-04	0	0	0	0	1.000	5	120
R030	Diesel	1400-2000	Euro 1	1.3561E+01	2.9399E-02	0	0	0	0	0	1.000	5	120
R031	Diesel	1400-2000	Euro 2	8.2874E+00	-6.2268E-03	0	0	0	0	0	1.000	5	120
R032	Diesel	1400-2000	Euro 3	3.2855E+00	-3.3729E-03	6.7841E-07	0	0	0	0	1.000	5	140
R033	Diesel	1400-2000	Euro 4	3.1897E+00	5.5195E-04	-6.1566E-05	-5.3770E-07	7.5075E-10	0	0	1.000	5	140
R034	Diesel	1400-2000	Euro 5	3.1897E+00	5.5195E-04	-6.1566E-05	-5.3770E-07	7.5075E-10	0	0	0.798	5	140
R035	Diesel	1400-2000	Euro 6	3.1897E+00	5.5195E-04	-6.1566E-05	-5.3770E-07	7.5075E-10	0	0	0.798	5	140
R036	Diesel	>2000	Pre-Euro 1	1.6458E+01	2.5542E-01	-6.9787E-04	0	0	0	0	1.000	5	120
R037	Diesel	>2000	Euro 1	1.5126E+01	-5.6260E-02	1.5927E-03	0	0	0	0	1.000	5	120
R038	Diesel	>2000	Euro 2	1.2709E+01	-8.1229E-03	0	0	0	0	0	1.000	5	140
R039	Diesel	>2000	Euro 3	1.5053E+00	7.3634E-03	-7.8400E-07	0	0	0	0	1.000	5	120
R040	Diesel	>2000	Euro 4	1.5053E+00	7.3634E-03	-7.8400E-07	0	0	0	0	0.781	5	120
R041	Diesel	>2000	Euro 5	1.5053E+00	7.3634E-03	-7.8400E-07	0	0	0	0	0.623	5	120
R042	Diesel	>2000	Euro 6	1.5053E+00	7.3634E-03	-7.8400E-07	0	0	0	0	0.623	5	120

Table D3: CO emission factors for LPG cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R043	LPG	All	Euro 1	2.2508E+01	-4.0826E-01	5.1071E-03	0	0	0	0	1.000	5	120
R044	LPG	All	Euro 2	2.2508E+01	-4.0826E-01	5.1071E-03	0	0	0	0	1.000	5	120
R045	LPG	All	Euro 3	8.2738E-01	2.0118E-02	1.2081E-03	-2.1246E-05	5.7257E-07	-4.6461E-09	2.3051E-11	1.000	5	120
R046	LPG	All	Euro 4	8.2738E-01	2.0118E-02	1.2081E-03	-2.1246E-05	5.7257E-07	-4.6461E-09	2.3051E-11	0.435	5	120
R047	LPG	All	Euro 5	8.2738E-01	2.0118E-02	1.2081E-03	-2.1246E-05	5.7257E-07	-4.6461E-09	2.3051E-11	0.435	5	120
R048	LPG	All	Euro 6	8.2738E-01	2.0118E-02	1.2081E-03	-2.1246E-05	5.7257E-07	-4.6461E-09	2.3051E-11	0.435	5	120

Table D4: HC emission factors for petrol cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R001	Petrol	<1400	Pre-Euro 1	6.5504E+01	8.7000E-02	0	0	0	0	0	1.000	5	140
R002	Petrol	<1400	Euro 1	1.8170E+01	-3.1736E-01	2.7224E-03	0	0	0	0	1.000	5	120
R003	Petrol	<1400	Euro 2	3.1725E+00	-7.1245E-02	8.8907E-04	0	0	0	0	1.000	5	140
R004	Petrol	<1400	Euro 3	5.0408E-01	-1.7082E-03	5.3430E-04	3.4214E-06	-2.2735E-07	2.4575E-09	-7.6339E-12	1.000	5	140
R005	Petrol	<1400	Euro 4	2.5204E-01	-8.5411E-04	2.6715E-04	1.7107E-06	-1.1367E-07	1.2288E-09	-3.8170E-12	0.500	5	140
R006	Petrol	<1400	Euro 5	2.5204E-01	-8.5411E-04	2.6715E-04	1.7107E-06	-1.1367E-07	1.2288E-09	-3.8170E-12	0.449	5	140
R007	Petrol	<1400	Euro 6	2.5204E-01	-8.5411E-04	2.6715E-04	1.7107E-06	-1.1367E-07	1.2288E-09	-3.8170E-12	0.449	5	140
R008	Petrol	1400-2000	Pre-Euro 1	4.8352E+01	1.7130E-01	0	0	0	0	0	1.000	5	140
R009	Petrol	1400-2000	Euro 1	7.0698E+00	-9.8584E-02	9.2501E-04	0	0	0	0	1.000	5	120
R010	Petrol	1400-2000	Euro 2	2.7734E+00	-2.4661E-02	4.6469E-04	0	0	0	0	1.000	5	140
R011	Petrol	1400-2000	Euro 3	7.1148E-01	-8.5402E-03	2.0361E-04	0	0	0	0	1.000	5	140
R012	Petrol	1400-2000	Euro 4	1.8962E+00	-2.8094E-02	2.1525E-04	0	0	0	0	1.000	5	140
R013	Petrol	1400-2000	Euro 5	1.8962E+00	-2.8094E-02	2.1525E-04	0	0	0	0	0.897	5	140
R014	Petrol	1400-2000	Euro 6	1.8962E+00	-2.8094E-02	2.1525E-04	0	0	0	0	0.897	5	140
R015	Petrol	>2000	Pre-Euro 1	2.5032E+01	3.4094E-01	1.4186E-03	0	0	0	0	1.000	5	140
R016	Petrol	>2000	Euro 1	1.1973E+01	-3.9874E-01	4.1904E-03	0	0	0	0	1.000	5	120
R017	Petrol	>2000	Euro 2	3.2349E+00	-6.1478E-02	5.8822E-04	0	0	0	0	1.000	5	140
R018	Petrol	>2000	Euro 3	4.3557E-01	-7.5001E-03	1.5627E-04	0	0	0	0	1.000	5	140
R019	Petrol	>2000	Euro 4	4.0700E-02	1.4336E-02	-6.6412E-04	1.8479E-05	-2.3295E-07	1.5054E-09	-3.4119E-12	1.000	5	120
R020	Petrol	>2000	Euro 5	4.0700E-02	1.4336E-02	-6.6412E-04	1.8479E-05	-2.3295E-07	1.5054E-09	-3.4119E-12	0.897	5	120
R021	Petrol	>2000	Euro 6	4.0700E-02	1.4336E-02	-6.6412E-04	1.8479E-05	-2.3295E-07	1.5054E-09	-3.4119E-12	0.897	5	120

Table D5: HC emission factors for diesel cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R022	Diesel	<1400	Pre-Euro 1	4.2915E+00	3.7700E-02	0	0	0	0	0	1.000	5	120
R023	Diesel	<1400	Euro 1	3.0760E+00	9.2000E-03	0	0	0	0	0	1.000	5	120
R024	Diesel	<1400	Euro 2	1.5670E+00	1.2700E-02	0	0	0	0	0	1.000	5	140
R025	Diesel	<1400	Euro 3	9.5460E-01	2.3000E-03	0	0	0	0	0	1.000	5	140
R026	Diesel	<1400	Euro 4	2.932E-01	1.41E-02	0	0	0	0	0	1.000	5	140
R027	Diesel	<1400	Euro 5	2.932E-01	1.41E-02	0	0	0	0	0	1.000	5	140
R028	Diesel	<1400	Euro 6	2.932E-01	1.41E-02	0	0	0	0	0	1.000	5	140
R029	Diesel	1400-2000	Pre-Euro 1	4.2915E+00	3.7700E-02	0	0	0	0	0	1.000	5	120
R030	Diesel	1400-2000	Euro 1	3.0760E+00	9.2000E-03	0	0	0	0	0	1.000	5	120
R031	Diesel	1400-2000	Euro 2	1.5670E+00	1.2700E-02	0	0	0	0	0	1.000	5	140
R032	Diesel	1400-2000	Euro 3	9.5460E-01	2.3000E-03	0	0	0	0	0	1.000	5	140
R033	Diesel	1400-2000	Euro 4	2.932E-01	1.41E-02	0	0	0	0	0	1.000	5	140
R034	Diesel	1400-2000	Euro 5	2.932E-01	1.41E-02	0	0	0	0	0	1.000	5	140
R035	Diesel	1400-2000	Euro 6	2.932E-01	1.41E-02	0	0	0	0	0	1.000	5	140
R036	Diesel	>2000	Pre-Euro 1	3.6494E+00	4.3700E-02	0	0	0	0	0	1.000	5	120
R037	Diesel	>2000	Euro 1	3.2304E+00	3.8000E-03	0	0	0	0	0	1.000	5	120
R038	Diesel	>2000	Euro 2	2.8073E+00	1.5100E-02	0	0	0	0	0	1.000	5	140
R039	Diesel	>2000	Euro 3	4.8119E-01	6.9553E-03	-3.7220E-05	0	0	0	0	1.000	5	120
R040	Diesel	>2000	Euro 4	4.8119E-01	6.9553E-03	-3.7220E-05	0	0	0	0	0.833	5	120
R041	Diesel	>2000	Euro 5	4.8119E-01	6.9553E-03	-3.7220E-05	0	0	0	0	0.833	5	120
R042	Diesel	>2000	Euro 6	4.8119E-01	6.9553E-03	-3.7220E-05	0	0	0	0	0.833	5	120

Table D6: HC emission factors for LPG cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R043	LPG	All	Euro 1	2.4060E-01	3.1200E-02	0	0	0	0	0	1.940	5	120
R044	LPG	All	Euro 2	2.4060E-01	3.1200E-02	0	0	0	0	0	1.000	5	120
R045	LPG	All	Euro 3	3.7892E+00	-7.4000E-03	0	0	0	0	0	1.000	5	120
R046	LPG	All	Euro 4	3.7892E+00	-7.4000E-03	0	0	0	0	0	0.500	5	120
R047	LPG	All	Euro 5	3.7892E+00	-7.4000E-03	0	0	0	0	0	0.500	5	120
R048	LPG	All	Euro 6	3.7892E+00	-7.4000E-03	0	0	0	0	0	0.500	5	120

Table D7: NO_x emission factors for petrol cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R001	Petrol	<1400	Pre-Euro 1	1.0961E+01	2.4560E-01	2.1200E-02	0	0	0	0	1.000	5	140
R002	Petrol	<1400	Euro 1	2.8772E+00	2.1805E-01	1.2959E-03	2.8540E-06	2.5071E-08	0	0	1.000	5	120
R003	Petrol	<1400	Euro 2	2.8180E+00	2.1812E-02	-1.0474E-04	9.4734E-06	-7.2580E-08	4.4225E-10	0	1.000	5	140
R004	Petrol	<1400	Euro 3	6.0676E-01	2.1434E-02	3.3843E-04	-9.3336E-07	1.8256E-08	0	0	1.000	5	140
R005	Petrol	<1400	Euro 4	8.8707E-01	9.7612E-03	9.9085E-05	1.8366E-07	0	0	0	1.000	5	120
R006	Petrol	<1400	Euro 5	8.8707E-01	9.7612E-03	9.9085E-05	1.8366E-07	0	0	0	0.594	5	120
R007	Petrol	<1400	Euro 6	8.8707E-01	9.7612E-03	9.9085E-05	1.8366E-07	0	0	0	0.594	5	120
R008	Petrol	1400-2000	Pre-Euro 1	5.8816E+00	6.8360E-01	1.3900E-02	0	0	0	0	1.000	5	140
R009	Petrol	1400-2000	Euro 1	2.3658E+00	1.9926E-01	6.4711E-04	3.2209E-06	0	0	0	1.000	5	120
R010	Petrol	1400-2000	Euro 2	1.0953E+00	1.2012E-01	6.1347E-04	1.1673E-06	8.7791E-09	0	0	1.000	5	140
R011	Petrol	1400-2000	Euro 3	4.3704E-01	6.1360E-02	8.0217E-05	8.8339E-08	0	0	0	1.000	5	140
R012	Petrol	1400-2000	Euro 4	5.1691E-01	3.4502E-02	5.4927E-05	4.0848E-07	0	0	0	1.000	5	120
R013	Petrol	1400-2000	Euro 5	5.1691E-01	3.4502E-02	5.4927E-05	4.0848E-07	0	0	0	0.594	5	120
R014	Petrol	1400-2000	Euro 6	5.1691E-01	3.4502E-02	5.4927E-05	4.0848E-07	0	0	0	0.594	5	120
R015	Petrol	>2000	Pre-Euro 1	2.0292E+01	9.1136E-01	1.3899E-02	-3.5810E-05	7.3584E-07	0	0	1.000	5	140
R016	Petrol	>2000	Euro 1	4.9237E+00	7.3510E-02	7.4324E-04	2.9545E-07	3.3257E-08	0	0	1.000	5	120
R017	Petrol	>2000	Euro 2	1.9784E+00	5.6400E-02	1.5000E-03	0	0	0	0	1.000	5	140
R018	Petrol	>2000	Euro 3	2.4307E+00	-2.5786E-03	6.2637E-04	-1.6871E-05	3.0312E-07	-2.3089E-09	8.5891E-12	1.000	5	140
R019	Petrol	>2000	Euro 4	2.6347E+00	3.7090E-03	2.8910E-04	3.1118E-07	0	0	0	1.000	5	120
R020	Petrol	>2000	Euro 5	2.6347E+00	3.7090E-03	2.8910E-04	3.1118E-07	0	0	0	0.594	5	120
R021	Petrol	>2000	Euro 6	2.6347E+00	3.7090E-03	2.8910E-04	3.1118E-07	0	0	0	0.594	5	120

Table D8: NO_x emission factors for diesel cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R022	Diesel	<1400	Pre-Euro 1	1.1891E+01	1.8677E-01	2.6783E-03	-4.4626E-06	1.6608E-07	0	0	1.000	5	120
R023	Diesel	<1400	Euro 1	1.1209E+01	1.5753E-01	1.2389E-03	2.2664E-05	-8.3039E-08	1.0851E-09	0	1.000	5	120
R024	Diesel	<1400	Euro 2	1.4764E+01	1.7674E-01	-3.0047E-04	6.4262E-05	-4.6197E-07	2.9617E-09	0	1.000	5	140
R025	Diesel	<1400	Euro 3	9.2938E+00	1.6837E-01	1.1791E-03	1.4993E-05	-3.7474E-08	4.9719E-10	0	1.000	5	140
R026	Diesel	<1400	Euro 4	5.4853E+00	1.2308E-01	6.7075E-04	2.0770E-05	-9.9725E-08	8.4951E-10	0	1.000	5	140
R027	Diesel	<1400	Euro 5	5.4853E+00	1.2308E-01	6.7075E-04	2.0770E-05	-9.9725E-08	8.4951E-10	0	0.675	5	140
R028	Diesel	<1400	Euro 6	5.4853E+00	1.2308E-01	6.7075E-04	2.0770E-05	-9.9725E-08	8.4951E-10	0	0.300	5	140
R029	Diesel	1400-2000	Pre-Euro 1	1.1891E+01	1.8677E-01	2.6783E-03	-4.4626E-06	1.6608E-07	0	0	1.000	5	120
R030	Diesel	1400-2000	Euro 1	1.1209E+01	1.5753E-01	1.2389E-03	2.2664E-05	-8.3039E-08	1.0851E-09	0	1.000	5	120
R031	Diesel	1400-2000	Euro 2	1.4764E+01	1.7674E-01	-3.0047E-04	6.4262E-05	-4.6197E-07	2.9617E-09	0	1.000	5	140
R032	Diesel	1400-2000	Euro 3	9.2938E+00	1.6837E-01	1.1791E-03	1.4993E-05	-3.7474E-08	4.9719E-10	0	1.000	5	140
R033	Diesel	1400-2000	Euro 4	5.4853E+00	1.2308E-01	6.7075E-04	2.0770E-05	-9.9725E-08	8.4951E-10	0	1.000	5	140
R034	Diesel	1400-2000	Euro 5	5.4853E+00	1.2308E-01	6.7075E-04	2.0770E-05	-9.9725E-08	8.4951E-10	0	0.675	5	140
R035	Diesel	1400-2000	Euro 6	5.4853E+00	1.2308E-01	6.7075E-04	2.0770E-05	-9.9725E-08	8.4951E-10	0	0.300	5	140
R036	Diesel	>2000	Pre-Euro 1	1.1555E+01	1.9454E-01	3.2370E-03	-8.3720E-06	2.2158E-07	0	0	1.000	5	120
R037	Diesel	>2000	Euro 1	1.8951E+01	1.2257E-01	-2.1770E-03	1.0643E-04	-1.0625E-06	6.7350E-09	0	1.000	5	120
R038	Diesel	>2000	Euro 2	1.8413E+01	1.9453E-01	5.5988E-04	4.8253E-05	-2.9283E-07	2.1257E-09	0	1.000	5	140
R039	Diesel	>2000	Euro 3	1.5897E+01	1.1491E-01	1.7938E-04	4.4201E-05	-3.3264E-07	2.6643E-09	0	1.000	5	120
R040	Diesel	>2000	Euro 4	1.5897E+01	1.1491E-01	1.7938E-04	4.4201E-05	-3.3264E-07	2.6643E-09	0	0.500	5	120
R041	Diesel	>2000	Euro 5	1.5897E+01	1.1491E-01	1.7938E-04	4.4201E-05	-3.3264E-07	2.6643E-09	0	0.338	5	120
R042	Diesel	>2000	Euro 6	1.5897E+01	1.1491E-01	1.7938E-04	4.4201E-05	-3.3264E-07	2.6643E-09	0	0.150	5	120

Table D9: NO_x emission factors for LPG cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R043	LPG	All	Euro 1	8.0249E+00	-4.6199E-02	2.7312E-05	0	0	0	0	1.940	5	120
R044	LPG	All	Euro 2	8.0249E+00	-4.6199E-02	2.7312E-05	0	0	0	0	1.000	5	120
R045	LPG	All	Euro 3	5.9598E+00	1.0112E-01	1.8804E-03	-6.1312E-06	1.3694E-07	0	0	1.000	5	120
R046	LPG	All	Euro 4	5.9598E+00	1.0112E-01	1.8804E-03	-6.1312E-06	1.3694E-07	0	0	0.533	5	120
R047	LPG	All	Euro 5	5.9598E+00	1.0112E-01	1.8804E-03	-6.1312E-06	1.3694E-07	0	0	0.400	5	120
R048	LPG	All	Euro 6	5.9598E+00	1.0112E-01	1.8804E-03	-6.1312E-06	1.3694E-07	0	0	0.400	5	120

Table D10: PM emission factors for petrol cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R001	Petrol	<1400	Pre-Euro 1	4.5494E-02	1.6612E-03	-2.7112E-06	7.8895E-07	-6.4924E-09	4.8650E-11	0	1.000	5	120
R002	Petrol	<1400	Euro 1	2.8708E-02	7.2084E-04	4.8988E-06	1.4697E-07	-7.5246E-10	7.8505E-12	0	1.000	5	120
R003	Petrol	<1400	Euro 2	2.8708E-02	7.2084E-04	4.8988E-06	1.4697E-07	-7.5246E-10	7.8505E-12	0	1.000	5	120
R004	Petrol	<1400	Euro 3	2.8708E-02	7.2084E-04	4.8988E-06	1.4697E-07	-7.5246E-10	7.8505E-12	0	1.000	5	120
R005	Petrol	<1400	Euro 4	2.8708E-02	7.2084E-04	4.8988E-06	1.4697E-07	-7.5246E-10	7.8505E-12	0	1.000	5	120
R006	Petrol	<1400	Euro 5	2.8708E-02	7.2084E-04	4.8988E-06	1.4697E-07	-7.5246E-10	7.8505E-12	0	1.000	5	120
R007	Petrol	<1400	Euro 6	2.8708E-02	7.2084E-04	4.8988E-06	1.4697E-07	-7.5246E-10	7.8505E-12	0	1.000	5	120
R008	Petrol	1400-2000	Pre-Euro 1	3.2355E-02	1.1605E-03	-1.2941E-06	5.3476E-07	-4.3484E-09	3.2883E-11	0	1.000	5	120
R009	Petrol	1400-2000	Euro 1	3.2355E-02	1.1605E-03	-1.2941E-06	5.3476E-07	-4.3484E-09	3.2883E-11	0	1.000	5	120
R010	Petrol	1400-2000	Euro 2	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120
R011	Petrol	1400-2000	Euro 3	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120
R012	Petrol	1400-2000	Euro 4	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120
R013	Petrol	1400-2000	Euro 5	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120
R014	Petrol	1400-2000	Euro 6	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120
R015	Petrol	>2000	Pre-Euro 1	8.7122E-02	2.3771E-03	1.3119E-05	6.0805E-07	-3.6636E-09	3.4261E-11	0	1.000	5	120
R016	Petrol	>2000	Euro 1	6.7263E-02	1.8112E-03	1.0414E-05	4.4757E-07	-2.6362E-09	2.5034E-11	0	1.000	5	120
R017	Petrol	>2000	Euro 2	6.7263E-02	1.8112E-03	1.0414E-05	4.4757E-07	-2.6362E-09	2.5034E-11	0	1.000	5	120
R018	Petrol	>2000	Euro 3	6.7263E-02	1.8112E-03	1.0414E-05	4.4757E-07	-2.6362E-09	2.5034E-11	0	1.000	5	120
R019	Petrol	>2000	Euro 4	6.7263E-02	1.8112E-03	1.0414E-05	4.4757E-07	-2.6362E-09	2.5034E-11	0	1.000	5	120
R020	Petrol	>2000	Euro 5	6.7263E-02	1.8112E-03	1.0414E-05	4.4757E-07	-2.6362E-09	2.5034E-11	0	1.000	5	120
R021	Petrol	>2000	Euro 6	6.7263E-02	1.8112E-03	1.0414E-05	4.4757E-07	-2.6362E-09	2.5034E-11	0	1.000	5	120

Table D11: PM emission factors for diesel cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R022	Diesel	<1400	Pre-Euro 1	3.2459E+00	1.0227E-01	6.3326E-04	1.3601E-06	1.3272E-08	0	0	1.000	5	120
R023	Diesel	<1400	Euro 1	1.2161E+00	1.2815E-02	4.6629E-05	4.1085E-06	-2.8257E-08	2.4129E-10	0	1.000	5	120
R024	Diesel	<1400	Euro 2	4.3527E-01	1.5628E-02	-7.7359E-05	6.8387E-06	-5.2527E-08	3.1939E-10	0	1.000	5	140
R025	Diesel	<1400	Euro 3	5.1115E-01	1.7231E-02	1.7563E-04	-7.5726E-08	6.9129E-09	0	0	1.000	5	140
R026	Diesel	<1400	Euro 4	2.5300E-01	1.6889E-02	1.2237E-04	1.3472E-07	3.2067E-09	0	0	1.000	5	140
R027	Diesel	<1400	Euro 5	0	5E-04	0	0	0	0	0	1.000	5	140
R028	Diesel	<1400	Euro 6	0	5E-04	0	0	0	0	0	1.000	5	140
R029	Diesel	1400-2000	Pre-Euro 1	3.2459E+00	1.0227E-01	6.3326E-04	1.3601E-06	1.3272E-08	0	0	1.000	5	120
R030	Diesel	1400-2000	Euro 1	1.2161E+00	1.2815E-02	4.6629E-05	4.1085E-06	-2.8257E-08	2.4129E-10	0	1.000	5	120
R031	Diesel	1400-2000	Euro 2	4.3527E-01	1.5628E-02	-7.7359E-05	6.8387E-06	-5.2527E-08	3.1939E-10	0	1.000	5	140
R032	Diesel	1400-2000	Euro 3	5.1115E-01	1.7231E-02	1.7563E-04	-7.5726E-08	6.9129E-09	0	0	1.000	5	140
R033	Diesel	1400-2000	Euro 4	2.5300E-01	1.6889E-02	1.2237E-04	1.3472E-07	3.2067E-09	0	0	1.000	5	140
R034	Diesel	1400-2000	Euro 5	0	5E-04	0	0	0	0	0	1.000	5	140
R035	Diesel	1400-2000	Euro 6	0	5E-04	0	0	0	0	0	1.000	5	140
R036	Diesel	>2000	Pre-Euro 1	2.8354E+00	-1.4792E-02	1.4201E-03	-5.1136E-05	9.6833E-07	-8.6719E-09	3.3723E-11	1.929	5	120
R037	Diesel	>2000	Euro 1	2.8354E+00	-1.4792E-02	1.4201E-03	-5.1136E-05	9.6833E-07	-8.6719E-09	3.3723E-11	1.000	5	120
R038	Diesel	>2000	Euro 2	8.7023E-01	1.8501E-02	1.4929E-04	2.2924E-06	-6.9493E-09	1.0348E-10	0	1.000	5	120
R039	Diesel	>2000	Euro 3	3.5385E-01	1.7187E-02	4.5847E-05	1.3890E-07	0	0	0	1.000	5	120
R040	Diesel	>2000	Euro 4	2.8290E-01	-9.5926E-03	7.1213E-04	-2.2677E-05	3.5258E-07	-2.6460E-09	7.8813E-12	1.000	5	140
R041	Diesel	>2000	Euro 5	0	5E-04	0	0	0	0	0	1.000	5	140
R042	Diesel	>2000	Euro 6	0	5E-04	0	0	0	0	0	1.000	5	140

Table D12: PM emission factors for LPG cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R043	LPG	All	Euro 1	3.2355E-02	1.1605E-03	-1.2941E-06	5.3476E-07	-4.3484E-09	3.2883E-11	0	1.000	5	120
R044	LPG	All	Euro 2	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120
R045	LPG	All	Euro 3	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120
R046	LPG	All	Euro 4	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120
R047	LPG	All	Euro 5	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120
R048	LPG	All	Euro 6	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120

D2 Cars and minibuses 2.5-3.5 tonnes

Table D13: CO emission factors for cars and minibuses 2.5-3.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R049	Petrol	All	Pre-Euro 1	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	3.935	5	120
R050	Petrol	All	Euro 1	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	1.000	5	120
R051	Petrol	All	Euro 2	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	1.000	5	120
R052	Petrol	All	Euro 3	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	1.000	5	120
R053	Petrol	All	Euro 4	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	1.000	5	120
R054	Petrol	All	Euro 5	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	0.822	5	120
R055	Petrol	All	Euro 6	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	0.822	5	120
R056	Diesel	All	Pre-Euro 1	2.8866E+01	-1.8153E-03	7.6069E-04	0	0	0	0	3.935	5	120
R057	Diesel	All	Euro 1	1.4148E+01	1.1423E+00	-4.3263E-03	0	0	0	0	0.633	5	120
R058	Diesel	All	Euro 2	1.4148E+01	1.1423E+00	-4.3263E-03	0	0	0	0	0.633	5	120
R059	Diesel	All	Euro 3	1.4148E+01	1.1423E+00	-4.3263E-03	0	0	0	0	0.633	5	120
R060	Diesel	All	Euro 4	1.4148E+01	1.1423E+00	-4.3263E-03	0	0	0	0	0.633	5	120
R061	Diesel	All	Euro 5	1.4148E+01	1.1423E+00	-4.3263E-03	0	0	0	0	0.505	5	120
R062	Diesel	All	Euro 6	1.4148E+01	1.1423E+00	-4.3263E-03	0	0	0	0	0.505	5	120

Table D14: HC emission factors for cars and minibuses 2.5-3.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission Standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R049	Petrol	All	Pre-Euro 1	2.7087E+00	3.2137E-02	2.6228E-04	0	0	0	0	4.065	5	120
R050	Petrol	All	Euro 1	2.7087E+00	3.2137E-02	2.6228E-04	0	0	0	0	1.000	5	120
R051	Petrol	All	Euro 2	9.2146E+00	-2.8708E-01	2.8410E-03	0	0	0	0	1.000	5	120
R052	Petrol	All	Euro 3	9.2146E+00	-2.8708E-01	2.8410E-03	0	0	0	0	0.625	5	120
R053	Petrol	All	Euro 4	9.2146E+00	-2.8708E-01	2.8410E-03	0	0	0	0	0.363	5	120
R054	Petrol	All	Euro 5	9.2146E+00	-2.8708E-01	2.8410E-03	0	0	0	0	0.325	5	120
R055	Petrol	All	Euro 6	9.2146E+00	-2.8708E-01	2.8410E-03	0	0	0	0	0.325	5	120
R056	Diesel	All	Pre-Euro 1	4.9011E+00	8.0067E-02	-1.4086E-04	0	0	0	0	4.319	5	120
R057	Diesel	All	Euro 1	4.9011E+00	8.0067E-02	-1.4086E-04	0	0	0	0	1.063	5	120
R058	Diesel	All	Euro 2	4.9011E+00	8.0067E-02	-1.4086E-04	0	0	0	0	1.000	5	140
R059	Diesel	All	Euro 3	4.9011E+00	8.0067E-02	-1.4086E-04	0	0	0	0	0.450	5	140
R060	Diesel	All	Euro 4	4.9011E+00	8.0067E-02	-1.4086E-04	0	0	0	0	0.288	5	140
R061	Diesel	All	Euro 5	4.9011E+00	8.0067E-02	-1.4086E-04	0	0	0	0	0.288	5	140
R062	Diesel	All	Euro 6	4.9011E+00	8.0067E-02	-1.4086E-04	0	0	0	0	0.288	5	140

Table D15: NO_x emission factors for cars and minibuses 2.5-3.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R049	Petrol	All	Pre-Euro 1	2.1701E+01	5.3361E-02	-3.8340E-03	1.1977E-04	-1.8756E-06	1.6649E-08	0	4.065	5	120
R050	Petrol	All	Euro 1	2.1701E+01	5.3361E-02	-3.8340E-03	1.1977E-04	-1.8756E-06	1.6649E-08	0	1.000	5	120
R051	Petrol	All	Euro 2	4.9653E+00	-3.1279E-03	2.0017E-03	-5.8552E-05	1.2458E-06	-1.0887E-08	4.7975E-11	1.000	5	120
R052	Petrol	All	Euro 3	4.9653E+00	-3.1279E-03	2.0017E-03	-5.8552E-05	1.2458E-06	-1.0887E-08	4.7975E-11	0.625	5	120
R053	Petrol	All	Euro 4	4.9653E+00	-3.1279E-03	2.0017E-03	-5.8552E-05	1.2458E-06	-1.0887E-08	4.7975E-11	0.363	5	120
R054	Petrol	All	Euro 5	4.9653E+00	-3.1279E-03	2.0017E-03	-5.8552E-05	1.2458E-06	-1.0887E-08	4.7975E-11	0.215	5	120
R055	Petrol	All	Euro 6	4.9653E+00	-3.1279E-03	2.0017E-03	-5.8552E-05	1.2458E-06	-1.0887E-08	4.7975E-11	0.215	5	120
R056	Diesel	All	Pre-Euro 1	1.8899E+01	2.3752E-01	6.5885E-04	8.2645E-05	-5.9285E-07	4.9146E-09	0	2.879	5	120
R057	Diesel	All	Euro 1	1.8899E+01	2.3752E-01	6.5885E-04	8.2645E-05	-5.9285E-07	4.9146E-09	0	1.000	5	120
R058	Diesel	All	Euro 2	2.3672E+01	2.4346E-01	-2.6060E-03	1.3632E-04	-1.1298E-06	6.4273E-09	0	1.000	5	140
R059	Diesel	All	Euro 3	1.5749E+01	1.4385E-01	-1.3657E-03	7.6950E-05	-6.2937E-07	3.6243E-09	0	1.000	5	140
R060	Diesel	All	Euro 4	1.5749E+01	1.4385E-01	-1.3657E-03	7.6950E-05	-6.2937E-07	3.6243E-09	0	0.500	5	140
R061	Diesel	All	Euro 5	1.5749E+01	1.4385E-01	-1.3657E-03	7.6950E-05	-6.2937E-07	3.6243E-09	0	0.338	5	140
R062	Diesel	All	Euro 6	1.5749E+01	1.4385E-01	-1.3657E-03	7.6950E-05	-6.2937E-07	3.6243E-09	0	0.150	5	140

Table D16: PM emission factors for cars and minibuses 2.5-3.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R049	Petrol	All	Pre-Euro 1	8.7122E-02	2.3771E-03	1.3119E-05	6.0805E-07	-3.6636E-09	3.4261E-11	0	1.000	5	120
R050	Petrol	All	Euro 1	6.7263E-02	1.8112E-03	1.0414E-05	4.4757E-07	-2.6362E-09	2.5034E-11	0	1.000	5	120
R051	Petrol	All	Euro 2	1.7050E-02	8.9762E-04	-1.1359E-05	6.7408E-07	-6.4666E-09	4.2618E-11	0	1.000	5	120
R052	Petrol	All	Euro 3	1.9957E-02	3.3780E-04	6.0024E-06	-1.7930E-08	4.2668E-10	0	0	1.000	5	120
R053	Petrol	All	Euro 4	2.2826E-02	2.9159E-04	2.1651E-06	3.7445E-09	6.2825E-11	0	0	1.000	5	120
R054	Petrol	All	Euro 5	2.2826E-02	2.9159E-04	2.1651E-06	3.7445E-09	6.2825E-11	0	0	1.000	5	120
R055	Petrol	All	Euro 6	2.2826E-02	2.9159E-04	2.1651E-06	3.7445E-09	6.2825E-11	0	0	1.000	5	120
R056	Diesel	All	Pre-Euro 1	2.8354E+00	-1.4792E-02	1.4201E-03	-5.1136E-05	9.6833E-07	-8.6719E-09	3.3723E-11	1.929	5	120
R057	Diesel	All	Euro 1	2.8354E+00	-1.4792E-02	1.4201E-03	-5.1136E-05	9.6833E-07	-8.6719E-09	3.3723E-11	1.000	5	120
R058	Diesel	All	Euro 2	8.7023E-01	1.8501E-02	1.4929E-04	2.2924E-06	-6.9493E-09	1.0348E-10	0	1.000	5	120
R059	Diesel	All	Euro 3	3.5385E-01	1.7187E-02	4.5847E-05	1.3890E-07	0	0	0	1.000	5	120
R060	Diesel	All	Euro 4	2.8290E-01	-9.5926E-03	7.1213E-04	-2.2677E-05	3.5258E-07	-2.6460E-09	7.8813E-12	1.000	5	140
R061	Diesel	All	Euro 5	0	5E-04	0	0	0	0	0	1.000	5	140
R062	Diesel	All	Euro 6	0	5E-04	0	0	0	0	0	1.000	5	140

D3 Taxis (black cabs)

Table D17: CO emission factors for taxis (black cabs).

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R063	Diesel	All	Pre-Euro 1	2.1989E+01	-1.1736E-01	7.7740E-03	0	0	0	0	1	5	120
R064	Diesel	All	Euro 1	1.4858E+01	1.9831E-01	8.4288E-04	0	0	0	0	1	5	120
R065	Diesel	All	Euro 2	1.7473E+01	-4.9323E-02	5.7938E-03	0	0	0	0	1	5	120
R066	Diesel	All	Euro 3	7.1593E+00	2.6066E-03	4.7939E-04	0	0	0	0	1	5	120
R067	Diesel	All	Euro 4	7.1593E+00	2.6066E-03	4.7939E-04	0	0	0	0	0.779	5	120
R068	Diesel	All	Euro 5	7.1593E+00	2.6066E-03	4.7939E-04	0	0	0	0	0.622	5	120
R069	Diesel	All	Euro 6	7.1593E+00	2.6066E-03	4.7939E-04	0	0	0	0	0.622	5	120

Table D18: HC emission factors for taxis (black cabs).

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R063	Diesel	All	Pre-Euro 1	3.0979E+00	9.6000E-02	0.0000E+00	0	0	0	0	1	5	120
R064	Diesel	All	Euro 1	3.0933E+00	2.2419E-02	-6.5755E-05	0	0	0	0	1	5	120
R065	Diesel	All	Euro 2	2.0654E+00	2.7482E-02	2.1867E-04	3.2671E-07	7.0848E-09	0	0	1	5	120
R066	Diesel	All	Euro 3	1.7242E+00	-1.0325E-02	1.7112E-04	0	0	0	0	1	5	120
R067	Diesel	All	Euro 4	1.7242E+00	-1.0325E-02	1.7112E-04	0	0	0	0	0.875	5	120
R068	Diesel	All	Euro 5	1.7242E+00	-1.0325E-02	1.7112E-04	0	0	0	0	0.875	5	120
R069	Diesel	All	Euro 6	1.7242E+00	-1.0325E-02	1.7112E-04	0	0	0	0	0.875	5	120

Table D19: NO_x emission factors for taxis (black cabs).

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R063	Diesel	All	Pre-Euro 1	2.6057E+01	4.3548E-01	6.8000E-03	-1.4923E-05	4.4731E-07	0	0	1.250	5	120
R064	Diesel	All	Euro 1	1.4830E+01	3.3621E-01	2.6132E-03	5.0694E-05	-1.9580E-07	2.4685E-09	0	1.300	5	120
R065	Diesel	All	Euro 2	1.6254E+01	3.8407E-01	2.8631E-03	6.5599E-05	-2.8779E-07	3.3297E-09	0	1.250	5	120
R066	Diesel	All	Euro 3	1.1060E+01	2.8838E-01	1.8082E-03	6.5323E-05	-3.6225E-07	3.5825E-09	0	1.000	5	120
R067	Diesel	All	Euro 4	1.1060E+01	2.8838E-01	1.8082E-03	6.5323E-05	-3.6225E-07	3.5825E-09	0	0.500	5	120
R068	Diesel	All	Euro 5	1.1060E+01	2.8838E-01	1.8082E-03	6.5323E-05	-3.6225E-07	3.5825E-09	0	0.337	5	120
R069	Diesel	All	Euro 6	1.1060E+01	2.8838E-01	1.8082E-03	6.5323E-05	-3.6225E-07	3.5825E-09	0	0.150	5	120

Table D20: PM emission factors for taxis (black cabs).

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R063	Diesel	All	Pre-Euro 1	5.1485E+00	1.1463E-01	8.5320E-04	1.4693E-06	2.4853E-08	0	0	1	5	120
R064	Diesel	All	Euro 1	2.1211E+00	3.3155E-02	1.2142E-05	1.3903E-05	-1.087E-07	8.4666E-10	0	1	5	120
R065	Diesel	All	Euro 2	8.3891E-01	6.4584E-02	4.8517E-04	8.2123E-07	1.435E-08	0	0	1	5	120
R066	Diesel	All	Euro 3	1.6784E+00	-2.3148E-04	4.7255E-04	-1.346E-05	2.9E-07	-2.524E-09	1.1222E-11	1	5	120
R067	Diesel	All	Euro 4	1.6784E+00	-2.3148E-04	4.7255E-04	-1.346E-05	2.9E-07	-2.524E-09	1.1222E-11	0.600	5	120
R068	Diesel	All	Euro 5	0	0.0005	0	0	0	0	0	1.000	5	120
R069	Diesel	All	Euro 6	0	0.0005	0	0	0	0	0	1.000	5	120

D4 Light goods/commercial vehicles: N1(I)

Table D21: CO emission factors for N1(I) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R070	Petrol	All	Pre-Euro 1	5.1982E+02	5.6485E-02	1.7898E-02	0	0	0	0	1.000	5	140
R071	Petrol	All	Euro 1	2.5453E+02	-5.7171E+00	7.3371E-02	0	0	0	0	1.000	5	120
R072	Petrol	All	Euro 2	1.2312E+02	-5.8139E+00	6.9583E-02	0	0	0	0	1.000	5	140
R073	Petrol	All	Euro 3	6.6605E+00	-3.0823E-01	3.2383E-02	-9.7346E-04	1.6499E-05	-1.2746E-07	4.4713E-10	1.000	5	140
R074	Petrol	All	Euro 4	6.6605E+00	-3.0823E-01	3.2383E-02	-9.7346E-04	1.6499E-05	-1.2746E-07	4.4713E-10	1.000	5	140
R075	Petrol	All	Euro 5	6.6605E+00	-3.0823E-01	3.2383E-02	-9.7346E-04	1.6499E-05	-1.2746E-07	4.4713E-10	0.822	5	140
R076	Petrol	All	Euro 6	6.6605E+00	-3.0823E-01	3.2383E-02	-9.7346E-04	1.6499E-05	-1.2746E-07	4.4713E-10	0.822	5	140
R077	Diesel	All	Pre-Euro 1	1.6412E+01	-1.6111E-01	5.4725E-03	0	0	0	0	4.085	5	120
R078	Diesel	All	Euro 1	1.6412E+01	-1.6111E-01	5.4725E-03	0	0	0	0	1.000	5	120
R079	Diesel	All	Euro 2	1.6412E+01	-1.6111E-01	5.4725E-03	0	0	0	0	1.563	5	120
R080	Diesel	All	Euro 3	9.8932E+00	-1.5598E-01	8.0683E-04	0	0	0	0	1.000	5	120
R081	Diesel	All	Euro 4	9.8932E+00	-1.5598E-01	8.0683E-04	0	0	0	0	0.781	5	120
R082	Diesel	All	Euro 5	9.8932E+00	-1.5598E-01	8.0683E-04	0	0	0	0	0.623	5	120
R083	Diesel	All	Euro 6	9.8932E+00	-1.5598E-01	8.0683E-04	0	0	0	0	0.623	5	120

Table D22: HC emission factors for N1(I) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R070	Petrol	All	Pre-Euro 1	6.5504E+01	8.7000E-02	0	0	0	0	0	1.000	5	140
R071	Petrol	All	Euro 1	1.8170E+01	-3.1736E-01	2.7224E-03	0	0	0	0	1.000	5	120
R072	Petrol	All	Euro 2	3.1725E+00	-7.1245E-02	8.8907E-04	0	0	0	0	1.000	5	140
R073	Petrol	All	Euro 3	5.0408E-01	-1.7082E-03	5.3430E-04	3.4214E-06	-2.2735E-07	2.4575E-09	-7.6339E-12	1.000	5	140
R074	Petrol	All	Euro 4	5.0408E-01	-1.7082E-03	5.3430E-04	3.4214E-06	-2.2735E-07	2.4575E-09	-7.6339E-12	0.500	5	140
R075	Petrol	All	Euro 5	5.0408E-01	-1.7082E-03	5.3430E-04	3.4214E-06	-2.2735E-07	2.4575E-09	-7.6339E-12	0.449	5	140
R076	Petrol	All	Euro 6	5.0408E-01	-1.7082E-03	5.3430E-04	3.4214E-06	-2.2735E-07	2.4575E-09	-7.6339E-12	0.449	5	140
R077	Diesel	All	Pre-Euro 1	3.1055E+00	2.0800E-02	0	0	0	0	0	3.814	5	120
R078	Diesel	All	Euro 1	3.1055E+00	2.0800E-02	0	0	0	0	0	1.000	5	120
R079	Diesel	All	Euro 2	1.4537E+00	5.0000E-03	0	0	0	0	0	1.000	5	120
R080	Diesel	All	Euro 3	1.3042E+00	-4.0000E-03	0	0	0	0	0	1.000	5	120
R081	Diesel	All	Euro 4	1.3042E+00	-4.0000E-03	0	0	0	0	0	0.833	5	120
R082	Diesel	All	Euro 5	1.3042E+00	-4.0000E-03	0	0	0	0	0	0.833	5	120
R083	Diesel	All	Euro 6	1.3042E+00	-4.0000E-03	0	0	0	0	0	0.833	5	120

Table D23: NO_x emission factors for N1(I) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R070	Petrol	All	Pre-Euro 1	1.0961E+01	2.4560E-01	2.1200E-02	0	0	0	0	1.000	5	140
R071	Petrol	All	Euro 1	2.8772E+00	2.1805E-01	1.2959E-03	2.8540E-06	2.5071E-08	0	0	1.000	5	120
R072	Petrol	All	Euro 2	2.8180E+00	2.1812E-02	-1.0474E-04	9.4734E-06	-7.2580E-08	4.4225E-10	0	1.000	5	140
R073	Petrol	All	Euro 3	6.0676E-01	2.1434E-02	3.3843E-04	-9.3336E-07	1.8256E-08	0	0	1.000	5	140
R074	Petrol	All	Euro 4	8.0356E-01	1.6719E-02	1.0098E-05	0	0	0	0	1.000	5	120
R075	Petrol	All	Euro 5	8.0356E-01	1.6719E-02	1.0098E-05	0	0	0	0	0.594	5	120
R076	Petrol	All	Euro 6	8.0356E-01	1.6719E-02	1.0098E-05	0	0	0	0	0.594	5	120
R077	Diesel	All	Pre-Euro 1	1.1891E+01	1.8677E-01	2.6783E-03	-4.4626E-06	1.6608E-07	0	0	1.000	5	120
R078	Diesel	All	Euro 1	1.1209E+01	1.5753E-01	1.2389E-03	2.2664E-05	-8.3039E-08	1.0851E-09	0	1.000	5	120
R079	Diesel	All	Euro 2	1.4764E+01	1.7674E-01	-3.0047E-04	6.4262E-05	-4.6197E-07	2.9617E-09	0	1.000	5	140
R080	Diesel	All	Euro 3	9.2938E+00	1.6837E-01	1.1791E-03	1.4993E-05	-3.7474E-08	4.9719E-10	0	1.000	5	140
R081	Diesel	All	Euro 4	5.4853E+00	1.2308E-01	6.7075E-04	2.0770E-05	-9.9725E-08	8.4951E-10	0	1.000	5	140
R082	Diesel	All	Euro 5	5.4853E+00	1.2308E-01	6.7075E-04	2.0770E-05	-9.9725E-08	8.4951E-10	0	0.675	5	140
R083	Diesel	All	Euro 6	5.4853E+00	1.2308E-01	6.7075E-04	2.0770E-05	-9.9725E-08	8.4951E-10	0	0.300	5	140

Table D24: PM emission factors for N1(I) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R070	Petrol	All	Pre-Euro 1	4.5494E-02	1.6612E-03	-2.7112E-06	7.8895E-07	-6.4924E-09	4.8650E-11	0	1.000	5	120
R071	Petrol	All	Euro 1	2.8708E-02	7.2084E-04	4.8988E-06	1.4697E-07	-7.5246E-10	7.8505E-12	0	1.000	5	120
R072	Petrol	All	Euro 2	2.3012E-02	7.0743E-04	2.1227E-06	2.4115E-07	-1.7122E-09	1.4297E-11	0	1.000	5	120
R073	Petrol	All	Euro 3	2.6715E-02	6.7499E-04	4.5329E-06	1.4006E-07	-7.2716E-10	7.5162E-12	0	1.000	5	120
R074	Petrol	All	Euro 4	2.6715E-02	6.7499E-04	4.5329E-06	1.4006E-07	-7.2716E-10	7.5162E-12	0	1.000	5	120
R075	Petrol	All	Euro 5	2.6715E-02	6.7499E-04	4.5329E-06	1.4006E-07	-7.2716E-10	7.5162E-12	0	1.000	5	120
R076	Petrol	All	Euro 6	2.6715E-02	6.7499E-04	4.5329E-06	1.4006E-07	-7.2716E-10	7.5162E-12	0	1.000	5	120
R077	Diesel	All	Pre-Euro 1	8.1152E-01	2.4050E-02	9.2586E-05	7.5449E-06	-5.1292E-08	4.4156E-10	0	1.929	5	120
R078	Diesel	All	Euro 1	8.1152E-01	2.4050E-02	9.2586E-05	7.5449E-06	-5.1292E-08	4.4156E-10	0	1.000	5	120
R079	Diesel	All	Euro 2	8.3740E-01	1.2336E-02	9.7533E-05	1.7324E-06	-6.1704E-09	8.2202E-11	0	1.000	5	120
R080	Diesel	All	Euro 3	5.7563E-01	1.9544E-02	1.4093E-04	3.5950E-06	-1.6883E-08	1.8662E-10	0	1.000	5	120
R081	Diesel	All	Euro 4	5.7563E-01	1.9544E-02	1.4093E-04	3.5950E-06	-1.6883E-08	1.8662E-10	0	0.500	5	120
R082	Diesel	All	Euro 5	0	0.0005	0	0	0	0	0	1.000	5	120
R083	Diesel	All	Euro 6	0	0.0005	0	0	0	0	0	1.000	5	120

D5 Light goods/commercial vehicles: N1(II)

Table D25: CO emission factors for N1(II) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R084	Petrol	All	Pre-Euro 1	3.0368E+02	5.6129E+00	7.5867E-02	-2.1220E-05	5.4247E-06	0	0	1.000	5	100
R085	Petrol	All	Euro 1	6.0395E+00	3.9342E-01	3.6618E-03	0	0	0	0	1.293	5	100
R086	Petrol	All	Euro 2	6.0395E+00	3.9342E-01	3.6618E-03	0	0	0	0	1.000	5	100
R087	Petrol	All	Euro 3	6.0395E+00	3.9342E-01	3.6618E-03	0	0	0	0	1.043	5	100
R088	Petrol	All	Euro 4	6.0395E+00	3.9342E-01	3.6618E-03	0	0	0	0	0.453	5	100
R089	Petrol	All	Euro 5	6.0395E+00	3.9342E-01	3.6618E-03	0	0	0	0	0.372	5	100
R090	Petrol	All	Euro 6	6.0395E+00	3.9342E-01	3.6618E-03	0	0	0	0	0.372	5	100
R091	Diesel	All	Pre-Euro 1	5.8149E+01	-7.2550E-01	5.5614E-03	0	0	0	0	1.000	5	120
R092	Diesel	All	Euro 1	1.0193E+01	2.6884E-02	-5.6817E-06	0	0	0	0	4.136	5	120
R093	Diesel	All	Euro 2	1.0193E+01	2.6884E-02	-5.6817E-06	0	0	0	0	1.000	5	120
R094	Diesel	All	Euro 3	1.0193E+01	2.6884E-02	-5.6817E-06	0	0	0	0	0.640	5	120
R095	Diesel	All	Euro 4	1.0193E+01	2.6884E-02	-5.6817E-06	0	0	0	0	0.504	5	120
R096	Diesel	All	Euro 5	1.0193E+01	2.6884E-02	-5.6817E-06	0	0	0	0	0.402	5	120
R097	Diesel	All	Euro 6	1.0193E+01	2.6884E-02	-5.6817E-06	0	0	0	0	0.402	5	120

Table D26: HC emission factors for N1(II) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R084	Petrol	All	Pre-Euro 1	3.5086E+01	4.2680E-01	0	0	0	0	0	1.000	5	120
R085	Petrol	All	Euro 1	7.4013E-01	-2.2508E-02	4.0179E-04	0	0	0	0	2.154	5	120
R086	Petrol	All	Euro 2	3.3062E-01	-5.3967E-03	2.3250E-03	-9.5274E-05	1.6914E-06	-1.3721E-08	4.2334E-11	1.000	5	120
R087	Petrol	All	Euro 3	7.4013E-01	-2.2508E-02	4.0179E-04	0	0	0	0	0.662	5	120
R088	Petrol	All	Euro 4	7.4013E-01	-2.2508E-02	4.0179E-04	0	0	0	0	0.354	5	120
R089	Petrol	All	Euro 5	7.4013E-01	-2.2508E-02	4.0179E-04	0	0	0	0	0.318	5	120
R090	Petrol	All	Euro 6	7.4013E-01	-2.2508E-02	4.0179E-04	0	0	0	0	0.318	5	120
R091	Diesel	All	Pre-Euro 1	1.0176E+01	-4.3300E-02	0	0	0	0	0	1.000	5	120
R092	Diesel	All	Euro 1	1.6192E+00	1.7000E-03	0	0	0	0	0	1.077	5	120
R093	Diesel	All	Euro 2	1.6192E+00	1.7000E-03	0	0	0	0	0	1.000	5	120
R094	Diesel	All	Euro 3	1.6192E+00	1.7000E-03	0	0	0	0	0	0.554	5	120
R095	Diesel	All	Euro 4	1.6192E+00	1.7000E-03	0	0	0	0	0	0.300	5	120
R096	Diesel	All	Euro 5	1.6192E+00	1.7000E-03	0	0	0	0	0	0.300	5	120
R097	Diesel	All	Euro 6	1.6192E+00	1.7000E-03	0	0	0	0	0	0.300	5	120

Table D27: NO_x emission factors for N1(II) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R084	Petrol	All	Pre-Euro 1	2.2095E+00	5.8208E-03	2.2252E-03	-5.8614E-05	1.3090E-06	-1.1264E-08	5.1250E-11	8.923	5	120
R085	Petrol	All	Euro 1	2.2095E+00	5.8208E-03	2.2252E-03	-5.8614E-05	1.3090E-06	-1.1264E-08	5.1250E-11	2.154	5	120
R086	Petrol	All	Euro 2	2.2095E+00	5.8208E-03	2.2252E-03	-5.8614E-05	1.3090E-06	-1.1264E-08	5.1250E-11	1.000	5	120
R087	Petrol	All	Euro 3	2.2095E+00	5.8208E-03	2.2252E-03	-5.8614E-05	1.3090E-06	-1.1264E-08	5.1250E-11	0.662	5	120
R088	Petrol	All	Euro 4	2.2095E+00	5.8208E-03	2.2252E-03	-5.8614E-05	1.3090E-06	-1.1264E-08	5.1250E-11	0.354	5	120
R089	Petrol	All	Euro 5	2.2095E+00	5.8208E-03	2.2252E-03	-5.8614E-05	1.3090E-06	-1.1264E-08	5.1250E-11	0.210	5	120
R090	Petrol	All	Euro 6	2.2095E+00	5.8208E-03	2.2252E-03	-5.8614E-05	1.3090E-06	-1.1264E-08	5.1250E-11	0.210	5	120
R091	Diesel	All	Pre-Euro 1	1.1555E+01	1.9454E-01	3.2370E-03	-8.3720E-06	2.2158E-07	0	0	1.000	5	120
R092	Diesel	All	Euro 1	1.8951E+01	1.2257E-01	-2.1770E-03	1.0643E-04	-1.0625E-06	6.7350E-09	0	1.000	5	120
R093	Diesel	All	Euro 2	1.8413E+01	1.9453E-01	5.5988E-04	4.8253E-05	-2.9283E-07	2.1257E-09	0	1.000	5	140
R094	Diesel	All	Euro 3	1.5897E+01	1.1491E-01	1.7938E-04	4.4201E-05	-3.3264E-07	2.6643E-09	0	1.000	5	120
R095	Diesel	All	Euro 4	1.5897E+01	1.1491E-01	1.7938E-04	4.4201E-05	-3.3264E-07	2.6643E-09	0	0.500	5	120
R096	Diesel	All	Euro 5	1.5897E+01	1.1491E-01	1.7938E-04	4.4201E-05	-3.3264E-07	2.6643E-09	0	0.334	5	120
R097	Diesel	All	Euro 6	1.5897E+01	1.1491E-01	1.7938E-04	4.4201E-05	-3.3264E-07	2.6643E-09	0	0.149	5	120

Table D28: PM emission factors for N1(II) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R084	Petrol	All	Pre-Euro 1	1.7690E+00	8.2494E-02	-7.4398E-04	5.4778E-05	-5.0658E-07	3.4512E-09	0	1.000	5	120
R085	Petrol	All	Euro 1	3.2355E-02	1.1605E-03	-1.2941E-06	5.3476E-07	-4.3484E-09	3.2883E-11	0	1.000	5	120
R086	Petrol	All	Euro 2	1.7004E-02	6.0988E-04	-6.8010E-07	2.8103E-07	-2.2852E-09	1.7281E-11	0	1.000	5	120
R087	Petrol	All	Euro 3	5.3153E-02	5.7556E-04	3.5818E-06	5.5996E-09	7.3847E-11	0	0	1.000	5	140
R088	Petrol	All	Euro 4	5.1421E-02	1.2541E-03	5.2374E-06	2.6396E-07	-1.4635E-09	1.1310E-11	0	1.000	5	140
R089	Petrol	All	Euro 5	5.1421E-02	1.2541E-03	5.2374E-06	2.6396E-07	-1.4635E-09	1.1310E-11	0	1.000	5	140
R090	Petrol	All	Euro 6	5.1421E-02	1.2541E-03	5.2374E-06	2.6396E-07	-1.4635E-09	1.1310E-11	0	1.000	5	140
R091	Diesel	All	Pre-Euro 1	1.2239E+01	7.7802E-02	2.2094E-04	7.6243E-07	0	0	0	1.000	5	120
R092	Diesel	All	Euro 1	5.3678E-01	1.2241E-02	9.4666E-05	1.8789E-06	-7.3986E-09	9.2062E-11	0	1.583	5	120
R093	Diesel	All	Euro 2	5.3678E-01	1.2241E-02	9.4666E-05	1.8789E-06	-7.3986E-09	9.2062E-11	0	1.000	5	120
R094	Diesel	All	Euro 3	5.3678E-01	1.2241E-02	9.4666E-05	1.8789E-06	-7.3986E-09	9.2062E-11	0	0.583	5	120
R095	Diesel	All	Euro 4	5.3678E-01	1.2241E-02	9.4666E-05	1.8789E-06	-7.3986E-09	9.2062E-11	0	0.333	5	120
R096	Diesel	All	Euro 5	0	0.0005	0	0	0	0	0	1.000	5	120
R097	Diesel	All	Euro 6	0	0.0005	0	0	0	0	0	1.000	5	120

D6 Light goods/commercial vehicles: N1(III)

Table D29: CO emission factors for N1(III) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R098	Petrol	All	Pre-Euro 1	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	3.935	5	120
R099	Petrol	All	Euro 1	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	1.000	5	120
R100	Petrol	All	Euro 2	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	1.000	5	120
R101	Petrol	All	Euro 3	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	1.000	5	120
R102	Petrol	All	Euro 4	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	1.000	5	120
R103	Petrol	All	Euro 5	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	0.822	5	120
R104	Petrol	All	Euro 6	1.6735E+02	-1.9448E+00	2.8300E-02	0	0	0	0	0.822	5	120
R105	Diesel	All	Pre-Euro 1	2.1989E+01	-1.1736E-01	7.7740E-03	0	0	0	0	1.000	5	120
R106	Diesel	All	Euro 1	1.4858E+01	1.9831E-01	8.4288E-04	0	0	0	0	1.000	5	120
R107	Diesel	All	Euro 2	1.7473E+01	-4.9323E-02	5.7938E-03	0	0	0	0	1.000	5	120
R108	Diesel	All	Euro 3	7.1593E+00	2.6066E-03	4.7939E-04	0	0	0	0	1.000	5	120
R109	Diesel	All	Euro 4	7.1593E+00	2.6066E-03	4.7939E-04	0	0	0	0	0.779	5	120
R110	Diesel	All	Euro 5	7.1593E+00	2.6066E-03	4.7939E-04	0	0	0	0	0.662	5	120
R111	Diesel	All	Euro 6	7.1593E+00	2.6066E-03	4.7939E-04	0	0	0	0	0.662	5	120

Table D30: HC emission factors for N1(III) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R098	Petrol	All	Pre-Euro 1	4.6761E+01	7.7960E-01	0	0	0	0	0	1.000	5	120
R099	Petrol	All	Euro 1	6.1126E+00	-1.3817E-01	1.1811E-02	-4.3365E-04	7.8952E-06	-6.9611E-08	2.4953E-10	1.000	5	120
R100	Petrol	All	Euro 2	3.3672E+00	9.8890E-03	4.8741E-04	-7.5768E-06	2.1701E-07	-1.7304E-09	8.7656E-12	1.000	5	120
R101	Petrol	All	Euro 3	3.3672E+00	9.8890E-03	4.8741E-04	-7.5768E-06	2.1701E-07	-1.7304E-09	8.7656E-12	0.625	5	120
R102	Petrol	All	Euro 4	3.3672E+00	9.8890E-03	4.8741E-04	-7.5768E-06	2.1701E-07	-1.7304E-09	8.7656E-12	0.338	5	120
R103	Petrol	All	Euro 5	3.3672E+00	9.8890E-03	4.8741E-04	-7.5768E-06	2.1701E-07	-1.7304E-09	8.7656E-12	0.303	5	120
R104	Petrol	All	Euro 6	3.3672E+00	9.8890E-03	4.8741E-04	-7.5768E-06	2.1701E-07	-1.7304E-09	8.7656E-12	0.303	5	120
R105	Diesel	All	Pre-Euro 1	3.0979E+00	9.6000E-02	0	0	0	0	0	1.000	5	120
R106	Diesel	All	Euro 1	3.0933E+00	2.2419E-02	-6.5755E-05	0	0	0	0	1.000	5	120
R107	Diesel	All	Euro 2	2.0654E+00	2.7482E-02	2.1867E-04	3.2671E-07	7.0848E-09	0	0	1.000	5	120
R108	Diesel	All	Euro 3	1.7242E+00	-1.0325E-02	1.7112E-04	0	0	0	0	1.000	5	120
R109	Diesel	All	Euro 4	1.7242E+00	-1.0325E-02	1.7112E-04	0	0	0	0	0.875	5	120
R110	Diesel	All	Euro 5	1.7242E+00	-1.0325E-02	1.7112E-04	0	0	0	0	0.875	5	120
R111	Diesel	All	Euro 6	1.7242E+00	-1.0325E-02	1.7112E-04	0	0	0	0	0.875	5	120

Table D31: NO_x emission factors for N1(III) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R098	Petrol	All	Pre-Euro 1	3.2495E+00	9.4937E-02	3.9526E-04	2.8800E-05	-1.9221E-07	1.6760E-09	0	8.000	5	120
R099	Petrol	All	Euro 1	3.2495E+00	9.4937E-02	3.9526E-04	2.8800E-05	-1.9221E-07	1.6760E-09	0	1.000	5	120
R100	Petrol	All	Euro 2	2.6554E+00	7.5446E-02	3.5817E-04	2.1389E-05	-1.3732E-07	1.2298E-09	0	1.000	5	120
R101	Petrol	All	Euro 3	2.6554E+00	7.5446E-02	3.5817E-04	2.1389E-05	-1.3732E-07	1.2298E-09	0	0.625	5	120
R102	Petrol	All	Euro 4	2.6554E+00	7.5446E-02	3.5817E-04	2.1389E-05	-1.3732E-07	1.2298E-09	0	0.338	5	120
R103	Petrol	All	Euro 5	2.6554E+00	7.5446E-02	3.5817E-04	2.1389E-05	-1.3732E-07	1.2298E-09	0	0.200	5	120
R104	Petrol	All	Euro 6	2.6554E+00	7.5446E-02	3.5817E-04	2.1389E-05	-1.3732E-07	1.2298E-09	0	0.200	5	120
R105	Diesel	All	Pre-Euro 1	2.6057E+01	4.3548E-01	6.8000E-03	-1.4923E-05	4.4731E-07	0	0	1.250	5	120
R106	Diesel	All	Euro 1	1.4830E+01	3.3621E-01	2.6132E-03	5.0694E-05	-1.9580E-07	2.4685E-09	0	1.300	5	120
R107	Diesel	All	Euro 2	1.6254E+01	3.8407E-01	2.8631E-03	6.5599E-05	-2.8779E-07	3.3297E-09	0	1.250	5	120
R108	Diesel	All	Euro 3	1.1060E+01	2.8838E-01	1.8082E-03	6.5323E-05	-3.6225E-07	3.5825E-09	0	1.000	5	120
R109	Diesel	All	Euro 4	1.1060E+01	2.8838E-01	1.8082E-03	6.5323E-05	-3.6225E-07	3.5825E-09	0	0.500	5	120
R110	Diesel	All	Euro 5	1.1060E+01	2.8838E-01	1.8082E-03	6.5323E-05	-3.6225E-07	3.5825E-09	0	0.337	5	120
R111	Diesel	All	Euro 6	1.1060E+01	2.8838E-01	1.8082E-03	6.5323E-05	-3.6225E-07	3.5825E-09	0	0.150	5	120

Table D32: PM emission factors for N1(III) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R098	Petrol	All	Pre-Euro 1	8.7122E-02	2.3771E-03	1.3119E-05	6.0805E-07	-3.6636E-09	3.4261E-11	0	1.000	5	120
R099	Petrol	All	Euro 1	6.7263E-02	1.8112E-03	1.0414E-05	4.4757E-07	-2.6362E-09	2.5034E-11	0	1.000	5	120
R100	Petrol	All	Euro 2	1.7050E-02	8.9762E-04	-1.1359E-05	6.7408E-07	-6.4666E-09	4.2618E-11	0	1.000	5	120
R101	Petrol	All	Euro 3	1.9957E-02	3.3780E-04	6.0024E-06	-1.7930E-08	4.2668E-10	0	0	1.000	5	120
R102	Petrol	All	Euro 4	2.2826E-02	2.9159E-04	2.1651E-06	3.7445E-09	6.2825E-11	0	0	1.000	5	120
R103	Petrol	All	Euro 5	2.2826E-02	2.9159E-04	2.1651E-06	3.7445E-09	6.2825E-11	0	0	1.000	5	120
R104	Petrol	All	Euro 6	2.2826E-02	2.9159E-04	2.1651E-06	3.7445E-09	6.2825E-11	0	0	1.000	5	120
R105	Diesel	All	Pre-Euro 1	5.1485E+00	1.1463E-01	8.5320E-04	1.4693E-06	2.4853E-08	0	0	1.000	5	120
R106	Diesel	All	Euro 1	2.1211E+00	3.3155E-02	1.2142E-05	1.3903E-05	-1.0872E-07	8.4666E-10	0	1.000	5	120
R107	Diesel	All	Euro 2	8.3891E-01	6.4584E-02	4.8517E-04	8.2123E-07	1.4350E-08	0	0	1.000	5	120
R108	Diesel	All	Euro 3	1.6784E+00	-2.3148E-04	4.7255E-04	-1.3462E-05	2.9000E-07	-2.5243E-09	1.1222E-11	1.000	5	120
R109	Diesel	All	Euro 4	1.6784E+00	-2.3148E-04	4.7255E-04	-1.3462E-05	2.9000E-07	-2.5243E-09	1.1222E-11	0.600	5	120
R110	Diesel	All	Euro 5	0	0.0005	0	0	0	0	0	1.000	5	120
R111	Diesel	All	Euro 6	0	0.0005	0	0	0	0	0	1.000	5	120

D7 Rigid heavy goods vehicles

Table D33(a): CO emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R112	Diesel	3.5-7.5 t	Pre-Euro I	1.0116E+01	5.0611E+00	-1.6916E-01	3.0078E-03	-2.8230E-05	1.6867E-07	-5.2817E-10	1.000	6	90
R113	Diesel	3.5-7.5 t	Euro I	1.7682E+00	2.2807E+00	-9.2818E-02	1.8315E-03	-1.6643E-05	6.6156E-08	-6.7929E-11	2.000	6	90
R114	Diesel	3.5-7.5 t	Euro II	5.8376E+00	9.0423E-01	-2.3249E-02	2.8015E-04	3.4116E-07	-2.2633E-08	1.0097E-10	2.000	6	90
R115	Diesel	3.5-7.5 t	Euro III	6.3111E+00	1.2301E+00	-2.6130E-02	3.4583E-05	5.4962E-06	-5.3910E-08	1.3831E-10	1.000	6	90
R116	Diesel	3.5-7.5 t	Euro IV	4.1246E-01	1.2129E-01	-4.1035E-03	7.3977E-05	-7.4122E-07	4.9909E-09	-1.7122E-11	10.000	6	90
R117	Diesel	3.5-7.5 t	Euro V	4.1410E-01	1.2255E-01	-4.1378E-03	7.4300E-05	-7.4498E-07	5.0542E-09	-1.7478E-11	1.000	6	90
R118	Diesel	3.5-7.5 t	Euro VI	4.1410E-01	1.2255E-01	-4.1378E-03	7.4300E-05	-7.4498E-07	5.0542E-09	-1.7478E-11	1.000	6	90
R119	Diesel	7.5-12 t	Pre-Euro I	3.2969E+01	4.4242E+00	-1.4945E-01	2.5062E-03	-2.0538E-05	1.1574E-07	-4.0263E-10	1.000	6	90
R120	Diesel	7.5-12 t	Euro I	1.0935E+01	2.6307E+00	-9.9417E-02	1.9913E-03	-2.1510E-05	1.4070E-07	-4.3691E-10	1.000	6	90
R121	Diesel	7.5-12 t	Euro II	1.0349E+01	1.5789E+00	-5.0270E-02	9.9225E-04	-1.1136E-05	8.3286E-08	-2.9751E-10	1.000	6	90
R122	Diesel	7.5-12 t	Euro III	1.2362E+01	2.4925E+00	-8.7846E-02	1.4873E-03	-1.2668E-05	7.1178E-08	-2.3283E-10	1.000	6	90
R123	Diesel	7.5-12 t	Euro IV	6.0920E-01	2.8002E-01	-1.3985E-02	3.6498E-04	-5.1852E-06	3.9512E-08	-1.2413E-10	1.000	6	90
R124	Diesel	7.5-12 t	Euro V	6.0760E-01	2.8759E-01	-1.4388E-02	3.7456E-04	-5.3029E-06	4.0262E-08	-1.2612E-10	1.000	6	90
R125	Diesel	7.5-12 t	Euro VI	6.0760E-01	2.8759E-01	-1.4388E-02	3.7456E-04	-5.3029E-06	4.0262E-08	-1.2612E-10	1.000	6	90
R126	Diesel	12-14 t	Pre-Euro I	3.7082E+01	4.5971E+00	-1.5829E-01	2.9028E-03	-2.8754E-05	1.9658E-07	-7.0058E-10	1.000	6	90
R127	Diesel	12-14 t	Euro I	1.5797E+01	2.0837E+00	-5.5821E-02	6.2268E-04	-5.5070E-07	-1.3318E-08	0	1.000	6	90
R128	Diesel	12-14 t	Euro II	1.0449E+01	1.8266E+00	-5.7896E-02	1.1399E-03	-1.2657E-05	9.2658E-08	-3.2520E-10	1.000	6	90
R129	Diesel	12-14 t	Euro III	1.5928E+01	2.4529E+00	-8.9843E-02	1.6988E-03	-1.7375E-05	1.1573E-07	-3.8804E-10	1.000	6	90
R130	Diesel	12-14 t	Euro IV	7.3035E-01	2.7820E-01	-1.4370E-02	3.9191E-04	-5.7447E-06	4.4498E-08	-1.4053E-10	1.000	6	90
R131	Diesel	12-14 t	Euro V	7.4034E-01	2.8415E-01	-1.4731E-02	4.0196E-04	-5.8920E-06	4.5617E-08	-1.4397E-10	1.000	6	90
R132	Diesel	12-14 t	Euro VI	7.4034E-01	2.8415E-01	-1.4731E-02	4.0196E-04	-5.8920E-06	4.5617E-08	-1.4397E-10	1.000	6	90
R133	Diesel	14-20 t	Pre-Euro I	5.3606E+01	6.6292E+00	-2.4937E-01	4.9408E-03	-5.4538E-05	3.9143E-07	-1.3533E-09	1.000	6	90
R134	Diesel	14-20 t	Euro I	2.3093E+01	2.7779E+00	-7.6894E-02	8.4479E-04	-5.1684E-07	-1.9583E-08	0	1.000	6	90
R135	Diesel	14-20 t	Euro II	1.5880E+01	2.2303E+00	-7.0994E-02	1.3966E-03	-1.5942E-05	1.2335E-07	-4.5211E-10	1.000	6	90
R136	Diesel	14-20 t	Euro III	2.1593E+01	3.7278E+00	-1.5406E-01	3.2888E-03	-3.8682E-05	2.7204E-07	-8.7190E-10	1.000	6	90
R137	Diesel	14-20 t	Euro IV	1.0939E+00	4.0248E-01	-2.1306E-02	5.8116E-04	-8.5121E-06	6.5815E-08	-2.0745E-10	15.000	6	90
R138	Diesel	14-20 t	Euro V	1.0857E+00	4.1599E-01	-2.2167E-02	6.0581E-04	-8.8753E-06	6.8525E-08	-2.1552E-10	1.000	6	90
R139	Diesel	14-20 t	Euro VI	1.0857E+00	4.1599E-01	-2.2167E-02	6.0581E-04	-8.8753E-06	6.8525E-08	-2.1552E-10	1.000	6	90

Table D33(b): CO emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R140	Diesel	20-26 t	Pre-Euro I	4.0746E+01	4.1298E+00	-1.0589E-01	6.8086E-04	1.2378E-05	-1.5305E-07	4.2088E-10	1.000	6	90
R141	Diesel	20-26 t	Euro I	3.6720E+01	2.0889E+00	-5.2364E-03	-1.6155E-03	3.9214E-05	-3.1856E-07	8.5351E-10	1.000	6	90
R142	Diesel	20-26 t	Euro II	1.8676E+01	2.9844E+00	-9.4836E-02	1.8666E-03	-2.1148E-05	1.6040E-07	-5.7767E-10	1.000	6	90
R143	Diesel	20-26 t	Euro III	3.1791E+01	3.7705E+00	-1.3079E-01	2.1856E-03	-1.7993E-05	1.0458E-07	-3.7546E-10	1.000	6	90
R144	Diesel	20-26 t	Euro IV	1.5139E+00	4.4430E-01	-2.2660E-02	6.0711E-04	-8.8338E-06	6.8710E-08	-2.1917E-10	1.000	6	90
R145	Diesel	20-26 t	Euro V	1.5238E+00	4.5722E-01	-2.3515E-02	6.3268E-04	-9.2256E-06	7.1734E-08	-2.2844E-10	1.000	6	90
R146	Diesel	20-26 t	Euro VI	1.5238E+00	4.5722E-01	-2.3515E-02	6.3268E-04	-9.2256E-06	7.1734E-08	-2.2844E-10	1.000	6	90
R147	Diesel	26-28 t	Pre-Euro I	4.5307E+01	3.2273E+00	-3.2756E-02	-1.5274E-03	4.4363E-05	-3.7481E-07	1.0138E-09	1.000	6	90
R148	Diesel	26-28 t	Euro I	3.8237E+01	1.6477E+00	3.5254E-02	-2.8383E-03	5.7062E-05	-4.4418E-07	1.1969E-09	1.000	6	90
R149	Diesel	26-28 t	Euro II	1.6225E+01	3.5203E+00	-1.1768E-01	2.3037E-03	-2.5159E-05	1.7658E-07	-5.9024E-10	1.000	6	90
R150	Diesel	26-28 t	Euro III	3.0162E+01	4.2917E+00	-1.6646E-01	3.4471E-03	-3.9815E-05	2.8643E-07	-9.5892E-10	1.000	6	90
R151	Diesel	26-28 t	Euro IV	1.9186E+00	3.6548E-01	-1.7250E-02	4.6130E-04	-6.9676E-06	5.7548E-08	-1.9451E-10	1.000	6	90
R152	Diesel	26-28 t	Euro V	1.9607E+00	3.7134E-01	-1.7607E-02	4.7172E-04	-7.1345E-06	5.8951E-08	-1.9923E-10	1.000	6	90
R153	Diesel	26-28 t	Euro VI	1.9607E+00	3.7134E-01	-1.7607E-02	4.7172E-04	-7.1345E-06	5.8951E-08	-1.9923E-10	1.000	6	90
R154	Diesel	28-32 t	Pre-Euro I	3.0036E+01	6.6091E+00	-2.1643E-01	3.4995E-03	-2.8526E-05	1.6480E-07	-5.8612E-10	1.000	6	90
R155	Diesel	28-32 t	Euro I	3.5668E+01	1.9546E+00	6.5510E-02	-4.4130E-03	8.7102E-05	-6.9632E-07	1.9856E-09	1.000	6	90
R156	Diesel	28-32 t	Euro II	1.4834E+01	4.2668E+00	-1.3601E-01	2.5234E-03	-2.6601E-05	1.8798E-07	-6.4519E-10	1.000	6	90
R157	Diesel	28-32 t	Euro III	1.6944E+01	6.3872E+00	-2.4103E-01	4.5735E-03	-4.5131E-05	2.6168E-07	-7.3525E-10	1.000	6	90
R158	Diesel	28-32 t	Euro IV	1.1464E+00	4.8045E-01	-2.0595E-02	4.9115E-04	-6.7030E-06	5.1885E-08	-1.7015E-10	1.000	6	90
R159	Diesel	28-32 t	Euro V	1.1600E+00	4.8860E-01	-2.0977E-02	5.0035E-04	-6.8248E-06	5.2773E-08	-1.7290E-10	1.000	6	90
R160	Diesel	28-32 t	Euro VI	1.1600E+00	4.8860E-01	-2.0977E-02	5.0035E-04	-6.8248E-06	5.2773E-08	-1.7290E-10	1.000	6	90
R161	Diesel	>32 t	Pre-Euro I	4.8337E+01	4.1550E+00	-7.4081E-02	-7.0060E-04	3.7146E-05	-3.4964E-07	9.9989E-10	1.000	6	90
R162	Diesel	>32 t	Euro I	4.3634E+01	1.8429E+00	5.0980E-02	-3.7067E-03	7.3889E-05	-5.8225E-07	1.6101E-09	1.000	6	90
R163	Diesel	>32 t	Euro II	1.7775E+01	4.2262E+00	-1.3930E-01	2.6829E-03	-2.8671E-05	1.9812E-07	-6.5764E-10	1.000	6	90
R164	Diesel	>32 t	Euro III	2.8930E+01	5.8277E+00	-2.4174E-01	5.2559E-03	-6.2376E-05	4.3317E-07	-1.3538E-09	1.000	6	90
R165	Diesel	>32 t	Euro IV	1.9887E+00	3.9981E-01	-1.7269E-02	4.1138E-04	-5.5916E-06	4.3672E-08	-1.4555E-10	1.000	6	90
R166	Diesel	>32 t	Euro V	2.0404E+00	4.0540E-01	-1.7566E-02	4.1924E-04	-5.7141E-06	4.4735E-08	-1.4931E-10	1.000	6	90
R167	Diesel	>32 t	Euro VI	2.0404E+00	4.0540E-01	-1.7566E-02	4.1924E-04	-5.7141E-06	4.4735E-08	-1.4931E-10	1.000	6	90

Table D34(a): HC emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R112	Diesel	3.5-7.5 t	Pre-Euro I	1.3260E+01	3.1269E+00	-1.0383E-01	1.8213E-03	-2.1327E-05	1.8674E-07	-7.5272E-10	1.000	6	90
R113	Diesel	3.5-7.5 t	Euro I	2.0783E+00	5.6894E-01	-1.4723E-02	1.5507E-04	-5.4338E-07	4.7347E-09	-4.0084E-11	1.000	6	90
R114	Diesel	3.5-7.5 t	Euro II	1.4178E+00	3.6517E-01	-9.8555E-03	1.2159E-04	-8.4962E-07	8.0545E-09	-4.4066E-11	1.000	6	90
R115	Diesel	3.5-7.5 t	Euro III	7.2593E-01	4.6027E-01	-1.7962E-02	3.9623E-04	-5.3636E-06	4.3620E-08	-1.5216E-10	1.000	6	90
R116	Diesel	3.5-7.5 t	Euro IV	7.2236E-02	1.9559E-02	-6.4393E-04	1.0917E-05	-1.2322E-07	1.0714E-09	-4.3663E-12	1.000	6	90
R117	Diesel	3.5-7.5 t	Euro V	7.2751E-02	1.9844E-02	-6.5256E-04	1.1045E-05	-1.2448E-07	1.0825E-09	-4.4152E-12	1.000	6	90
R118	Diesel	3.5-7.5 t	Euro VI	7.2751E-02	1.9844E-02	-6.5256E-04	1.1045E-05	-1.2448E-07	1.0825E-09	-4.4152E-12	0.291	6	90
R119	Diesel	7.5-12 t	Pre-Euro I	1.1909E+01	3.2336E+00	-1.6507E-01	4.3197E-03	-6.3161E-05	5.0211E-07	-1.6433E-09	1.000	6	90
R120	Diesel	7.5-12 t	Euro I	2.5532E+00	1.5166E+00	-7.3278E-02	1.8297E-03	-2.5237E-05	1.8990E-07	-5.9632E-10	1.000	6	90
R121	Diesel	7.5-12 t	Euro II	2.0141E+00	9.0526E-01	-4.2103E-02	1.0171E-03	-1.3768E-05	1.0378E-07	-3.3041E-10	1.000	6	90
R122	Diesel	7.5-12 t	Euro III	1.4023E+00	9.7410E-01	-4.8904E-02	1.2404E-03	-1.7244E-05	1.2943E-07	-4.0307E-10	1.000	6	90
R123	Diesel	7.5-12 t	Euro IV	1.0126E-01	5.1116E-02	-2.6431E-03	6.7199E-05	-9.3406E-07	7.0048E-09	-2.1803E-11	1.000	6	90
R124	Diesel	7.5-12 t	Euro V	1.0618E-01	5.1484E-02	-2.6367E-03	6.6407E-05	-9.1609E-07	6.8454E-09	-2.1299E-11	1.000	6	90
R125	Diesel	7.5-12 t	Euro VI	1.0618E-01	5.1484E-02	-2.6367E-03	6.6407E-05	-9.1609E-07	6.8454E-09	-2.1299E-11	0.291	6	90
R126	Diesel	12-14 t	Pre-Euro I	1.3597E+01	3.6225E+00	-1.9801E-01	5.3659E-03	-7.8464E-05	6.0910E-07	-1.9331E-09	1.000	6	90
R127	Diesel	12-14 t	Euro I	3.5686E+00	1.6034E+00	-8.2514E-02	2.1871E-03	-3.1433E-05	2.4078E-07	-7.5698E-10	1.000	6	90
R128	Diesel	12-14 t	Euro II	2.8228E+00	9.2523E-01	-4.5971E-02	1.1845E-03	-1.6762E-05	1.2859E-07	-4.0884E-10	1.000	6	90
R129	Diesel	12-14 t	Euro III	1.8800E+00	1.0842E+00	-6.0945E-02	1.6863E-03	-2.4730E-05	1.8886E-07	-5.8454E-10	1.000	6	90
R130	Diesel	12-14 t	Euro IV	1.2003E-01	5.6891E-02	-3.3004E-03	9.2075E-05	-1.3564E-06	1.0377E-08	-3.2123E-11	1.000	6	90
R131	Diesel	12-14 t	Euro V	1.2148E-01	5.8211E-02	-3.3761E-03	9.4153E-05	-1.3865E-06	1.0602E-08	-3.2807E-11	1.000	6	90
R132	Diesel	12-14 t	Euro VI	1.2148E-01	5.8211E-02	-3.3761E-03	9.4153E-05	-1.3865E-06	1.0602E-08	-3.2807E-11	0.291	6	90
R133	Diesel	14-20 t	Pre-Euro I	2.0223E+01	5.2189E+00	-2.8542E-01	7.7761E-03	-1.1411E-04	8.8760E-07	-2.8194E-09	1.000	6	90
R134	Diesel	14-20 t	Euro I	5.7139E+00	2.2033E+00	-1.1280E-01	2.9775E-03	-4.2829E-05	3.2988E-07	-1.0445E-09	1.000	6	90
R135	Diesel	14-20 t	Euro II	4.7605E+00	1.1914E+00	-5.7144E-02	1.4438E-03	-2.0428E-05	1.5971E-07	-5.2086E-10	1.000	6	90
R136	Diesel	14-20 t	Euro III	3.2946E+00	1.4724E+00	-8.1643E-02	2.2380E-03	-3.2720E-05	2.5076E-07	-7.8142E-10	1.000	6	90
R137	Diesel	14-20 t	Euro IV	2.0627E-01	7.7771E-02	-4.4647E-03	1.2372E-04	-1.8182E-06	1.3946E-08	-4.3402E-11	1.000	6	90
R138	Diesel	14-20 t	Euro V	2.0895E-01	7.9363E-02	-4.5508E-03	1.2597E-04	-1.8495E-06	1.4177E-08	-4.4100E-11	1.000	6	90
R139	Diesel	14-20 t	Euro VI	2.0895E-01	7.9363E-02	-4.5508E-03	1.2597E-04	-1.8495E-06	1.4177E-08	-4.4100E-11	0.291	6	90

Table D34(b): HC emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R140	Diesel	20-26 t	Pre-Euro I	1.0613E+01	3.1317E+00	-1.7234E-01	4.7216E-03	-7.0192E-05	5.5268E-07	-1.7712E-09	1.000	6	90
R141	Diesel	20-26 t	Euro I	9.2580E+00	2.3608E+00	-1.1832E-01	3.0759E-03	-4.4280E-05	3.4689E-07	-1.1236E-09	1.000	6	90
R142	Diesel	20-26 t	Euro II	5.4278E+00	1.6278E+00	-8.5529E-02	2.3270E-03	-3.4722E-05	2.7629E-07	-8.9584E-10	1.000	6	90
R143	Diesel	20-26 t	Euro III	5.5334E+00	1.5533E+00	-8.5619E-02	2.3312E-03	-3.4148E-05	2.6469E-07	-8.3750E-10	1.000	6	90
R144	Diesel	20-26 t	Euro IV	3.1302E-01	8.5195E-02	-4.9185E-03	1.3631E-04	-2.0127E-06	1.5586E-08	-4.9046E-11	1.000	6	90
R145	Diesel	20-26 t	Euro V	3.1952E-01	8.6676E-02	-4.9978E-03	1.3841E-04	-2.0432E-06	1.5825E-08	-4.9817E-11	1.000	6	90
R146	Diesel	20-26 t	Euro VI	3.1952E-01	8.6676E-02	-4.9978E-03	1.3841E-04	-2.0432E-06	1.5825E-08	-4.9817E-11	0.291	6	90
R147	Diesel	26-28 t	Pre-Euro I	1.1335E+01	3.0282E+00	-1.6497E-01	4.6039E-03	-7.0291E-05	5.6800E-07	-1.8575E-09	1.000	6	90
R148	Diesel	26-28 t	Euro I	9.4330E+00	2.3852E+00	-1.2306E-01	3.3657E-03	-5.0818E-05	4.1060E-07	-1.3500E-09	1.000	6	90
R149	Diesel	26-28 t	Euro II	5.7746E+00	1.5660E+00	-8.0580E-02	2.2139E-03	-3.3740E-05	2.7491E-07	-9.0909E-10	1.000	6	90
R150	Diesel	26-28 t	Euro III	5.7872E+00	1.5428E+00	-8.6184E-02	2.4546E-03	-3.7756E-05	3.0442E-07	-9.8921E-10	1.000	6	90
R151	Diesel	26-28 t	Euro IV	3.7290E-01	7.3857E-02	-4.1809E-03	1.1833E-04	-1.8140E-06	1.4664E-08	-4.7918E-11	1.000	6	90
R152	Diesel	26-28 t	Euro V	3.8160E-01	7.4940E-02	-4.2342E-03	1.1973E-04	-1.8353E-06	1.4844E-08	-4.8545E-11	1.000	6	90
R153	Diesel	26-28 t	Euro VI	3.8160E-01	7.4940E-02	-4.2342E-03	1.1973E-04	-1.8353E-06	1.4844E-08	-4.8545E-11	0.291	6	90
R154	Diesel	28-32 t	Pre-Euro I	1.0476E+01	2.8561E+00	-1.3414E-01	3.2752E-03	-4.5593E-05	3.5691E-07	-1.1757E-09	1.000	6	90
R155	Diesel	28-32 t	Euro I	8.0175E+00	2.3375E+00	-1.0038E-01	2.3204E-03	-3.0884E-05	2.3791E-07	-7.8739E-10	1.000	6	90
R156	Diesel	28-32 t	Euro II	4.9715E+00	1.5289E+00	-6.6661E-02	1.5780E-03	-2.1628E-05	1.6991E-07	-5.6663E-10	1.000	6	90
R157	Diesel	28-32 t	Euro III	3.9216E+00	1.6307E+00	-7.9026E-02	1.9905E-03	-2.7899E-05	2.1413E-07	-6.8448E-10	1.000	6	90
R158	Diesel	28-32 t	Euro IV	2.7951E-01	7.8082E-02	-3.8080E-03	9.4186E-05	-1.3000E-06	9.9405E-09	-3.1931E-11	1.000	6	90
R159	Diesel	28-32 t	Euro V	2.8503E-01	7.9753E-02	-3.8761E-03	9.5524E-05	-1.3146E-06	1.0039E-08	-3.2248E-11	1.000	6	90
R160	Diesel	28-32 t	Euro VI	2.8503E-01	7.9753E-02	-3.8761E-03	9.5524E-05	-1.3146E-06	1.0039E-08	-3.2248E-11	0.291	6	90
R161	Diesel	>32 t	Pre-Euro I	1.3677E+01	3.0205E+00	-1.6002E-01	4.2134E-03	-6.0895E-05	4.7554E-07	-1.5315E-09	1.000	6	90
R162	Diesel	>32 t	Euro I	1.0705E+01	2.5518E+00	-1.2561E-01	3.2219E-03	-4.6032E-05	3.6077E-07	-1.1742E-09	1.000	6	90
R163	Diesel	>32 t	Euro II	6.0822E+00	1.7957E+00	-9.4253E-02	2.5758E-03	-3.8687E-05	3.0976E-07	-1.0091E-09	1.000	6	90
R164	Diesel	>32 t	Euro III	6.1089E+00	1.6946E+00	-9.2712E-02	2.5149E-03	-3.6797E-05	2.8556E-07	-9.0549E-10	1.000	6	90
R165	Diesel	>32 t	Euro IV	3.5106E-01	9.1692E-02	-5.2847E-03	1.4630E-04	-2.1601E-06	1.6747E-08	-5.2786E-11	1.000	6	90
R166	Diesel	>32 t	Euro V	3.5934E-01	9.3573E-02	-5.3987E-03	1.4956E-04	-2.2094E-06	1.7133E-08	-5.4005E-11	1.000	6	90
R167	Diesel	>32 t	Euro VI	3.5934E-01	9.3573E-02	-5.3987E-03	1.4956E-04	-2.2094E-06	1.7133E-08	-5.4005E-11	0.291	6	90

Table D35(a): NO_x emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R112	Diesel	3.5-7.5 t	Pre-Euro I	9.0285E-01	9.1775E+00	-2.8858E-01	6.2635E-03	-6.5655E-05	3.7295E-07	-8.9416E-10	1.000	6	90
R113	Diesel	3.5-7.5 t	Euro I	2.3872E+00	7.2845E+00	-2.9944E-01	7.9202E-03	-1.0210E-04	6.7894E-07	-1.8350E-09	1.000	6	90
R114	Diesel	3.5-7.5 t	Euro II	2.9285E+00	7.9127E+00	-3.2880E-01	8.7310E-03	-1.1453E-04	7.7118E-07	-2.1030E-09	1.000	6	90
R115	Diesel	3.5-7.5 t	Euro III	3.4735E+01	2.5141E+00	-7.6474E-02	2.2784E-03	-3.0720E-05	2.1937E-07	-6.3187E-10	1.000	6	90
R116	Diesel	3.5-7.5 t	Euro IV	1.6342E+01	1.4186E+00	-2.8557E-02	8.8230E-04	-1.1735E-05	8.6039E-08	-2.4599E-10	1.000	6	90
R117	Diesel	3.5-7.5 t	Euro V	1.2789E+01	5.9975E-01	-6.0942E-03	1.9229E-04	-1.4850E-06	5.8648E-09	0	1.000	6	90
R118	Diesel	3.5-7.5 t	Euro VI	1.2789E+01	5.9975E-01	-6.0942E-03	1.9229E-04	-1.4850E-06	5.8648E-09	0	0.200	6	90
R119	Diesel	7.5-12 t	Pre-Euro I	3.8319E+00	1.9085E+01	-6.5617E-01	1.4908E-02	-1.7242E-04	1.0563E-06	-2.6980E-09	1.000	6	90
R120	Diesel	7.5-12 t	Euro I	5.3831E+00	1.2224E+01	-4.9667E-01	1.2918E-02	-1.7104E-04	1.1663E-06	-3.2301E-09	1.000	6	90
R121	Diesel	7.5-12 t	Euro II	6.7818E+00	1.3275E+01	-5.5577E-01	1.4664E-02	-1.9771E-04	1.3652E-06	-3.8123E-09	1.000	6	90
R122	Diesel	7.5-12 t	Euro III	6.3415E+01	2.2753E+00	3.4228E-02	-1.8578E-03	3.8820E-05	-3.0922E-07	8.4026E-10	1.000	6	90
R123	Diesel	7.5-12 t	Euro IV	2.7019E+01	2.0825E+00	-1.4511E-03	-5.9682E-04	1.6292E-05	-1.3736E-07	3.7404E-10	1.000	6	90
R124	Diesel	7.5-12 t	Euro V	2.4124E+01	1.7412E-01	5.9696E-02	-2.1529E-03	3.7979E-05	-3.0482E-07	9.1533E-10	1.000	6	90
R125	Diesel	7.5-12 t	Euro VI	2.4124E+01	1.7412E-01	5.9696E-02	-2.1529E-03	3.7979E-05	-3.0482E-07	9.1533E-10	0.200	6	90
R126	Diesel	12-14 t	Pre-Euro I	1.1179E+01	2.0449E+01	-6.3227E-01	1.2468E-02	-1.2102E-04	6.3378E-07	-1.5140E-09	1.000	6	90
R127	Diesel	12-14 t	Euro I	9.4340E+00	1.3037E+01	-4.7352E-01	1.1153E-02	-1.3785E-04	9.2526E-07	-2.6470E-09	1.000	6	90
R128	Diesel	12-14 t	Euro II	5.3508E+01	6.0300E+00	2.4123E-03	-3.4752E-03	8.8574E-05	-7.9479E-07	2.4638E-09	1.000	6	90
R129	Diesel	12-14 t	Euro III	7.5279E+01	1.0371E+00	2.1272E-01	-8.5649E-03	1.4911E-04	-1.1426E-06	3.2214E-09	1.000	6	90
R130	Diesel	12-14 t	Euro IV	3.7998E+01	6.8531E-01	1.4942E-01	-6.1818E-03	1.1135E-04	-8.9636E-07	2.6897E-09	1.000	6	90
R131	Diesel	12-14 t	Euro V	2.8173E+01	-3.5471E-01	1.3401E-01	-4.9815E-03	8.5318E-05	-6.7051E-07	1.9869E-09	1.000	6	90
R132	Diesel	12-14 t	Euro VI	2.8173E+01	-3.5471E-01	1.3401E-01	-4.9815E-03	8.5318E-05	-6.7051E-07	1.9869E-09	0.200	6	90
R133	Diesel	14-20 t	Pre-Euro I	6.3437E+01	1.8227E+01	-3.0467E-01	1.0325E-03	5.7335E-05	-6.3295E-07	1.8421E-09	1.000	6	90
R134	Diesel	14-20 t	Euro I	5.8992E+01	8.1150E+00	-2.2032E-02	-4.1541E-03	1.0885E-04	-9.5965E-07	2.8816E-09	1.000	6	90
R135	Diesel	14-20 t	Euro II	6.2791E+01	9.1747E+00	-5.5926E-02	-3.4053E-03	9.6657E-05	-8.3682E-07	2.3889E-09	1.000	6	90
R136	Diesel	14-20 t	Euro III	9.3733E+01	4.6921E+00	-2.2917E-04	-1.8497E-03	3.6785E-05	-1.8425E-07	0	1.000	6	90
R137	Diesel	14-20 t	Euro IV	5.5178E+01	1.0293E-01	2.4673E-01	-9.8190E-03	1.7101E-04	-1.3398E-06	3.9213E-09	1.000	6	90
R138	Diesel	14-20 t	Euro V	4.0014E+01	-7.8406E-01	1.9236E-01	-7.0815E-03	1.1911E-04	-9.1753E-07	2.6607E-09	1.000	6	90
R139	Diesel	14-20 t	Euro VI	4.0014E+01	-7.8406E-01	1.9236E-01	-7.0815E-03	1.1911E-04	-9.1753E-07	2.6607E-09	0.200	6	90

Table D35(b): NO_x emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R140	Diesel	20-26 t	Pre-Euro I	9.5720E+01	1.2413E+01	2.5166E-01	-1.7450E-02	3.4014E-04	-2.6656E-06	7.4211E-09	1.000	6	90
R141	Diesel	20-26 t	Euro I	8.8842E+01	5.1906E+00	3.8744E-01	-1.8423E-02	3.3361E-04	-2.6022E-06	7.4353E-09	1.000	6	90
R142	Diesel	20-26 t	Euro II	8.6600E+01	7.9515E+00	2.4111E-01	-1.4347E-02	2.7161E-04	-2.1093E-06	5.8575E-09	1.000	6	90
R143	Diesel	20-26 t	Euro III	1.1033E+02	3.4913E+00	2.6641E-01	-1.2121E-02	2.1208E-04	-1.5645E-06	4.1221E-09	1.000	6	90
R144	Diesel	20-26 t	Euro IV	6.4765E+01	-2.1339E-01	3.7296E-01	-1.4616E-02	2.4993E-04	-1.9311E-06	5.5877E-09	1.000	6	90
R145	Diesel	20-26 t	Euro V	4.5360E+01	-9.2557E-01	2.6298E-01	-9.8135E-03	1.6487E-04	-1.2670E-06	3.6662E-09	1.000	6	90
R146	Diesel	20-26 t	Euro VI	4.5360E+01	-9.2557E-01	2.6298E-01	-9.8135E-03	1.6487E-04	-1.2670E-06	3.6662E-09	0.200	6	90
R147	Diesel	26-28 t	Pre-Euro I	9.4214E+01	1.2257E+01	3.4909E-01	-2.0943E-02	3.9435E-04	-3.0503E-06	8.4487E-09	1.000	6	90
R148	Diesel	26-28 t	Euro I	8.4570E+01	6.1288E+00	3.9036E-01	-1.9048E-02	3.4431E-04	-2.6618E-06	7.5074E-09	1.000	6	90
R149	Diesel	26-28 t	Euro II	8.1956E+01	9.0616E+00	2.2374E-01	-1.4433E-02	2.7697E-04	-2.1558E-06	5.9750E-09	1.000	6	90
R150	Diesel	26-28 t	Euro III	1.0864E+02	4.1158E+00	2.4362E-01	-1.1816E-02	2.1183E-04	-1.5867E-06	4.2402E-09	1.000	6	90
R151	Diesel	26-28 t	Euro IV	6.4367E+01	-1.8421E-02	3.8396E-01	-1.5287E-02	2.6313E-04	-2.0419E-06	5.9297E-09	1.000	6	90
R152	Diesel	26-28 t	Euro V	4.5375E+01	-8.0256E-01	2.6738E-01	-1.0195E-02	1.7340E-04	-1.3456E-06	3.9288E-09	1.000	6	90
R153	Diesel	26-28 t	Euro VI	4.5375E+01	-8.0256E-01	2.6738E-01	-1.0195E-02	1.7340E-04	-1.3456E-06	3.9288E-09	0.200	6	90
R154	Diesel	28-32 t	Pre-Euro I	8.2400E+01	1.3059E+01	4.8896E-01	-2.5550E-02	4.5784E-04	-3.4309E-06	9.2387E-09	1.000	6	90
R155	Diesel	28-32 t	Euro I	9.7420E+01	4.6565E+00	6.2305E-01	-2.7019E-02	4.7369E-04	-3.6583E-06	1.0461E-08	1.000	6	90
R156	Diesel	28-32 t	Euro II	2.5483E+01	2.2770E+01	-6.2998E-01	1.2845E-02	-1.6568E-04	1.3846E-06	-5.0824E-09	1.000	6	90
R157	Diesel	28-32 t	Euro III	1.0492E+02	8.5560E+00	-1.6163E-02	-3.0134E-03	5.9977E-05	-2.9780E-07	0	1.000	6	90
R158	Diesel	28-32 t	Euro IV	4.3432E+01	6.1362E+00	-1.4368E-02	-1.9843E-03	3.8864E-05	-1.9079E-07	0	1.000	6	90
R159	Diesel	28-32 t	Euro V	4.1741E+01	1.5355E+00	1.0356E-01	-4.1719E-03	6.4774E-05	-4.0436E-07	8.0497E-10	1.000	6	90
R160	Diesel	28-32 t	Euro VI	4.1741E+01	1.5355E+00	1.0356E-01	-4.1719E-03	6.4774E-05	-4.0436E-07	8.0497E-10	0.200	6	90
R161	Diesel	>32 t	Pre-Euro I	1.2683E+02	7.8748E+00	8.8299E-01	-3.8926E-02	6.7359E-04	-5.0843E-06	1.4108E-08	1.000	6	90
R162	Diesel	>32 t	Euro I	9.7654E+01	5.6602E+00	5.9425E-01	-2.6717E-02	4.6919E-04	-3.5879E-06	1.0090E-08	1.000	6	90
R163	Diesel	>32 t	Euro II	6.2980E+01	1.6356E+01	-1.5328E-01	-2.4596E-03	7.1309E-05	-3.7942E-07	0	1.000	6	90
R164	Diesel	>32 t	Euro III	1.0078E+02	9.4752E+00	-2.7553E-02	-3.1933E-03	6.4616E-05	-3.2147E-07	0	1.000	6	90
R165	Diesel	>32 t	Euro IV	7.4640E+01	-7.6693E-01	5.2020E-01	-1.9946E-02	3.3438E-04	-2.5419E-06	7.2471E-09	1.000	6	90
R166	Diesel	>32 t	Euro V	5.0793E+01	-1.1020E+00	3.3824E-01	-1.2620E-02	2.0982E-04	-1.5928E-06	4.5487E-09	1.000	6	90
R167	Diesel	>32 t	Euro VI	5.0793E+01	-1.1020E+00	3.3824E-01	-1.2620E-02	2.0982E-04	-1.5928E-06	4.5487E-09	0.200	6	90

Table D36(a): PM emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R112	Diesel	3.5-7.5 t	Pre-Euro I	4.1030E+00	6.1745E-01	-1.6264E-02	1.9088E-04	-3.3599E-07	-3.0101E-09	0	1.000	6	90
R113	Diesel	3.5-7.5 t	Euro I	8.6208E-01	3.7477E-01	-1.4681E-02	3.1348E-04	-3.6236E-06	2.4147E-08	-7.2377E-11	1.000	6	90
R114	Diesel	3.5-7.5 t	Euro II	1.4912E-01	1.2193E-01	-3.5112E-03	6.7775E-05	-6.3371E-07	2.6154E-09	0	1.000	6	90
R115	Diesel	3.5-7.5 t	Euro III	2.2229E-01	1.4552E-01	-3.5814E-03	3.3673E-05	2.9525E-08	-1.0510E-09	0	1.000	6	90
R116	Diesel	3.5-7.5 t	Euro IV	1.9965E-01	2.4946E-02	-1.1713E-03	3.1111E-05	-4.7468E-07	4.0254E-09	-1.3991E-11	1.000	6	90
R117	Diesel	3.5-7.5 t	Euro V	2.0142E-01	2.5302E-02	-1.1899E-03	3.1607E-05	-4.8223E-07	4.0882E-09	-1.4205E-11	1.000	6	90
R118	Diesel	3.5-7.5 t	Euro VI	2.0142E-01	2.5302E-02	-1.1899E-03	3.1607E-05	-4.8223E-07	4.0882E-09	-1.4205E-11	0.100	6	90
R119	Diesel	7.5-12 t	Pre-Euro I	5.5086E+00	6.6940E-01	-2.2492E-02	3.8451E-04	-3.3757E-06	2.1356E-08	-7.8233E-11	1.000	6	90
R120	Diesel	7.5-12 t	Euro I	2.0531E+00	6.6247E-01	-2.9798E-02	6.8258E-04	-8.3542E-06	5.6716E-08	-1.6710E-10	1.000	6	90
R121	Diesel	7.5-12 t	Euro II	1.4137E-02	2.8421E-01	-9.9391E-03	1.8460E-04	-1.7279E-06	9.1443E-09	-2.1035E-11	1.000	6	90
R122	Diesel	7.5-12 t	Euro III	5.0013E-01	3.3797E-01	-1.4561E-02	3.1991E-04	-3.8143E-06	2.5617E-08	-7.5625E-11	1.000	6	90
R123	Diesel	7.5-12 t	Euro IV	3.3844E-01	5.0943E-02	-2.8890E-03	8.1267E-05	-1.2184E-06	9.6454E-09	-3.1058E-11	1.000	6	90
R124	Diesel	7.5-12 t	Euro V	3.4376E-01	5.2367E-02	-2.9766E-03	8.3720E-05	-1.2543E-06	9.9173E-09	-3.1893E-11	1.000	6	90
R125	Diesel	7.5-12 t	Euro VI	3.4376E-01	5.2367E-02	-2.9766E-03	8.3720E-05	-1.2543E-06	9.9173E-09	-3.1893E-11	0.100	6	90
R126	Diesel	12-14 t	Pre-Euro I	6.3184E+00	6.1772E-01	-1.8617E-02	2.9004E-04	-2.2767E-06	1.5829E-08	-7.0007E-11	1.000	6	90
R127	Diesel	12-14 t	Euro I	2.5992E+00	6.3975E-01	-2.8492E-02	6.6997E-04	-8.5505E-06	6.1106E-08	-1.8833E-10	1.000	6	90
R128	Diesel	12-14 t	Euro II	3.2435E-02	2.8656E-01	-8.6435E-03	1.2756E-04	-7.6741E-07	2.0345E-09	0	1.000	6	90
R129	Diesel	12-14 t	Euro III	5.7856E-01	3.9294E-01	-2.0059E-02	5.2528E-04	-7.3412E-06	5.4304E-08	-1.6522E-10	1.000	6	90
R130	Diesel	12-14 t	Euro IV	3.7240E-01	4.7911E-02	-2.6613E-03	7.6199E-05	-1.1729E-06	9.5569E-09	-3.1533E-11	1.000	6	90
R131	Diesel	12-14 t	Euro V	3.7897E-01	4.8923E-02	-2.7258E-03	7.8076E-05	-1.2014E-06	9.7818E-09	-3.2247E-11	1.000	6	90
R132	Diesel	12-14 t	Euro VI	3.7897E-01	4.8923E-02	-2.7258E-03	7.8076E-05	-1.2014E-06	9.7818E-09	-3.2247E-11	0.100	6	90
R133	Diesel	14-20 t	Pre-Euro I	8.8145E+00	9.7444E-01	-3.6725E-02	7.6118E-04	-9.1170E-06	7.0626E-08	-2.5218E-10	2.000	6	90
R134	Diesel	14-20 t	Euro I	2.8867E+00	1.2044E+00	-6.5865E-02	1.8144E-03	-2.6539E-05	2.0314E-07	-6.3192E-10	1.000	6	90
R135	Diesel	14-20 t	Euro II	9.4968E-01	2.2611E-01	-4.0658E-03	-2.0467E-05	1.9823E-06	-2.3935E-08	9.2388E-11	1.000	6	90
R136	Diesel	14-20 t	Euro III	7.9909E-01	6.1446E-01	-3.3754E-02	9.2740E-04	-1.3478E-05	1.0199E-07	-3.1314E-10	1.000	6	90
R137	Diesel	14-20 t	Euro IV	5.6707E-01	6.6049E-02	-3.7475E-03	1.0743E-04	-1.6557E-06	1.3521E-08	-4.4727E-11	1.000	6	90
R138	Diesel	14-20 t	Euro V	5.7623E-01	6.7360E-02	-3.8286E-03	1.0971E-04	-1.6896E-06	1.3787E-08	-4.5576E-11	1.000	6	90
R139	Diesel	14-20 t	Euro VI	5.7623E-01	6.7360E-02	-3.8286E-03	1.0971E-04	-1.6896E-06	1.3787E-08	-4.5576E-11	0.100	6	90

Table D36(b): PM emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R140	Diesel	20-26 t	Pre-Euro I	6.9569E+00	9.2330E-01	-2.3290E-02	2.2447E-04	3.8331E-07	-8.4511E-09	0	1.000	6	90
R141	Diesel	20-26 t	Euro I	7.6960E+00	7.4870E-01	-2.9059E-02	5.7958E-04	-6.6099E-06	5.0173E-08	-1.8099E-10	1.000	6	90
R142	Diesel	20-26 t	Euro II	1.0215E-02	5.2687E-01	-1.6934E-02	2.7117E-04	-2.1578E-06	1.0446E-08	-2.2613E-11	1.000	6	90
R143	Diesel	20-26 t	Euro III	1.7773E+00	6.0831E-01	-3.0774E-02	7.9516E-04	-1.1158E-05	8.4326E-08	-2.6403E-10	1.000	6	90
R144	Diesel	20-26 t	Euro IV	6.5150E-01	8.2282E-02	-4.3224E-03	1.1538E-04	-1.6952E-06	1.3592E-08	-4.4981E-11	1.000	6	90
R145	Diesel	20-26 t	Euro V	6.6101E-01	8.4435E-02	-4.4650E-03	1.1976E-04	-1.7657E-06	1.4168E-08	-4.6852E-11	1.000	6	90
R146	Diesel	20-26 t	Euro VI	6.6101E-01	8.4435E-02	-4.4650E-03	1.1976E-04	-1.7657E-06	1.4168E-08	-4.6852E-11	0.100	6	90
R147	Diesel	26-28 t	Pre-Euro I	7.9433E+00	7.2639E-01	-6.8996E-03	-2.7410E-04	7.6185E-06	-5.8558E-08	1.3355E-10	1.000	6	90
R148	Diesel	26-28 t	Euro I	8.3583E+00	6.1098E-01	-1.9855E-02	3.5080E-04	-3.8402E-06	3.4282E-08	-1.4704E-10	1.000	6	90
R149	Diesel	26-28 t	Euro II	3.6005E-02	5.1624E-01	-1.4905E-02	2.0243E-04	-1.1048E-06	2.7542E-09	0	1.000	6	90
R150	Diesel	26-28 t	Euro III	2.4387E+00	4.4601E-01	-1.9104E-02	4.6176E-04	-6.5065E-06	5.2876E-08	-1.8137E-10	1.000	6	90
R151	Diesel	26-28 t	Euro IV	6.9138E-01	7.7697E-02	-4.2123E-03	1.1913E-04	-1.8486E-06	1.5381E-08	-5.1904E-11	1.000	6	90
R152	Diesel	26-28 t	Euro V	7.0746E-01	7.8430E-02	-4.2581E-03	1.2057E-04	-1.8740E-06	1.5617E-08	-5.2767E-11	1.000	6	90
R153	Diesel	26-28 t	Euro VI	7.0746E-01	7.8430E-02	-4.2581E-03	1.2057E-04	-1.8740E-06	1.5617E-08	-5.2767E-11	0.100	6	90
R154	Diesel	28-32 t	Pre-Euro I	7.6401E+00	7.2154E-01	4.9896E-03	-7.8280E-04	1.6652E-05	-1.3153E-07	3.5612E-10	1.000	6	90
R155	Diesel	28-32 t	Euro I	7.5435E+00	6.1835E-01	-9.3113E-03	-1.2495E-04	4.9938E-06	-4.0296E-08	9.0422E-11	1.000	6	90
R156	Diesel	28-32 t	Euro II	-2.6739E-10	5.1376E-01	-1.1032E-02	8.3790E-05	6.4704E-08	0	0	1.000	6	90
R157	Diesel	28-32 t	Euro III	1.4798E+00	4.9477E-01	-1.6073E-02	2.6822E-04	-2.4671E-06	1.6383E-08	-5.9493E-11	1.000	6	90
R158	Diesel	28-32 t	Euro IV	7.4025E-01	7.9019E-02	-4.1362E-03	1.1564E-04	-1.7951E-06	1.5083E-08	-5.1505E-11	1.000	6	90
R159	Diesel	28-32 t	Euro V	7.5515E-01	8.0399E-02	-4.2108E-03	1.1767E-04	-1.8262E-06	1.5345E-08	-5.2403E-11	1.000	6	90
R160	Diesel	28-32 t	Euro VI	7.5515E-01	8.0399E-02	-4.2108E-03	1.1767E-04	-1.8262E-06	1.5345E-08	-5.2403E-11	0.100	6	90
R161	Diesel	>32 t	Pre-Euro I	9.3384E+00	7.2407E-01	-8.3182E-04	-5.6227E-04	1.3226E-05	-1.0685E-07	2.8795E-10	1.000	6	90
R162	Diesel	>32 t	Euro I	9.1152E+00	6.6883E-01	-1.5719E-02	8.7304E-05	1.5516E-06	-1.2280E-08	0	1.000	6	90
R163	Diesel	>32 t	Euro II	6.6826E-03	5.9498E-01	-1.5443E-02	1.6795E-04	-5.4087E-07	1.0833E-09	0	1.000	6	90
R164	Diesel	>32 t	Euro III	2.5890E+00	4.9208E-01	-1.9440E-02	4.0987E-04	-4.9805E-06	3.7333E-08	-1.2661E-10	1.000	6	90
R165	Diesel	>32 t	Euro IV	7.3729E-01	8.5315E-02	-4.2341E-03	1.0899E-04	-1.5766E-06	1.2753E-08	-4.3032E-11	1.000	6	90
R166	Diesel	>32 t	Euro V	7.5519E-01	8.6426E-02	-4.3024E-03	1.1100E-04	-1.6094E-06	1.3039E-08	-4.4033E-11	1.000	6	90
R167	Diesel	>32 t	Euro VI	7.5519E-01	8.6426E-02	-4.3024E-03	1.1100E-04	-1.6094E-06	1.3039E-08	-4.4033E-11	0.100	6	90

D8 Articulated heavy goods vehicles

Table D37: CO emission factors for articulated heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R168	Diesel	14-20 t	Pre-Euro I	4.9330E+01	5.9533E+00	-2.0770E-01	3.8457E-03	-4.0072E-05	2.9285E-07	-1.0771E-09	1.000	6	90
R169	Diesel	14-20 t	Euro I	2.0884E+01	2.6365E+00	-6.9421E-02	7.1389E-04	3.7158E-07	-2.1580E-08	0	1.000	6	90
R170	Diesel	14-20 t	Euro II	1.4384E+01	2.2535E+00	-7.1668E-02	1.4088E-03	-1.6138E-05	1.2462E-07	-4.5431E-10	1.000	6	90
R171	Diesel	14-20 t	Euro III	2.0065E+01	3.3887E+00	-1.3040E-01	2.5710E-03	-2.7523E-05	1.8411E-07	-5.9597E-10	1.000	6	90
R172	Diesel	14-20 t	Euro IV	9.6077E-01	3.6767E-01	-1.8989E-02	5.1188E-04	-7.4521E-06	5.7584E-08	-1.8193E-10	1.000	6	90
R173	Diesel	14-20 t	Euro V	9.6153E-01	3.7847E-01	-1.9669E-02	5.3141E-04	-7.7417E-06	5.9765E-08	-1.8851E-10	1.000	6	90
R174	Diesel	14-20 t	Euro VI	9.6153E-01	3.7847E-01	-1.9669E-02	5.3141E-04	-7.7417E-06	5.9765E-08	-1.8851E-10	1.000	6	90
R175	Diesel	20-28 t	Pre-Euro I	3.2487E+01	4.8940E+00	-1.5240E-01	2.1776E-03	-1.2329E-05	4.5475E-08	-1.9631E-10	1.000	6	90
R176	Diesel	20-28 t	Euro I	3.0398E+01	2.4869E+00	-1.5771E-02	-1.3787E-03	3.5698E-05	-2.9043E-07	7.6417E-10	1.000	6	90
R177	Diesel	20-28 t	Euro II	1.4197E+01	3.5371E+00	-1.1469E-01	2.1620E-03	-2.3076E-05	1.6336E-07	-5.5829E-10	1.000	6	90
R178	Diesel	20-28 t	Euro III	2.1486E+01	5.0775E+00	-2.0918E-01	4.4952E-03	-5.2517E-05	3.5798E-07	-1.1025E-09	1.000	6	90
R179	Diesel	20-28 t	Euro IV	1.1765E+00	4.3693E-01	-2.1348E-02	5.5700E-04	-7.9833E-06	6.1788E-08	-1.9730E-10	1.000	6	90
R180	Diesel	20-28 t	Euro V	1.2262E+00	4.3793E-01	-2.1291E-02	5.5361E-04	-7.9258E-06	6.1426E-08	-1.9663E-10	1.000	6	90
R181	Diesel	20-28 t	Euro VI	1.2262E+00	4.3793E-01	-2.1291E-02	5.5361E-04	-7.9258E-06	6.1426E-08	-1.9663E-10	1.000	6	90
R182	Diesel	28-34 t	Pre-Euro I	2.7034E+01	6.5140E+00	-2.5672E-01	5.3136E-03	-6.0120E-05	4.0696E-07	-1.2735E-09	1.000	6	90
R183	Diesel	28-34 t	Euro I	2.6908E+01	3.6790E+00	-1.0026E-01	1.5270E-03	-1.3533E-05	1.1389E-07	-5.2018E-10	1.000	6	90
R184	Diesel	28-34 t	Euro II	1.4092E+01	3.8444E+00	-1.2341E-01	2.3030E-03	-2.4724E-05	1.7888E-07	-6.2210E-10	1.000	6	90
R185	Diesel	28-34 t	Euro III	2.2223E+01	5.0457E+00	-1.9550E-01	3.9636E-03	-4.3673E-05	2.9105E-07	-9.1180E-10	1.000	6	90
R186	Diesel	28-34 t	Euro IV	1.2404E+00	4.1801E-01	-1.9483E-02	4.9374E-04	-6.9846E-06	5.4312E-08	-1.7577E-10	1.000	6	90
R187	Diesel	28-34 t	Euro V	1.2438E+00	4.2934E-01	-2.0102E-02	5.0955E-04	-7.1992E-06	5.5846E-08	-1.8028E-10	1.000	6	90
R188	Diesel	28-34 t	Euro VI	1.2438E+00	4.2934E-01	-2.0102E-02	5.0955E-04	-7.1992E-06	5.5846E-08	-1.8028E-10	1.000	6	90
R189	Diesel	34-40 t	Pre-Euro I	4.8486E+01	4.1714E+00	-6.4139E-02	-1.1777E-03	4.5882E-05	-4.2046E-07	1.2140E-09	1.000	6	90
R190	Diesel	34-40 t	Euro I	4.5579E+01	1.5363E+00	8.4013E-02	-4.8839E-03	9.3465E-05	-7.3611E-07	2.0741E-09	1.000	6	90
R191	Diesel	34-40 t	Euro II	1.7190E+01	4.4627E+00	-1.4370E-01	2.6776E-03	-2.8460E-05	2.0398E-07	-7.0543E-10	1.000	6	90
R192	Diesel	34-40 t	Euro III	3.0263E+01	5.5814E+00	-2.1467E-01	4.2766E-03	-4.5973E-05	3.0365E-07	-9.6195E-10	1.000	6	90
R193	Diesel	34-40 t	Euro IV	1.5032E+00	5.0295E-01	-2.4206E-02	6.2326E-04	-8.8781E-06	6.8858E-08	-2.2127E-10	3.000	6	90
R194	Diesel	34-40 t	Euro V	1.5836E+00	5.0040E-01	-2.3909E-02	6.1235E-04	-8.7038E-06	6.7617E-08	-2.1804E-10	1.000	6	90
R195	Diesel	34-40 t	Euro VI	1.5836E+00	5.0040E-01	-2.3909E-02	6.1235E-04	-8.7038E-06	6.7617E-08	-2.1804E-10	1.000	6	90
R196	Diesel	40-50 t	Pre-Euro I	5.1582E+01	4.2311E+00	-4.5222E-02	-2.0098E-03	6.0763E-05	-5.3839E-07	1.5615E-09	1.000	6	90
R197	Diesel	40-50 t	Euro I	3.1542E+01	5.5479E+00	-1.7598E-01	3.0232E-03	-2.7226E-05	1.7116E-07	-5.9681E-10	1.000	6	90
R198	Diesel	40-50 t	Euro II	1.7750E+01	4.9981E+00	-1.5678E-01	2.8205E-03	-2.8850E-05	2.0486E-07	-7.1671E-10	1.000	6	90
R199	Diesel	40-50 t	Euro III	2.5840E+01	7.2748E+00	-3.0259E-01	6.5010E-03	-7.5454E-05	5.0502E-07	-1.5137E-09	0.500	6	90
R200	Diesel	40-50 t	Euro IV	1.7758E+00	4.6740E-01	-2.0346E-02	4.8498E-04	-6.5891E-06	5.1057E-08	-1.6834E-10	1.000	6	90
R201	Diesel	40-50 t	Euro V	1.6392E+00	5.1869E-01	-2.3976E-02	6.0008E-04	-8.4071E-06	6.5149E-08	-2.1105E-10	1.000	6	90
R202	Diesel	40-50 t	Euro VI	1.6392E+00	5.1869E-01	-2.3976E-02	6.0008E-04	-8.4071E-06	6.5149E-08	-2.1105E-10	1.000	6	90

Table D38: HC emission factors for articulated heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R168	Diesel	14-20 t	Pre-Euro I	1.7699E+01	4.9795E+00	-2.8309E-01	7.9759E-03	-1.2015E-04	9.4712E-07	-3.0196E-09	1.000	6	90
R169	Diesel	14-20 t	Euro I	5.0872E+00	2.0144E+00	-1.0206E-01	2.6724E-03	-3.8278E-05	2.9464E-07	-9.3427E-10	1.000	6	90
R170	Diesel	14-20 t	Euro II	3.4818E+00	1.2907E+00	-6.6753E-02	1.7892E-03	-2.6226E-05	2.0527E-07	-6.5717E-10	1.000	6	90
R171	Diesel	14-20 t	Euro III	2.5435E+00	1.4128E+00	-7.8654E-02	2.1585E-03	-3.1522E-05	2.4063E-07	-7.4607E-10	1.000	6	90
R172	Diesel	14-20 t	Euro IV	1.5608E-01	7.5803E-02	-4.3925E-03	1.2250E-04	-1.8049E-06	1.3811E-08	-4.2764E-11	1.000	6	90
R173	Diesel	14-20 t	Euro V	1.5810E-01	7.7520E-02	-4.4900E-03	1.2518E-04	-1.8439E-06	1.4107E-08	-4.3670E-11	1.000	6	90
R174	Diesel	14-20 t	Euro VI	1.5810E-01	7.7520E-02	-4.4900E-03	1.2518E-04	-1.8439E-06	1.4107E-08	-4.3670E-11	0.291	6	90
R175	Diesel	20-28 t	Pre-Euro I	8.1492E+00	3.1211E+00	-1.7199E-01	4.6689E-03	-6.8020E-05	5.2253E-07	-1.6372E-09	1.000	6	90
R176	Diesel	20-28 t	Euro I	6.6436E+00	2.4511E+00	-1.2358E-01	3.2277E-03	-4.6206E-05	3.5631E-07	-1.1331E-09	1.000	6	90
R177	Diesel	20-28 t	Euro II	4.7208E+00	1.4879E+00	-7.4509E-02	1.9419E-03	-2.7917E-05	2.1730E-07	-6.9813E-10	1.000	6	90
R178	Diesel	20-28 t	Euro III	3.3964E+00	1.7107E+00	-9.6035E-02	2.6514E-03	-3.8880E-05	2.9755E-07	-9.2381E-10	1.000	6	90
R179	Diesel	20-28 t	Euro IV	1.9946E-01	9.3787E-02	-5.5291E-03	1.5585E-04	-2.3094E-06	1.7698E-08	-5.4744E-11	1.000	6	90
R180	Diesel	20-28 t	Euro V	2.0238E-01	9.5921E-02	-5.6524E-03	1.5921E-04	-2.3574E-06	1.8054E-08	-5.5816E-11	1.000	6	90
R181	Diesel	20-28 t	Euro VI	2.0238E-01	9.5921E-02	-5.6524E-03	1.5921E-04	-2.3574E-06	1.8054E-08	-5.5816E-11	0.291	6	90
R182	Diesel	28-34 t	Pre-Euro I	8.2461E+00	3.0917E+00	-1.7209E-01	4.7042E-03	-6.8791E-05	5.2892E-07	-1.6559E-09	1.000	6	90
R183	Diesel	28-34 t	Euro I	6.8038E+00	2.3871E+00	-1.1848E-01	3.0677E-03	-4.3748E-05	3.3790E-07	-1.0791E-09	1.000	6	90
R184	Diesel	28-34 t	Euro II	4.5887E+00	1.5348E+00	-7.9295E-02	2.1417E-03	-3.1733E-05	2.5110E-07	-8.1105E-10	1.000	6	90
R185	Diesel	28-34 t	Euro III	3.4692E+00	1.6652E+00	-9.2790E-02	2.5527E-03	-3.7385E-05	2.8636E-07	-8.9085E-10	1.000	6	90
R186	Diesel	28-34 t	Euro IV	2.0511E-01	9.1235E-02	-5.3689E-03	1.5127E-04	-2.2419E-06	1.7198E-08	-5.3268E-11	1.000	6	90
R187	Diesel	28-34 t	Euro V	2.0619E-01	9.3771E-02	-5.5210E-03	1.5551E-04	-2.3034E-06	1.7655E-08	-5.4634E-11	1.000	6	90
R188	Diesel	28-34 t	Euro VI	2.0619E-01	9.3771E-02	-5.5210E-03	1.5551E-04	-2.3034E-06	1.7655E-08	-5.4634E-11	0.291	6	90
R189	Diesel	34-40 t	Pre-Euro I	1.2736E+01	3.1801E+00	-1.7237E-01	4.6122E-03	-6.7057E-05	5.2111E-07	-1.6616E-09	1.000	6	90
R190	Diesel	34-40 t	Euro I	1.0269E+01	2.5917E+00	-1.2725E-01	3.2608E-03	-4.6601E-05	3.6531E-07	-1.1889E-09	1.000	6	90
R191	Diesel	34-40 t	Euro II	5.9163E+00	1.7985E+00	-9.3987E-02	2.5640E-03	-3.8497E-05	3.0837E-07	-1.0052E-09	1.000	6	90
R192	Diesel	34-40 t	Euro III	5.7137E+00	1.7347E+00	-9.5316E-02	2.5946E-03	-3.8011E-05	2.9448E-07	-9.3087E-10	1.000	6	90
R193	Diesel	34-40 t	Euro IV	3.2396E-01	9.5542E-02	-5.5509E-03	1.5438E-04	-2.2792E-06	1.7591E-08	-5.5096E-11	1.000	6	90
R194	Diesel	34-40 t	Euro V	3.2847E-01	9.8146E-02	-5.7123E-03	1.5904E-04	-2.3490E-06	1.8125E-08	-5.6736E-11	1.000	6	90
R195	Diesel	34-40 t	Euro VI	3.2847E-01	9.8146E-02	-5.7123E-03	1.5904E-04	-2.3490E-06	1.8125E-08	-5.6736E-11	0.291	6	90
R196	Diesel	40-50 t	Pre-Euro I	1.2673E+01	3.4242E+00	-1.8899E-01	5.1138E-03	-7.4647E-05	5.7826E-07	-1.8318E-09	1.000	6	90
R197	Diesel	40-50 t	Euro I	9.9066E+00	2.8765E+00	-1.4677E-01	3.9200E-03	-5.7816E-05	4.5879E-07	-1.4913E-09	1.000	6	90
R198	Diesel	40-50 t	Euro II	6.0172E+00	1.8967E+00	-9.9729E-02	2.7452E-03	-4.1494E-05	3.3334E-07	-1.0869E-09	1.000	6	90
R199	Diesel	40-50 t	Euro III	5.7337E+00	1.8508E+00	-1.0484E-01	2.9541E-03	-4.4538E-05	3.5099E-07	-1.1178E-09	1.000	6	90
R200	Diesel	40-50 t	Euro IV	3.3952E-01	9.6800E-02	-5.6134E-03	1.5602E-04	-2.3028E-06	1.7780E-08	-5.5733E-11	1.000	6	90
R201	Diesel	40-50 t	Euro V	3.4637E-01	9.8854E-02	-5.7310E-03	1.5926E-04	-2.3507E-06	1.8153E-08	-5.6916E-11	1.000	6	90
R202	Diesel	40-50 t	Euro VI	3.4637E-01	9.8854E-02	-5.7310E-03	1.5926E-04	-2.3507E-06	1.8153E-08	-5.6916E-11	0.291	6	90

Table D39: NO_x emission factors for articulated heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R168	Diesel	14-20 t	Pre-Euro I	9.9344E+01	9.4272E+00	3.1590E-01	-1.8638E-02	3.6265E-04	-2.9378E-06	8.6246E-09	1.000	6	90
R169	Diesel	14-20 t	Euro I	5.0837E+01	7.9941E+00	1.7431E-02	-5.6158E-03	1.2720E-04	-1.0430E-06	2.9394E-09	1.000	6	90
R170	Diesel	14-20 t	Euro II	5.4401E+01	9.1350E+00	-3.1258E-02	-4.3562E-03	1.0717E-04	-8.6474E-07	2.2986E-09	1.000	6	90
R171	Diesel	14-20 t	Euro III	1.0400E+02	-4.7034E-02	3.7610E-01	-1.4627E-02	2.4621E-04	-1.8416E-06	5.0843E-09	1.000	6	90
R172	Diesel	14-20 t	Euro IV	5.2850E+01	-2.8340E-01	2.8642E-01	-1.1199E-02	1.9158E-04	-1.4809E-06	4.2854E-09	1.000	6	90
R173	Diesel	14-20 t	Euro V	3.8536E+01	-1.0172E+00	2.1593E-01	-7.9111E-03	1.3177E-04	-1.0073E-06	2.9030E-09	1.000	6	90
R174	Diesel	14-20 t	Euro VI	3.8536E+01	-1.0172E+00	2.1593E-01	-7.9111E-03	1.3177E-04	-1.0073E-06	2.9030E-09	0.200	6	90
R175	Diesel	20-28 t	Pre-Euro I	9.8040E+01	8.6036E+00	6.0208E-01	-2.8623E-02	5.0456E-04	-3.8104E-06	1.0480E-08	1.000	6	90
R176	Diesel	20-28 t	Euro I	2.4374E+01	1.8763E+01	-5.1582E-01	1.0333E-02	-1.3522E-04	1.1694E-06	-4.4101E-09	1.000	6	90
R177	Diesel	20-28 t	Euro II	2.6093E+01	1.9825E+01	-5.6586E-01	1.1572E-02	-1.5293E-04	1.3101E-06	-4.8751E-09	1.000	6	90
R178	Diesel	20-28 t	Euro III	1.1601E+02	1.7560E+00	3.8561E-01	-1.4976E-02	2.3704E-04	-1.5965E-06	3.7611E-09	1.000	6	90
R179	Diesel	20-28 t	Euro IV	6.9885E+01	-2.0521E+00	5.3344E-01	-1.9871E-02	3.2954E-04	-2.5017E-06	7.1582E-09	1.000	6	90
R180	Diesel	20-28 t	Euro V	4.9574E+01	-2.1913E+00	3.6960E-01	-1.3283E-02	2.1728E-04	-1.6418E-06	4.6955E-09	1.000	6	90
R181	Diesel	20-28 t	Euro VI	4.9574E+01	-2.1913E+00	3.6960E-01	-1.3283E-02	2.1728E-04	-1.6418E-06	4.6955E-09	0.200	6	90
R182	Diesel	28-34 t	Pre-Euro I	4.6657E+01	1.9673E+01	-8.4472E-02	-6.0552E-03	1.2030E-04	-5.8839E-07	0	1.000	6	90
R183	Diesel	28-34 t	Euro I	3.6517E+01	1.5535E+01	-2.0506E-01	3.5229E-04	1.3447E-05	1.2529E-07	-1.6064E-09	1.000	6	90
R184	Diesel	28-34 t	Euro II	2.3371E+01	2.0382E+01	-5.1741E-01	9.1526E-03	-1.1004E-04	9.8058E-07	-3.9414E-09	1.000	6	90
R185	Diesel	28-34 t	Euro III	1.1942E+02	1.2734E+00	4.7833E-01	-1.8435E-02	2.9364E-04	-2.0234E-06	4.9824E-09	1.000	6	90
R186	Diesel	28-34 t	Euro IV	6.8992E+01	-1.7837E+00	5.5649E-01	-2.0892E-02	3.4509E-04	-2.5983E-06	7.3548E-09	1.000	6	90
R187	Diesel	28-34 t	Euro V	5.1106E+01	-2.4025E+00	4.0789E-01	-1.4715E-02	2.4062E-04	-1.8168E-06	5.1923E-09	1.000	6	90
R188	Diesel	28-34 t	Euro VI	5.1106E+01	-2.4025E+00	4.0789E-01	-1.4715E-02	2.4062E-04	-1.8168E-06	5.1923E-09	0.200	6	90
R189	Diesel	34-40 t	Pre-Euro I	4.9107E+01	2.3374E+01	-1.0300E-01	-7.4626E-03	1.4739E-04	-7.1966E-07	0	1.000	6	90
R190	Diesel	34-40 t	Euro I	4.9235E+01	1.5823E+01	-7.9635E-02	-4.6880E-03	9.6036E-05	-4.7404E-07	0	1.000	6	90
R191	Diesel	34-40 t	Euro II	5.3117E+01	1.8137E+01	-2.2136E-01	-6.2060E-04	3.5094E-05	-4.5170E-09	-1.4564E-09	1.000	6	90
R192	Diesel	34-40 t	Euro III	1.1794E+02	5.3019E+00	2.9953E-01	-1.3380E-02	2.1404E-04	-1.3636E-06	2.7916E-09	1.000	6	90
R193	Diesel	34-40 t	Euro IV	8.1030E+01	-2.3213E+00	6.6212E-01	-2.4655E-02	4.0545E-04	-3.0437E-06	8.5956E-09	1.000	6	90
R194	Diesel	34-40 t	Euro V	5.5273E+01	-2.1694E+00	4.3273E-01	-1.5789E-02	2.5873E-04	-1.9488E-06	5.5415E-09	1.000	6	90
R195	Diesel	34-40 t	Euro VI	5.5273E+01	-2.1694E+00	4.3273E-01	-1.5789E-02	2.5873E-04	-1.9488E-06	5.5415E-09	0.200	6	90
R196	Diesel	40-50 t	Pre-Euro I	4.4198E+01	2.5898E+01	-4.8911E-02	-1.0267E-02	1.8615E-04	-8.8707E-07	0	1.000	6	90
R197	Diesel	40-50 t	Euro I	4.5084E+01	1.7763E+01	-5.8492E-02	-6.2485E-03	1.1895E-04	-5.7530E-07	0	1.000	6	90
R198	Diesel	40-50 t	Euro II	5.5256E+01	1.8867E+01	-1.1179E-01	-5.2626E-03	1.1141E-04	-5.5438E-07	0	1.000	6	90
R199	Diesel	40-50 t	Euro III	1.0324E+02	1.0242E+01	6.3141E-02	-6.6412E-03	1.0825E-04	-5.0279E-07	0	1.000	6	90
R200	Diesel	40-50 t	Euro IV	8.7455E+01	-2.6859E+00	7.6243E-01	-2.8313E-02	4.6374E-04	-3.4682E-06	9.7586E-09	1.000	6	90
R201	Diesel	40-50 t	Euro V	5.9377E+01	-2.3913E+00	4.9163E-01	-1.8012E-02	2.9541E-04	-2.2262E-06	6.3339E-09	1.000	6	90
R202	Diesel	40-50 t	Euro VI	5.9377E+01	-2.3913E+00	4.9163E-01	-1.8012E-02	2.9541E-04	-2.2262E-06	6.3339E-09	0.200	6	90

Table D40: PM emission factors for articulated heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R168	Diesel	14-20 t	Pre-Euro I	8.1608E+00	8.5190E-01	-2.7775E-02	4.7508E-04	-4.5768E-06	3.4752E-08	-1.4032E-10	1.000	6	90
R169	Diesel	14-20 t	Euro I	3.5165E+00	8.2496E-01	-3.6834E-02	8.6930E-04	-1.1387E-05	8.4489E-08	-2.6943E-10	1.000	6	90
R170	Diesel	14-20 t	Euro II	1.2709E-02	3.8799E-01	-1.2916E-02	2.2353E-04	-1.9782E-06	1.0313E-08	-2.3498E-11	1.000	6	90
R171	Diesel	14-20 t	Euro III	7.1063E-01	5.3717E-01	-2.8069E-02	7.4958E-04	-1.0721E-05	8.0848E-08	-2.4930E-10	1.000	6	90
R172	Diesel	14-20 t	Euro IV	4.8366E-01	6.5380E-02	-3.6730E-03	1.0488E-04	-1.6141E-06	1.3147E-08	-4.3348E-11	1.000	6	90
R173	Diesel	14-20 t	Euro V	4.9119E-01	6.7013E-02	-3.7803E-03	1.0810E-04	-1.6644E-06	1.3547E-08	-4.4619E-11	1.000	6	90
R174	Diesel	14-20 t	Euro VI	4.9119E-01	6.7013E-02	-3.7803E-03	1.0810E-04	-1.6644E-06	1.3547E-08	-4.4619E-11	0.100	6	90
R175	Diesel	20-28 t	Pre-Euro I	5.9856E+00	9.2119E-01	-2.1202E-02	1.6338E-04	1.0303E-06	-1.0834E-08	0.0000E+00	1.000	6	90
R176	Diesel	20-28 t	Euro I	5.1126E+00	8.7243E-01	-3.2927E-02	6.8532E-04	-8.2639E-06	6.2684E-08	-2.1678E-10	1.000	6	90
R177	Diesel	20-28 t	Euro II	6.0194E-03	4.7488E-01	-1.2250E-02	1.3445E-04	-4.4907E-07	9.2867E-10	0.0000E+00	1.000	6	90
R178	Diesel	20-28 t	Euro III	1.2611E+00	5.7567E-01	-2.7291E-02	6.7537E-04	-9.1258E-06	6.7305E-08	-2.0834E-10	1.000	6	90
R179	Diesel	20-28 t	Euro IV	6.3382E-01	7.6298E-02	-4.1749E-03	1.1698E-04	-1.7867E-06	1.4621E-08	-4.8695E-11	1.000	6	90
R180	Diesel	20-28 t	Euro V	6.5070E-01	7.6574E-02	-4.1806E-03	1.1697E-04	-1.7870E-06	1.4648E-08	-4.8886E-11	1.000	6	90
R181	Diesel	20-28 t	Euro VI	6.5070E-01	7.6574E-02	-4.1806E-03	1.1697E-04	-1.7870E-06	1.4648E-08	-4.8886E-11	0.100	6	90
R182	Diesel	28-34 t	Pre-Euro I	6.1633E+00	8.9793E-01	-1.5947E-02	-3.9376E-05	4.4429E-06	-3.7289E-08	7.7799E-11	1.000	6	90
R183	Diesel	28-34 t	Euro I	5.3228E+00	8.0542E-01	-2.4959E-02	4.0784E-04	-3.7875E-06	2.8539E-08	-1.1669E-10	1.000	6	90
R184	Diesel	28-34 t	Euro II	-2.3920E-10	4.8855E-01	-1.0921E-02	8.3564E-05	5.8910E-08	0.0000E+00	0.0000E+00	1.000	6	90
R185	Diesel	28-34 t	Euro III	1.6905E+00	4.6317E-01	-1.8657E-02	4.0731E-04	-5.0488E-06	3.7138E-08	-1.2123E-10	1.000	6	90
R186	Diesel	28-34 t	Euro IV	6.3526E-01	7.4859E-02	-3.9995E-03	1.1078E-04	-1.6891E-06	1.3905E-08	-4.6693E-11	1.000	6	90
R187	Diesel	28-34 t	Euro V	6.4909E-01	7.5753E-02	-4.0356E-03	1.1129E-04	-1.6914E-06	1.3906E-08	-4.6703E-11	1.000	6	90
R188	Diesel	28-34 t	Euro VI	6.4909E-01	7.5753E-02	-4.0356E-03	1.1129E-04	-1.6914E-06	1.3906E-08	-4.6703E-11	0.100	6	90
R189	Diesel	34-40 t	Pre-Euro I	9.5948E+00	6.5878E-01	6.9744E-03	-8.4517E-04	1.7764E-05	-1.4059E-07	3.8334E-10	1.000	6	90
R190	Diesel	34-40 t	Euro I	9.3110E+00	6.2045E-01	-1.0117E-02	-1.0387E-04	4.5119E-06	-3.3714E-08	5.9198E-11	1.000	6	90
R191	Diesel	34-40 t	Euro II	-2.8285E-10	5.9198E-01	-1.3337E-02	1.0056E-04	7.9535E-08	0.0000E+00	0.0000E+00	1.000	6	90
R192	Diesel	34-40 t	Euro III	2.6047E+00	4.7454E-01	-1.7523E-02	3.4675E-04	-4.0301E-06	3.0604E-08	-1.0838E-10	1.000	6	90
R193	Diesel	34-40 t	Euro IV	7.1125E-01	8.8456E-02	-4.3390E-03	1.0986E-04	-1.5690E-06	1.2602E-08	-4.2415E-11	1.000	6	90
R194	Diesel	34-40 t	Euro V	7.2642E-01	9.0078E-02	-4.4374E-03	1.1274E-04	-1.6149E-06	1.2988E-08	-4.3719E-11	1.000	6	90
R195	Diesel	34-40 t	Euro VI	7.2642E-01	9.0078E-02	-4.4374E-03	1.1274E-04	-1.6149E-06	1.2988E-08	-4.3719E-11	0.100	6	90
R196	Diesel	40-50 t	Pre-Euro I	1.0163E+01	6.4266E-01	1.4527E-02	-1.1343E-03	2.2561E-05	-1.7686E-07	4.8657E-10	1.000	6	90
R197	Diesel	40-50 t	Euro I	9.6930E+00	6.0274E-01	-3.2787E-03	-3.6673E-04	8.9603E-06	-6.8335E-08	1.6128E-10	1.000	6	90
R198	Diesel	40-50 t	Euro II	-3.1923E-10	6.5716E-01	-1.4618E-02	1.0923E-04	9.6740E-08	0.0000E+00	0.0000E+00	1.000	6	90
R199	Diesel	40-50 t	Euro III	2.8085E+00	4.5195E-01	-1.3938E-02	2.1468E-04	-1.8315E-06	1.3564E-08	-5.8066E-11	1.000	6	90
R200	Diesel	40-50 t	Euro IV	7.3195E-01	9.1854E-02	-4.3751E-03	1.0804E-04	-1.5162E-06	1.2130E-08	-4.1005E-11	1.000	6	90
R201	Diesel	40-50 t	Euro V	7.4868E-01	9.3174E-02	-4.4422E-03	1.0975E-04	-1.5422E-06	1.2356E-08	-4.1815E-11	1.000	6	90
R202	Diesel	40-50 t	Euro VI	7.4868E-01	9.3174E-02	-4.4422E-03	1.0975E-04	-1.5422E-06	1.2356E-08	-4.1815E-11	0.100	6	90

D9 Buses

Table D41: CO emission factors for buses.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R203	Diesel	<15 t	Pre-Euro I	6.0111E+01	6.9137E+00	-2.1934E-01	2.5963E-03	1.1029E-05	-4.0461E-07	2.0802E-09	0.400	6	75
R204	Diesel	<15 t	Euro I	1.3147E+01	4.8888E+00	-2.7871E-01	8.4063E-03	-1.3784E-04	1.1735E-06	-4.0335E-09	1.000	6	75
R205	Diesel	<15 t	Euro II	7.0216E+00	6.7028E+00	-4.4085E-01	1.4232E-02	-2.4167E-04	2.0797E-06	-7.1399E-09	0.500	6	75
R206	Diesel	<15 t	Euro III	8.8853E+00	5.6595E+00	-3.3211E-01	1.0303E-02	-1.7340E-04	1.4925E-06	-5.1392E-09	0.300	6	75
R207	Diesel	<15 t	Euro IV	1.5318E+00	3.9786E-01	-2.3000E-02	6.6310E-04	-1.0401E-05	8.5729E-08	-2.8854E-10	1.000	6	75
R208	Diesel	<15 t	Euro V	1.6116E+00	3.8847E-01	-2.2180E-02	6.3154E-04	-9.7936E-06	8.0057E-08	-2.6802E-10	1.000	6	75
R209	Diesel	<15 t	Euro VI	1.6116E+00	3.8847E-01	-2.2180E-02	6.3154E-04	-9.7936E-06	8.0057E-08	-2.6802E-10	1.000	6	75
R210	Diesel	15-18 t	Pre-Euro I	5.6795E+01	1.1488E+01	-6.5935E-01	2.0401E-02	-3.4589E-04	3.0399E-06	-1.0728E-08	1.000	6	75
R211	Diesel	15-18 t	Euro I	1.8670E+01	5.8997E+00	-3.1076E-01	9.1544E-03	-1.4959E-04	1.2638E-06	-4.2970E-09	1.000	6	75
R212	Diesel	15-18 t	Euro II	7.6901E+00	8.8511E+00	-5.7076E-01	1.8219E-02	-3.0337E-04	2.5397E-06	-8.4900E-09	1.000	6	75
R213	Diesel	15-18 t	Euro III	8.3154E+00	8.0999E+00	-4.7224E-01	1.4592E-02	-2.4498E-04	2.1050E-06	-7.2395E-09	1.000	6	75
R214	Diesel	15-18 t	Euro IV	1.9118E+00	4.9387E-01	-2.6277E-02	7.1636E-04	-1.0897E-05	8.8606E-08	-2.9698E-10	1.000	6	75
R215	Diesel	15-18 t	Euro V	2.0021E+00	4.8259E-01	-2.5327E-02	6.8197E-04	-1.0279E-05	8.3160E-08	-2.7810E-10	1.000	6	75
R216	Diesel	15-18 t	Euro VI	2.0021E+00	4.8259E-01	-2.5327E-02	6.8197E-04	-1.0279E-05	8.3160E-08	-2.7810E-10	1.000	6	75
R217	Diesel	>18 t	Pre-Euro I	3.6913E+01	2.0308E+01	-1.2141E+00	3.8041E-02	-6.4050E-04	5.5221E-06	-1.9053E-08	1.000	6	75
R218	Diesel	>18 t	Euro I	1.7834E+01	8.0426E+00	-4.0500E-01	1.1646E-02	-1.8762E-04	1.5706E-06	-5.3068E-09	1.000	6	75
R219	Diesel	>18 t	Euro II	3.6587E+00	1.1856E+01	-7.1749E-01	2.2383E-02	-3.7709E-04	3.2449E-06	-1.1168E-08	1.000	6	75
R220	Diesel	>18 t	Euro III	-4.9698E-01	1.2451E+01	-7.3572E-01	2.2720E-02	-3.8062E-04	3.2638E-06	-1.1206E-08	1.000	6	75
R221	Diesel	>18 t	Euro IV	-2.5612E-02	1.1682E+00	-7.3946E-02	2.3411E-03	-3.9702E-05	3.4287E-07	-1.1825E-09	1.000	6	75
R222	Diesel	>18 t	Euro V	6.2823E-02	1.1570E+00	-7.3124E-02	2.3145E-03	-3.9252E-05	3.3901E-07	-1.1693E-09	1.000	6	75
R223	Diesel	>18 t	Euro VI	6.2823E-02	1.1570E+00	-7.3124E-02	2.3145E-03	-3.9252E-05	3.3901E-07	-1.1693E-09	1.000	6	75

Table D42: HC emission factors for buses.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R203	Diesel	<15 t	Pre-Euro I	8.0078E+01	-3.6492E+00	4.3390E-01	-1.8044E-02	3.5726E-04	-3.3726E-06	1.2282E-08	0.300	6	75
R204	Diesel	<15 t	Euro I	1.3467E+01	-6.0062E-01	8.3859E-02	-3.6115E-03	7.3072E-05	-7.0093E-07	2.5845E-09	1.000	6	75
R205	Diesel	<15 t	Euro II	9.4300E+00	-4.5252E-01	5.7622E-02	-2.4463E-03	4.9231E-05	-4.7098E-07	1.7338E-09	1.000	6	75
R206	Diesel	<15 t	Euro III	8.1492E+00	-4.1302E-01	5.3415E-02	-2.2656E-03	4.5503E-05	-4.3483E-07	1.5999E-09	1.000	6	75
R207	Diesel	<15 t	Euro IV	4.5389E-01	-2.1168E-02	2.6286E-03	-1.1201E-04	2.2553E-06	-2.1559E-08	7.9275E-11	1.000	6	75
R208	Diesel	<15 t	Euro V	4.6440E-01	-2.1567E-02	2.6907E-03	-1.1483E-04	2.3146E-06	-2.2144E-08	8.1473E-11	1.000	6	75
R209	Diesel	<15 t	Euro VI	4.6440E-01	-2.1567E-02	2.6907E-03	-1.1483E-04	2.3146E-06	-2.2144E-08	8.1473E-11	0.291	6	75
R210	Diesel	15-18 t	Pre-Euro I	5.5269E+01	-2.7017E+00	2.7247E-01	-1.0615E-02	1.9942E-04	-1.8075E-06	6.3763E-09	1.000	6	75
R211	Diesel	15-18 t	Euro I	1.8004E+01	-8.3751E-01	1.1100E-01	-4.6345E-03	9.0695E-05	-8.4692E-07	3.0586E-09	1.000	6	75
R212	Diesel	15-18 t	Euro II	1.2073E+01	-5.9164E-01	7.7598E-02	-3.3002E-03	6.5755E-05	-6.2299E-07	2.2755E-09	1.000	6	75
R213	Diesel	15-18 t	Euro III	1.0622E+01	-5.7758E-01	7.4368E-02	-3.1266E-03	6.1757E-05	-5.8189E-07	2.1180E-09	1.000	6	75
R214	Diesel	15-18 t	Euro IV	5.9757E-01	-3.0748E-02	3.7748E-03	-1.5913E-04	3.1472E-06	-2.9646E-08	1.0780E-10	1.000	6	75
R215	Diesel	15-18 t	Euro V	6.1076E-01	-3.1679E-02	3.8829E-03	-1.6371E-04	3.2388E-06	-3.0520E-08	1.1102E-10	1.000	6	75
R216	Diesel	15-18 t	Euro VI	6.1076E-01	-3.1679E-02	3.8829E-03	-1.6371E-04	3.2388E-06	-3.0520E-08	1.1102E-10	0.291	6	75
R217	Diesel	>18 t	Pre-Euro I	6.0979E+01	-3.0641E+00	2.8989E-01	-1.1086E-02	2.0636E-04	-1.8592E-06	6.5289E-09	1.000	6	75
R218	Diesel	>18 t	Euro I	1.9164E+01	-8.1806E-01	1.1236E-01	-4.6983E-03	9.1936E-05	-8.5776E-07	3.0944E-09	1.000	6	75
R219	Diesel	>18 t	Euro II	1.3139E+01	-6.5276E-01	8.4198E-02	-3.5522E-03	7.0457E-05	-6.6560E-07	2.4261E-09	1.000	6	75
R220	Diesel	>18 t	Euro III	1.1578E+01	-6.3827E-01	7.9917E-02	-3.3314E-03	6.5522E-05	-6.1571E-07	2.2368E-09	1.000	6	75
R221	Diesel	>18 t	Euro IV	6.6240E-01	-3.5584E-02	4.1312E-03	-1.7162E-04	3.3715E-06	-3.1636E-08	1.1474E-10	1.000	6	75
R222	Diesel	>18 t	Euro V	6.7223E-01	-3.5840E-02	4.1875E-03	-1.7431E-04	3.4280E-06	-3.2185E-08	1.1677E-10	1.000	6	75
R223	Diesel	>18 t	Euro VI	6.7223E-01	-3.5840E-02	4.1875E-03	-1.7431E-04	3.4280E-06	-3.2185E-08	1.1677E-10	0.291	6	75

Table D43: NO_x emission factors for buses.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R203	Diesel	<15 t	Pre-Euro I	3.0400E+02	-2.7824E+01	2.2432E+00	-7.2803E-02	1.1971E-03	-9.5885E-06	2.9778E-08	1.000	6	75
R204	Diesel	<15 t	Euro I	1.4227E+02	-4.6401E+00	6.2778E-01	-2.2877E-02	4.0705E-04	-3.4154E-06	1.0899E-08	1.000	6	75
R205	Diesel	<15 t	Euro II	1.2827E+02	-9.1667E-01	4.2980E-01	-1.7490E-02	3.2887E-04	-2.8328E-06	9.1541E-09	1.000	6	75
R206	Diesel	<15 t	Euro III	1.2203E+02	4.0594E+00	-1.0058E-01	1.8676E-03	-2.3766E-05	2.6319E-07	-1.2558E-09	1.000	6	75
R207	Diesel	<15 t	Euro IV	4.6503E+01	4.7336E+00	-1.7069E-01	4.1004E-03	-5.5067E-05	4.2706E-07	-1.4314E-09	1.000	6	75
R208	Diesel	<15 t	Euro V	3.7810E+01	2.3073E+00	-8.5096E-02	2.0225E-03	-2.6763E-05	2.1215E-07	-7.4082E-10	1.000	6	75
R209	Diesel	<15 t	Euro VI	3.7810E+01	2.3073E+00	-8.5096E-02	2.0225E-03	-2.6763E-05	2.1215E-07	-7.4082E-10	0.200	6	75
R210	Diesel	15-18 t	Pre-Euro I	2.4238E+01	3.6465E+01	-1.5019E+00	3.6414E-02	-4.5798E-04	2.9995E-06	-8.1342E-09	1.000	6	75
R211	Diesel	15-18 t	Euro I	2.6953E+01	2.2651E+01	-1.0366E+00	2.7970E-02	-3.9734E-04	2.9268E-06	-8.7636E-09	1.000	6	75
R212	Diesel	15-18 t	Euro II	5.6375E+01	1.8136E+01	-6.6234E-01	1.5018E-02	-1.8032E-04	1.1842E-06	-3.3728E-09	1.000	6	75
R213	Diesel	15-18 t	Euro III	1.4044E+02	7.9849E+00	-3.0007E-01	7.4620E-03	-1.0354E-04	8.4541E-07	-2.9772E-09	1.000	6	75
R214	Diesel	15-18 t	Euro IV	3.3943E+01	1.1961E+01	-6.4575E-01	1.9666E-02	-3.1241E-04	2.5176E-06	-8.0490E-09	1.000	6	75
R215	Diesel	15-18 t	Euro V	2.9056E+01	7.2708E+00	-4.3092E-01	1.3728E-02	-2.2498E-04	1.8498E-06	-5.9869E-09	1.000	6	75
R216	Diesel	15-18 t	Euro VI	2.9056E+01	7.2708E+00	-4.3092E-01	1.3728E-02	-2.2498E-04	1.8498E-06	-5.9869E-09	0.200	6	75
R217	Diesel	>18 t	Pre-Euro I	2.2902E+01	4.0625E+01	-1.3220E+00	2.6192E-02	-2.6811E-04	1.4917E-06	-3.7398E-09	1.000	6	75
R218	Diesel	>18 t	Euro I	1.6613E+01	2.7366E+01	-1.0359E+00	2.3154E-02	-2.7012E-04	1.6734E-06	-4.4103E-09	1.000	6	75
R219	Diesel	>18 t	Euro II	3.0007E+01	2.7713E+01	-1.1202E+00	2.8227E-02	-3.8994E-04	2.8937E-06	-8.9049E-09	1.000	6	75
R220	Diesel	>18 t	Euro III	9.2959E+01	2.4674E+01	-1.4038E+00	4.4073E-02	-7.2155E-04	5.9638E-06	-1.9440E-08	1.000	6	75
R221	Diesel	>18 t	Euro IV	3.1525E+01	1.4893E+01	-7.1700E-01	2.0560E-02	-3.1757E-04	2.5435E-06	-8.1723E-09	1.000	6	75
R222	Diesel	>18 t	Euro V	2.8039E+01	9.2214E+00	-4.9522E-01	1.5027E-02	-2.4112E-04	1.9729E-06	-6.4037E-09	1.000	6	75
R223	Diesel	>18 t	Euro VI	2.8039E+01	9.2214E+00	-4.9522E-01	1.5027E-02	-2.4112E-04	1.9729E-06	-6.4037E-09	0.200	6	75

Table D44: PM emission factors for buses.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R203	Diesel	<15 t	Pre-Euro I	1.4493E+01	1.0704E+00	-3.9973E-02	7.0096E-04	-4.9864E-06	8.3214E-09	3.6903E-11	0.400	6	75
R204	Diesel	<15 t	Euro I	3.6381E+00	3.4711E-01	-2.3424E-03	-3.4449E-04	1.1412E-05	-1.3283E-07	5.4216E-10	1.000	6	75
R205	Diesel	<15 t	Euro II	1.2599E-01	4.5643E-01	-2.3635E-02	6.5856E-04	-9.7421E-06	7.4902E-08	-2.3544E-10	0.600	6	75
R206	Diesel	<15 t	Euro III	8.1704E-02	4.1453E-01	-1.9994E-02	5.2931E-04	-7.5387E-06	5.6400E-08	-1.7386E-10	0.500	6	75
R207	Diesel	<15 t	Euro IV	7.4158E-01	1.5679E-02	-5.2045E-04	1.5270E-06	1.8056E-07	-2.6038E-09	1.0849E-11	1.000	6	75
R208	Diesel	<15 t	Euro V	7.5914E-01	1.5597E-02	-5.0548E-04	6.0003E-07	2.0412E-07	-2.8580E-09	1.1849E-11	1.000	6	75
R209	Diesel	<15 t	Euro VI	7.5542E-01	1.6773E-02	-6.2414E-04	5.8723E-06	8.9631E-08	-1.6672E-09	7.1068E-12	0.100	6	75
R210	Diesel	15-18 t	Pre-Euro I	1.0622E+01	1.6823E+00	-9.8387E-02	3.0474E-03	-5.1549E-05	4.5287E-07	-1.6003E-09	1.000	6	75
R211	Diesel	15-18 t	Euro I	2.5072E+00	1.0381E+00	-5.1585E-02	1.4973E-03	-2.4236E-05	2.0351E-07	-6.8909E-10	1.000	6	75
R212	Diesel	15-18 t	Euro II	9.7544E-02	5.9432E-01	-2.7814E-02	7.1424E-04	-9.9438E-06	7.3184E-08	-2.2299E-10	1.000	6	75
R213	Diesel	15-18 t	Euro III	3.1983E+00	-9.2795E-02	2.2376E-02	-1.0384E-03	2.1517E-05	-2.0864E-07	7.7426E-10	1.000	6	75
R214	Diesel	15-18 t	Euro IV	9.3620E-01	1.9818E-02	-3.8726E-04	-1.0746E-05	4.5017E-07	-5.0775E-09	1.9276E-11	1.000	6	75
R215	Diesel	15-18 t	Euro V	9.6101E-01	1.8081E-02	-2.3276E-04	-1.6861E-05	5.6842E-07	-6.1791E-09	2.3253E-11	1.000	6	75
R216	Diesel	15-18 t	Euro VI	9.5469E-01	2.0082E-02	-4.3457E-04	-7.8890E-06	3.7346E-07	-4.1499E-09	1.5167E-11	0.100	6	75
R217	Diesel	>18 t	Pre-Euro I	8.6711E+00	2.8180E+00	-1.7226E-01	5.4904E-03	-9.3879E-05	8.2151E-07	-2.8728E-09	1.000	6	75
R218	Diesel	>18 t	Euro I	2.3816E+00	1.2918E+00	-6.1496E-02	1.7508E-03	-2.8006E-05	2.3341E-07	-7.8628E-10	1.000	6	75
R219	Diesel	>18 t	Euro II	6.8389E-02	7.3053E-01	-3.0526E-02	7.1428E-04	-9.2689E-06	6.4841E-08	-1.9062E-10	1.000	6	75
R220	Diesel	>18 t	Euro III	6.4762E-02	6.2372E-01	-2.6886E-02	6.3886E-04	-8.3880E-06	5.9179E-08	-1.7501E-10	1.000	6	75
R221	Diesel	>18 t	Euro IV	9.8315E-01	3.9102E-02	-1.5405E-03	2.4085E-05	-1.3483E-07	4.9792E-11	1.1766E-12	2.000	6	75
R222	Diesel	>18 t	Euro V	1.0011E+00	3.8945E-02	-1.5306E-03	2.3904E-05	-1.3442E-07	7.2484E-11	1.0100E-12	1.000	6	75
R223	Diesel	>18 t	Euro VI	1.0036E+00	3.8146E-02	-1.4481E-03	2.0148E-05	-5.0699E-08	-8.2173E-10	4.6671E-12	0.100	6	75

D10 Coaches

Table D45: CO emission factors for coaches.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R224	Diesel	15-18 t	Pre-Euro I	4.8026E+01	5.1512E+00	-2.1082E-01	4.5343E-03	-5.3705E-05	3.4032E-07	-8.9040E-10	1.000	6	105
R225	Diesel	15-18 t	Euro I	3.5267E+01	4.4619E+00	-1.9075E-01	4.4446E-03	-5.6878E-05	3.8127E-07	-1.0337E-09	1.000	6	105
R226	Diesel	15-18 t	Euro II	4.2180E+01	2.3450E+00	-9.4418E-02	2.0310E-03	-2.3038E-05	1.3994E-07	-3.5579E-10	1.000	6	105
R227	Diesel	15-18 t	Euro III	4.0555E+01	3.8474E+00	-1.5120E-01	3.2819E-03	-3.9585E-05	2.5621E-07	-6.8321E-10	1.000	6	105
R228	Diesel	15-18 t	Euro IV	3.6216E+00	4.1288E-01	-2.2554E-02	5.9674E-04	-8.1120E-06	5.5260E-08	-1.4903E-10	1.000	6	105
R229	Diesel	15-18 t	Euro V	3.7509E+00	4.1920E-01	-2.2843E-02	6.0345E-04	-8.1988E-06	5.5839E-08	-1.5058E-10	1.000	6	105
R230	Diesel	15-18 t	Euro VI	3.7509E+00	4.1920E-01	-2.2843E-02	6.0345E-04	-8.1988E-06	5.5839E-08	-1.5058E-10	0.100	6	105
R231	Diesel	>18 t	Pre-Euro I	6.2838E+01	4.7659E+00	-1.9731E-01	4.4227E-03	-5.3578E-05	3.4481E-07	-9.1276E-10	1.000	6	105
R232	Diesel	>18 t	Euro I	4.5681E+01	4.2421E+00	-1.8371E-01	4.5266E-03	-6.0453E-05	4.1796E-07	-1.1580E-09	1.000	6	105
R233	Diesel	>18 t	Euro II	4.8035E+01	2.5518E+00	-1.0650E-01	2.5409E-03	-3.2307E-05	2.1634E-07	-5.9047E-10	1.000	6	105
R234	Diesel	>18 t	Euro III	5.6242E+01	3.1003E+00	-1.2995E-01	3.2514E-03	-4.5172E-05	3.2628E-07	-9.3832E-10	1.000	6	105
R235	Diesel	>18 t	Euro IV	4.3561E+00	3.3501E-01	-1.8304E-02	5.0421E-04	-7.1949E-06	5.1496E-08	-1.4512E-10	1.000	6	105
R236	Diesel	>18 t	Euro V	4.4715E+00	3.4689E-01	-1.8987E-02	5.2251E-04	-7.4516E-06	5.3310E-08	-1.5018E-10	1.000	6	105
R237	Diesel	>18 t	Euro VI	4.4715E+00	3.4689E-01	-1.8987E-02	5.2251E-04	-7.4516E-06	5.3310E-08	-1.5018E-10	0.100	6	105

Table D46: HC emission factors for coaches.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R224	Diesel	15-18 t	Pre-Euro I	1.1690E+01	2.8152E+00	-1.3398E-01	3.2490E-03	-4.2425E-05	2.8229E-07	-7.4968E-10	1.000	6	105
R225	Diesel	15-18 t	Euro I	8.4070E+00	2.6451E+00	-1.2154E-01	2.9430E-03	-3.8740E-05	2.6205E-07	-7.0852E-10	1.000	6	105
R226	Diesel	15-18 t	Euro II	7.6201E+00	1.4482E+00	-6.4586E-02	1.5519E-03	-2.0255E-05	1.3495E-07	-3.5893E-10	1.000	6	105
R227	Diesel	15-18 t	Euro III	7.8425E+00	1.3402E+00	-6.0379E-02	1.4040E-03	-1.7503E-05	1.1266E-07	-2.9251E-10	1.000	6	105
R228	Diesel	15-18 t	Euro IV	5.0194E-01	6.4495E-02	-3.0176E-03	7.1337E-05	-8.9987E-07	5.8411E-09	-1.5257E-11	1.000	6	105
R229	Diesel	15-18 t	Euro V	5.1659E-01	6.6900E-02	-3.1202E-03	7.3658E-05	-9.2860E-07	6.0260E-09	-1.5738E-11	1.000	6	105
R230	Diesel	15-18 t	Euro VI	5.1659E-01	6.6900E-02	-3.1202E-03	7.3658E-05	-9.2860E-07	6.0260E-09	-1.5738E-11	0.291	6	105
R231	Diesel	>18 t	Pre-Euro I	1.8855E+01	2.4638E+00	-1.2237E-01	3.0494E-03	-4.0078E-05	2.6755E-07	-7.1227E-10	1.000	6	105
R232	Diesel	>18 t	Euro I	1.4204E+01	2.2729E+00	-1.0532E-01	2.5617E-03	-3.3170E-05	2.1937E-07	-5.8041E-10	1.000	6	105
R233	Diesel	>18 t	Euro II	1.0409E+01	1.3361E+00	-5.9636E-02	1.3932E-03	-1.7459E-05	1.1291E-07	-2.9428E-10	1.000	6	105
R234	Diesel	>18 t	Euro III	1.0068E+01	1.9119E+00	-1.1329E-01	3.1187E-03	-4.3507E-05	3.0117E-07	-8.2073E-10	1.000	6	105
R235	Diesel	>18 t	Euro IV	6.0962E-01	9.5204E-02	-5.8462E-03	1.6282E-04	-2.2859E-06	1.5889E-08	-4.3422E-11	1.000	6	105
R236	Diesel	>18 t	Euro V	6.3013E-01	9.7549E-02	-5.9808E-03	1.6647E-04	-2.3365E-06	1.6238E-08	-4.4374E-11	1.000	6	105
R237	Diesel	>18 t	Euro VI	6.3013E-01	9.7549E-02	-5.9808E-03	1.6647E-04	-2.3365E-06	1.6238E-08	-4.4374E-11	0.291	6	105

Table D47: NO_x emission factors for coaches.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R224	Diesel	15-18 t	Pre-Euro I	8.7166E+01	2.2617E+01	-7.4673E-01	1.5276E-02	-1.7111E-04	1.1333E-06	-3.4791E-09	1.000	6	105
R225	Diesel	15-18 t	Euro I	1.5578E+02	2.2032E+00	4.0413E-01	-1.8666E-02	3.5345E-04	-2.9516E-06	9.1186E-09	1.000	6	105
R226	Diesel	15-18 t	Euro II	1.6398E+02	4.6511E+00	3.2232E-01	-1.7268E-02	3.3963E-04	-2.8555E-06	8.7728E-09	1.000	6	105
R227	Diesel	15-18 t	Euro III	2.4127E+02	-4.4617E-01	2.1119E-01	-7.5885E-03	1.2438E-04	-8.4460E-07	1.8971E-09	1.000	6	105
R228	Diesel	15-18 t	Euro IV	1.2000E+02	-2.0720E-01	2.2430E-01	-8.8811E-03	1.5468E-04	-1.1930E-06	3.3770E-09	1.000	6	105
R229	Diesel	15-18 t	Euro V	8.6122E+01	-6.2423E-01	1.2239E-01	-4.3597E-03	7.2239E-05	-5.2749E-07	1.3867E-09	1.000	6	105
R230	Diesel	15-18 t	Euro VI	8.6122E+01	-6.2423E-01	1.2239E-01	-4.3597E-03	7.2239E-05	-5.2749E-07	1.3867E-09	0.200	6	105
R231	Diesel	>18 t	Pre-Euro I	1.8585E+02	8.4665E+00	4.9952E-01	-2.6645E-02	5.1198E-04	-4.2177E-06	1.2725E-08	1.000	6	105
R232	Diesel	>18 t	Euro I	1.7861E+02	2.6424E+00	5.6629E-01	-2.5709E-02	4.7458E-04	-3.8733E-06	1.1716E-08	1.000	6	105
R233	Diesel	>18 t	Euro II	1.8618E+02	5.0010E+00	4.5536E-01	-2.2681E-02	4.2723E-04	-3.4755E-06	1.0366E-08	1.000	6	105
R234	Diesel	>18 t	Euro III	2.5469E+02	-2.3617E-01	2.7495E-01	-1.0194E-02	1.6869E-04	-1.1832E-06	2.8659E-09	1.000	6	105
R235	Diesel	>18 t	Euro IV	1.1474E+02	3.1476E+00	3.0773E-02	-2.7568E-03	5.2726E-05	-3.4505E-07	6.1906E-10	1.000	6	105
R236	Diesel	>18 t	Euro V	8.2307E+01	8.4004E-01	6.1071E-02	-2.7200E-03	4.7108E-05	-3.2385E-07	7.2378E-10	1.000	6	105
R237	Diesel	>18 t	Euro VI	8.2307E+01	8.4004E-01	6.1071E-02	-2.7200E-03	4.7108E-05	-3.2385E-07	7.2378E-10	0.200	6	105

Table D48: PM emission factors for coaches.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R224	Diesel	15-18 t	Pre-Euro I	7.1952E+00	1.0726E+00	-3.7768E-02	7.4260E-04	-8.1453E-06	4.8683E-08	-1.2231E-10	1.000	6	105
R225	Diesel	15-18 t	Euro I	3.8773E+00	1.1388E+00	-4.5927E-02	1.0188E-03	-1.2628E-05	8.2526E-08	-2.1912E-10	1.000	6	105
R226	Diesel	15-18 t	Euro II	1.9984E+00	3.0488E-01	-7.7764E-03	1.1554E-04	-8.7092E-07	3.3575E-09	-5.3159E-12	1.000	6	105
R227	Diesel	15-18 t	Euro III	1.3235E+00	6.2279E-01	-2.7129E-02	6.4266E-04	-8.2078E-06	5.3751E-08	-1.4113E-10	1.000	6	105
R228	Diesel	15-18 t	Euro IV	1.2419E+00	4.5857E-02	-2.5397E-03	6.5812E-05	-8.7720E-07	6.0215E-09	-1.6630E-11	1.000	6	105
R229	Diesel	15-18 t	Euro V	1.2772E+00	4.7971E-02	-2.6670E-03	6.9408E-05	-9.3022E-07	6.4121E-09	-1.7756E-11	1.000	6	105
R230	Diesel	15-18 t	Euro VI	1.2177E+00	6.5515E-02	-4.2790E-03	1.3401E-04	-2.1890E-06	1.8127E-08	-5.9440E-11	0.333	6	105
R231	Diesel	>18 t	Pre-Euro I	1.0393E+01	8.9415E-01	-2.6208E-02	4.4969E-04	-4.2306E-06	2.2510E-08	-5.3181E-11	1.000	6	105
R232	Diesel	>18 t	Euro I	6.2426E+00	1.0100E+00	-3.9444E-02	8.7177E-04	-1.0682E-05	6.9391E-08	-1.8418E-10	1.000	6	105
R233	Diesel	>18 t	Euro II	2.4169E+00	3.3604E-01	-9.0043E-03	1.5158E-04	-1.3577E-06	6.6056E-09	-1.3944E-11	1.000	6	105
R234	Diesel	>18 t	Euro III	2.8258E+00	6.8405E-01	-3.5689E-02	9.3925E-04	-1.2792E-05	8.7255E-08	-2.3546E-10	1.000	6	105
R235	Diesel	>18 t	Euro IV	1.4051E+00	4.0821E-02	-2.4492E-03	6.7046E-05	-9.1391E-07	6.2230E-09	-1.6777E-11	1.000	6	105
R236	Diesel	>18 t	Euro V	1.4474E+00	4.1768E-02	-2.5101E-03	6.8678E-05	-9.3609E-07	6.3741E-09	-1.7186E-11	1.000	6	105
R237	Diesel	>18 t	Euro VI	1.4165E+00	5.0884E-02	-3.3449E-03	1.0201E-04	-1.5829E-06	1.2371E-08	-3.8437E-11	0.333	6	105

D11 Mopeds

Table D49: Emission factors for mopeds.

Pollutant	Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
					a	B	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
CO	**R238**	Petrol	< 50 cc	Pre-Euro I	0	1.3800E+01	0	0	0	0	0	1.000	5	50
	R239	Petrol	< 50 cc	Euro I	0	5.6000E+00	0	0	0	0	0	1.000	5	50
	R240	Petrol	< 50 cc	Euro II	0	1.3000E+00	0	0	0	0	0	1.000	5	50
	R241	Petrol	< 50 cc	Euro III	0	1.3000E+00	0	0	0	0	0	1.000	5	50
HC	**R238**	Petrol	< 50 cc	Pre-Euro I	0	1.3910E+01	0	0	0	0	0	1.000	5	50
	R239	Petrol	< 50 cc	Euro I	0	2.7300E+00	0	0	0	0	0	1.000	5	50
	R240	Petrol	< 50 cc	Euro II	0	1.5600E+00	0	0	0	0	0	1.000	5	50
	R241	Petrol	< 50 cc	Euro III	0	1.2000E+00	0	0	0	0	0	1.000	5	50
NOx	**R238**	Petrol	< 50 cc	Pre-Euro I	0	3.0000E-02	0	0	0	0	0	1.000	5	50
	R239	Petrol	< 50 cc	Euro I	0	3.0000E-02	0	0	0	0	0	1.000	5	50
	R240	Petrol	< 50 cc	Euro II	0	1.0000E-02	0	0	0	0	0	1.000	5	50
	R241	Petrol	< 50 cc	Euro III	0	1.0000E-02	0	0	0	0	0	1.000	5	50
PM	**R238**	Petrol	< 50 cc	Pre-Euro I	0	1.8800E-01	0	0	0	0	0	1.000	5	50
	R239	Petrol	< 50 cc	Euro I	0	7.5500E-02	0	0	0	0	0	1.000	5	50
	R240	Petrol	< 50 cc	Euro II	0	3.7600E-02	0	0	0	0	0	1.000	5	50
	R241	Petrol	< 50 cc	Euro III	0	1.1400E-02	0	0	0	0	0	1.000	5	50

D12 Motorcycles

Table D50: CO emission factors for motorcycles.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R242	Petrol	<=150	Pre-Euro 1	1.7220E-05	3.5967E+01	-1.5199E+00	4.3972E-02	-6.4777E-04	5.1644E-06	-1.6378E-08	1.000	5	100
R243	Petrol	<=150	Euro 1	1.1360E-05	2.3734E+01	-1.0032E+00	2.9026E-02	-4.2762E-04	3.4095E-06	-1.0814E-08	1.000	5	100
R244	Petrol	<=150	Euro 2	8.9854E-06	1.8748E+01	-7.9052E-01	2.2844E-02	-3.3623E-04	2.6804E-06	-8.5022E-09	1.000	5	100
R245	Petrol	<=150	Euro 3	4.9537E-06	1.0404E+01	-4.4293E-01	1.2875E-02	-1.9040E-04	1.5195E-06	-4.8180E-09	1.000	5	100
R246	Petrol	150-250	Pre-Euro 1	-1.7092E-05	6.3415E+01	-2.5329E+00	5.9432E-02	-7.1748E-04	4.3656E-06	-1.0349E-08	1.000	5	130
R247	Petrol	150-250	Euro 1	-1.7092E-05	6.3415E+01	-2.5329E+00	5.9432E-02	-7.1748E-04	4.3656E-06	-1.0349E-08	1.000	5	130
R248	Petrol	150-250	Euro 2	-1.3521E-05	5.0132E+01	-2.0003E+00	4.6892E-02	-5.6562E-04	3.4392E-06	-8.1483E-09	1.000	5	130
R249	Petrol	150-250	Euro 3	-7.4636E-06	2.7692E+01	-1.1060E+00	2.5948E-02	-3.1324E-04	1.9058E-06	-4.5174E-09	1.000	5	130
R250	Petrol	<=150	Pre-Euro 1	1.5022E-05	4.2058E+01	-1.7920E+00	4.6895E-02	-6.3577E-04	4.6619E-06	-1.3734E-08	1.000	5	100
R251	Petrol	<=150	Euro 1	1.4126E-05	2.6206E+01	-1.1899E+00	3.4546E-02	-5.1565E-04	4.2671E-06	-1.3886E-08	1.000	5	100
R252	Petrol	<=150	Euro 2	5.2955E-06	1.3026E+01	-7.2783E-01	2.1261E-02	-3.0359E-04	2.3270E-06	-7.2809E-09	1.000	5	100
R253	Petrol	<=150	Euro 3	2.9248E-06	7.1829E+00	-4.0123E-01	1.1719E-02	-1.6733E-04	1.2829E-06	-4.0163E-09	1.000	5	100
R254	Petrol	150-250	Pre-Euro 1	-2.3868E-05	2.7207E+01	-1.0413E+00	2.2684E-02	-2.3385E-04	1.3869E-06	-3.0263E-09	1.000	5	130
R255	Petrol	150-250	Euro 1	-2.3868E-05	2.7207E+01	-1.0413E+00	2.2684E-02	-2.3385E-04	1.3869E-06	-3.0263E-09	1.000	5	130
R256	Petrol	150-250	Euro 2	-1.8893E-05	2.1550E+01	-8.2670E-01	1.8044E-02	-1.8645E-04	1.1068E-06	-2.4180E-09	1.000	5	130
R257	Petrol	150-250	Euro 3	-1.0423E-05	1.1872E+01	-4.5368E-01	9.8607E-03	-1.0128E-04	5.9866E-07	-1.3004E-09	1.000	5	130
R258	Petrol	250-750	Pre-Euro 1	3.0540E-05	4.8575E+01	-1.7426E+00	4.4292E-02	-5.4301E-04	3.2027E-06	-6.7638E-09	1.000	5	140
R259	Petrol	250-750	Euro 1	3.0316E-05	1.8978E+01	-4.9343E-01	1.2559E-02	-1.3638E-04	8.4274E-07	-1.7995E-09	1.000	5	140
R260	Petrol	250-750	Euro 2	1.6509E+00	1.0038E+01	-8.0836E-02	2.9160E-03	-4.1511E-05	2.6984E-07	0	1.000	5	140
R261	Petrol	250-750	Euro 3	1.0551E+00	5.5166E+00	-4.3400E-02	1.5847E-03	-2.2699E-05	1.4830E-07	0	1.000	5	140
R262	Petrol	>750	Pre-Euro 1	2.2952E-05	6.3976E+01	-2.6791E+00	6.3037E-02	-7.4033E-04	4.3672E-06	-9.9890E-09	1.000	5	140
R263	Petrol	>750	Euro 1	1.0000E+02	2.6433E+00	1.0840E-01	0	0	0	0	1.000	5	140
R264	Petrol	>750	Euro 2	3.3116E+00	9.0088E+00	-3.5807E-01	6.5779E-03	-5.7220E-05	2.4306E-07	0	1.000	5	140
R265	Petrol	>750	Euro 3	1.9461E+00	4.9397E+00	-1.9590E-01	3.5960E-03	-3.1291E-05	1.3329E-07	0	1.000	5	140

Table D51: HC emission factors for motorcycles.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R242	Petrol	<=150	Pre-Euro 1	5.6606E-06	3.5599E+01	-1.7469E+00	4.5681E-02	-6.4182E-04	4.7142E-06	-1.3749E-08	1.000	5	100
R243	Petrol	<=150	Euro 1	2.3725E-06	1.1188E+01	-5.2234E-01	1.2462E-02	-1.5857E-04	1.1070E-06	-3.1502E-09	1.000	5	100
R244	Petrol	<=150	Euro 2	1.2636E-06	5.9025E+00	-2.7282E-01	6.4315E-03	-8.0767E-05	5.5849E-07	-1.5783E-09	1.000	5	100
R245	Petrol	<=150	Euro 3	7.8476E-07	3.7218E+00	-1.7520E-01	4.2274E-03	-5.4465E-05	3.8361E-07	-1.0976E-09	1.000	5	100
R246	Petrol	150-250	Pre-Euro 1	-3.1672E-06	5.1890E+01	-2.2304E+00	5.0092E-02	-6.0768E-04	3.6630E-06	-8.5333E-09	1.000	5	130
R247	Petrol	150-250	Euro 1	-3.1672E-06	5.1890E+01	-2.2304E+00	5.0092E-02	-6.0768E-04	3.6630E-06	-8.5333E-09	1.000	5	130
R248	Petrol	150-250	Euro 2	-1.6819E-06	2.7574E+01	-1.1860E+00	2.6649E-02	-3.2338E-04	1.9496E-06	-4.5420E-09	1.000	5	130
R249	Petrol	150-250	Euro 3	-1.0511E-06	1.7218E+01	-7.4171E-01	1.6695E-02	-2.0291E-04	1.2252E-06	-2.8587E-09	1.000	5	130
R250	Petrol	<=150	Pre-Euro 1	6.3051E-07	5.1551E+00	-2.1695E-01	4.6576E-03	-5.3914E-05	3.3198E-07	-8.3493E-10	1.000	5	100
R251	Petrol	<=150	Euro 1	6.3225E-07	3.5354E+00	-1.4650E-01	3.4133E-03	-4.2856E-05	2.8366E-07	-7.5602E-10	1.000	5	100
R252	Petrol	<=150	Euro 2	3.2305E-07	1.4546E+00	-7.2104E-02	2.0927E-03	-3.1155E-05	2.3497E-07	-7.0043E-10	1.000	5	100
R253	Petrol	<=150	Euro 3	2.0021E-07	9.3943E-01	-4.8090E-02	1.4130E-03	-2.1154E-05	1.5955E-07	-4.7432E-10	1.000	5	100
R254	Petrol	150-250	Pre-Euro 1	-4.9308E-07	2.8862E+00	-1.1895E-01	2.5149E-03	-2.8270E-05	1.6384E-07	-3.7299E-10	1.000	5	130
R255	Petrol	150-250	Euro 1	-4.9308E-07	2.8862E+00	-1.1895E-01	2.5149E-03	-2.8270E-05	1.6384E-07	-3.7299E-10	1.000	5	130
R256	Petrol	150-250	Euro 2	-2.6371E-07	1.5695E+00	-6.6742E-02	1.4561E-03	-1.6859E-05	1.0010E-07	-2.3300E-10	1.000	5	130
R257	Petrol	150-250	Euro 3	-1.6431E-07	9.7853E-01	-4.1638E-02	9.0704E-04	-1.0445E-05	6.1477E-08	-1.4152E-10	1.000	5	130
R258	Petrol	250-750	Pre-Euro 1	9.0571E-07	7.6601E+00	-2.8077E-01	5.7915E-03	-6.4873E-05	3.6219E-07	-7.7613E-10	1.000	5	140
R259	Petrol	250-750	Euro 1	8.4378E-07	3.9489E+00	-1.4010E-01	2.9011E-03	-3.2818E-05	1.8820E-07	-4.1208E-10	1.000	5	140
R260	Petrol	250-750	Euro 2	7.6625E-07	1.7456E+00	-6.5097E-02	1.4372E-03	-1.6857E-05	1.0116E-07	-2.2511E-10	1.000	5	140
R261	Petrol	250-750	Euro 3	4.8039E-07	1.0623E+00	-3.8054E-02	8.1214E-04	-9.2504E-06	5.4385E-08	-1.1803E-10	1.000	5	140
R262	Petrol	>750	Pre-Euro 1	1.6033E-06	7.6867E+00	-2.6467E-01	5.1652E-03	-5.6803E-05	3.2965E-07	-7.4834E-10	1.000	5	140
R263	Petrol	>750	Euro 1	8.4064E-07	4.7368E+00	-2.0533E-01	4.4797E-03	-5.1452E-05	2.9440E-07	-6.3408E-10	1.000	5	140
R264	Petrol	>750	Euro 2	6.4448E-07	1.9686E+00	-9.6172E-02	2.2362E-03	-2.5919E-05	1.4602E-07	-2.9752E-10	1.000	5	140
R265	Petrol	>750	Euro 3	4.01866E-07	1.22097413	-0.060004888	0.001408833	-1.65177E-05	9.42773E-08	-1.95518E-10	1.000	5	140

Table D52: NO_x emission factors for motorcycles.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R242	Petrol	<=150	Pre-Euro 1	1.3927E-01	9.5517E-03	1.8440E-04	1.6184E-06	0	0	0	1.000	5	100
R243	Petrol	<=150	Euro 1	1.4227E-01	2.5335E-02	1.7000E-04	1.6974E-06	0	0	0	1.000	5	100
R244	Petrol	<=150	Euro 2	1.5700E-01	3.0499E-02	1.8460E-04	1.8804E-06	0	0	0	1.000	5	100
R245	Petrol	<=150	Euro 3	1.3867E-01	6.3951E-03	1.8728E-04	1.6026E-06	0	0	0	1.000	5	100
R246	Petrol	150-250	Pre-Euro 1	-1.8696E-07	5.6336E-02	-2.0181E-03	8.8163E-05	-2.0242E-06	2.1975E-08	-7.3757E-11	1.000	5	130
R247	Petrol	150-250	Euro 1	-1.8696E-07	5.6336E-02	-2.0181E-03	8.8163E-05	-2.0242E-06	2.1975E-08	-7.3757E-11	1.000	5	130
R248	Petrol	150-250	Euro 2	-2.1912E-07	9.4118E-02	-5.5708E-03	2.1436E-04	-4.0252E-06	3.6871E-08	-1.1431E-10	1.000	5	130
R249	Petrol	150-250	Euro 3	-1.1158E-07	3.0817E-02	-1.4152E-03	6.4465E-05	-1.3945E-06	1.4289E-08	-4.6593E-11	1.000	5	130
R250	Petrol	<=150	Pre-Euro 1	3.5454E-07	3.4838E-01	-1.6964E-02	8.2323E-04	-1.5406E-05	1.3686E-07	-4.5971E-10	1.000	5	100
R251	Petrol	<=150	Euro 1	3.6746E-07	4.3678E-01	-2.6326E-02	1.2350E-03	-2.3459E-05	2.0977E-07	-7.0746E-10	1.000	5	100
R252	Petrol	<=150	Euro 2	3.5641E-07	4.0098E-01	-1.8970E-02	7.3403E-04	-1.2753E-05	1.1409E-07	-3.8922E-10	1.000	5	100
R253	Petrol	<=150	Euro 3	1.8082E-07	2.1913E-01	-1.0901E-02	4.0795E-04	-6.8596E-06	5.9137E-08	-1.9527E-10	1.000	5	100
R254	Petrol	150-250	Pre-Euro 1	-4.2131E-07	2.9486E-01	-9.0071E-03	3.4875E-04	-4.8124E-06	3.3084E-08	-8.6903E-11	1.000	5	130
R255	Petrol	150-250	Euro 1	-4.2131E-07	2.9486E-01	-9.0071E-03	3.4875E-04	-4.8124E-06	3.3084E-08	-8.6903E-11	1.000	5	130
R256	Petrol	150-250	Euro 2	-4.2131E-07	2.9486E-01	-9.0071E-03	3.4875E-04	-4.8124E-06	3.3084E-08	-8.6903E-11	1.000	5	130
R257	Petrol	150-250	Euro 3	-2.1409E-07	1.5735E-01	-4.9247E-03	1.8097E-04	-2.4263E-06	1.6314E-08	-4.2152E-11	1.000	5	130
R258	Petrol	250-750	Pre-Euro 1	9.2748E-07	3.0752E-01	3.2088E-03	-4.5132E-04	1.2853E-05	-1.2798E-07	4.4315E-10	1.000	5	140
R259	Petrol	250-750	Euro 1	6.6130E-07	2.4536E-01	-1.7934E-03	1.9811E-05	1.4062E-06	-1.7380E-08	6.4553E-11	1.000	5	140
R260	Petrol	250-750	Euro 2	0.152202301	0.153651271	-0.004902847	8.55531E-05	-3.7854E-07	1.24045E-09	0	1.000	5	140
R261	Petrol	250-750	Euro 3	1.73837E-07	0.106720937	-0.004822914	0.000118149	-1.29645E-06	8.17396E-09	-1.9298E-11	1.000	5	140
R262	Petrol	>750	Pre-Euro 1	5.26838E-07	0.305914394	-0.011038414	0.00023567	-1.98838E-06	1.23655E-08	-3.4881E-11	1.000	5	140
R263	Petrol	>750	Euro 1	5.26838E-07	0.305914394	-0.011038414	0.00023567	-1.98838E-06	1.23655E-08	-3.4881E-11	1.000	5	140
R264	Petrol	>750	Euro 2	-0.242197352	0.32721333	-0.011735086	0.000183537	-7.80911E-07	2.78557E-09	0	1.000	5	140
R265	Petrol	>750	Euro 3	-0.047158976	0.162754624	-0.005899573	9.39744E-05	-4.16764E-07	1.50834E-09	0	1.000	5	140

Table D53: PM emission factors for motorcycles.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R242	Petrol	<=150	Pre-Euro 1	0	2.0000E-01	0	0	0	0	0	1.000	10	110
R243	Petrol	<=150	Euro 1	0	8.0000E-02	0	0	0	0	0	1.000	10	110
R244	Petrol	<=150	Euro 2	0	4.0000E-02	0	0	0	0	0	1.000	10	110
R245	Petrol	<=150	Euro 3	0	1.2000E-02	0	0	0	0	0	1.000	10	110
R246	Petrol	150-250	Pre-Euro 1	0	2.0000E-01	0	0	0	0	0	1.000	10	110
R247	Petrol	150-250	Euro 1	0	8.0000E-02	0	0	0	0	0	1.000	10	110
R248	Petrol	150-250	Euro 2	0	4.0000E-02	0	0	0	0	0	1.000	10	110
R249	Petrol	150-250	Euro 3	0	1.2000E-02	0	0	0	0	0	1.000	10	110
R250	Petrol	<=150	Pre-Euro 1	0	2.0000E-02	0	0	0	0	0	1.000	10	110
R251	Petrol	<=150	Euro 1	0	2.0000E-02	0	0	0	0	0	1.000	10	110
R252	Petrol	<=150	Euro 2	0	5.0000E-03	0	0	0	0	0	1.000	10	110
R253	Petrol	<=150	Euro 3	0	5.0000E-03	0	0	0	0	0	1.000	10	110
R254	Petrol	150-250	Pre-Euro 1	0	2.0000E-02	0	0	0	0	0	1.000	10	110
R255	Petrol	150-250	Euro 1	0	2.0000E-02	0	0	0	0	0	1.000	10	110
R256	Petrol	150-250	Euro 2	0	5.0000E-03	0	0	0	0	0	1.000	10	110
R257	Petrol	150-250	Euro 3	0	5.0000E-03	0	0	0	0	0	1.000	10	110
R258	Petrol	250-750	Pre-Euro 1	0	2.0000E-02	0	0	0	0	0	1.000	10	110
R259	Petrol	250-750	Euro 1	0	2.0000E-02	0	0	0	0	0	1.000	10	110
R260	Petrol	250-750	Euro 2	0	5.0000E-03	0	0	0	0	0	1.000	10	110
R261	Petrol	250-750	Euro 3	0	5.0000E-03	0	0	0	0	0	1.000	10	110
R262	Petrol	>750	Pre-Euro 1	0	2.0000E-02	0	0	0	0	0	1.000	10	110
R263	Petrol	>750	Euro 1	0	2.0000E-02	0	0	0	0	0	1.000	10	110
R264	Petrol	>750	Euro 2	0	5.0000E-03	0	0	0	0	0	1.000	10	110
R265	Petrol	>750	Euro 3	0	5.0000E-03	0	0	0	0	0	1.000	10	110

Appendix E: Basic emission factors for ultimate CO_2

E1	**Petrol cars and minibuses < 2.5 tonnes GVW**	**Tables E1**
E2	**Diesel cars and minibuses < 2.5 tonnes GVW**	**Tables E2**
E3	**LPG cars and minibuses < 2.5 tonnes GVW**	**Tables E3**
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E5	**Taxis (black cabs)**	**Tables E5**
E6	**Light goods/commercial vehicles: N1(I)**	**Tables E6**
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E8	**Rigid heavy goods vehicles**	**Tables E9(a) & E9(b)**
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E13	**Coaches**	**Tables E12**
E12	**Mopeds**	**Tables E13**
E14	**Motorcycles – 2-stroke**	**Tables E14**
E14	**Motorcycles – 4-stroke**	**Tables E15**

Table E1: Ultimate CO_2 emission factors for petrol cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R001	Petrol	<1400 cc	Pre-Euro 1	2.2606E+03	1.0314E+02	2.9263E-01	3.0199E-03	0	0	0	1.000	5	140
R002	Petrol	<1400 cc	Euro 1	2.2606E+03	8.7563E+01	2.9263E-01	3.0199E-03	0	0	0	1.000	5	140
R003	Petrol	<1400 cc	Euro 2	2.2606E+03	8.0148E+01	2.9263E-01	3.0199E-03	0	0	0	1.000	5	140
R004	Petrol	<1400 cc	Euro 3	2.2606E+03	7.0183E+01	2.9263E-01	3.0199E-03	0	0	0	1.000	5	140
R005	Petrol	<1400 cc	Euro 4	2.2606E+03	5.9444E+01	2.9263E-01	3.0199E-03	0	0	0	1.000	5	140
R006	Petrol	<1400 cc	Euro 5	2.2606E+03	4.4379E+01	2.9263E-01	3.0199E-03	0	0	0	1.000	5	140
R007	Petrol	<1400 cc	Euro 6	2.2606E+03	3.1583E+01	2.9263E-01	3.0199E-03	0	0	0	1.000	5	140
R008	Petrol	1400-2000 cc	Pre-Euro 1	2.5324E+03	1.5328E+02	-4.3167E-01	6.6776E-03	0	0	0	1.000	5	140
R009	Petrol	1400-2000 cc	Euro 1	2.5324E+03	1.3779E+02	-4.3167E-01	6.6776E-03	0	0	0	1.000	5	140
R010	Petrol	1400-2000 cc	Euro 2	2.5324E+03	1.2988E+02	-4.3167E-01	6.6776E-03	0	0	0	1.000	5	140
R011	Petrol	1400-2000 cc	Euro 3	2.5324E+03	1.1834E+02	-4.3167E-01	6.6776E-03	0	0	0	1.000	5	140
R012	Petrol	1400-2000 cc	Euro 4	2.5324E+03	1.0340E+02	-4.3167E-01	6.6776E-03	0	0	0	1.000	5	140
R013	Petrol	1400-2000 cc	Euro 5	2.5324E+03	8.4595E+01	-4.3167E-01	6.6776E-03	0	0	0	1.000	5	140
R014	Petrol	1400-2000 cc	Euro 6	2.5324E+03	6.8842E+01	-4.3167E-01	6.6776E-03	0	0	0	1.000	5	140
R015	Petrol	>2000 cc	Pre-Euro 1	3.7473E+03	2.0881E+02	-8.5270E-01	1.0318E-02	0	0	0	1.000	5	140
R016	Petrol	>2000 cc	Euro 1	3.7473E+03	1.9576E+02	-8.5270E-01	1.0318E-02	0	0	0	1.000	5	140
R017	Petrol	>2000 cc	Euro 2	3.7473E+03	1.8600E+02	-8.5270E-01	1.0318E-02	0	0	0	1.000	5	140
R018	Petrol	>2000 cc	Euro 3	3.7473E+03	1.6774E+02	-8.5270E-01	1.0318E-02	0	0	0	1.000	5	140
R019	Petrol	>2000 cc	Euro 4	3.7473E+03	1.5599E+02	-8.5270E-01	1.0318E-02	0	0	0	1.000	5	140
R020	Petrol	>2000 cc	Euro 5	3.7473E+03	1.2877E+02	-8.5270E-01	1.0318E-02	0	0	0	1.000	5	140
R021	Petrol	>2000 cc	Euro 6	3.7473E+03	1.0571E+02	-8.5270E-01	1.0318E-02	0	0	0	1.000	5	140

Table E2: Ultimate CO_2 emission factors for diesel cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R022	Diesel	<1400 cc	Pre-Euro 1	1.2988E+03	1.4063E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R023	Diesel	<1400 cc	Euro 1	1.2988E+03	1.3636E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R024	Diesel	<1400 cc	Euro 2	1.2988E+03	1.2848E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R025	Diesel	<1400 cc	Euro 3	1.2988E+03	1.1770E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R026	Diesel	<1400 cc	Euro 4	1.2988E+03	1.1846E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R027	Diesel	<1400 cc	Euro 5	1.2988E+03	1.0596E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R028	Diesel	<1400 cc	Euro 6	1.2988E+03	9.4974E+01	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R029	Diesel	1400-2000 cc	Pre-Euro 1	1.2988E+03	1.8097E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R030	Diesel	1400-2000 cc	Euro 1	1.2988E+03	1.7576E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R031	Diesel	1400-2000 cc	Euro 2	1.2988E+03	1.6567E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R032	Diesel	1400-2000 cc	Euro 3	1.2988E+03	1.5249E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R033	Diesel	1400-2000 cc	Euro 4	1.2988E+03	1.4665E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R034	Diesel	1400-2000 cc	Euro 5	1.2988E+03	1.3055E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R035	Diesel	1400-2000 cc	Euro 6	1.2988E+03	1.1701E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R036	Diesel	>2000 cc	Pre-Euro 1	1.2988E+03	2.5320E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R037	Diesel	>2000 cc	Euro 1	1.2988E+03	2.4671E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R038	Diesel	>2000 cc	Euro 2	1.2988E+03	2.3270E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R039	Diesel	>2000 cc	Euro 3	1.2988E+03	2.1490E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R040	Diesel	>2000 cc	Euro 4	1.2988E+03	2.0203E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R041	Diesel	>2000 cc	Euro 5	1.2988E+03	1.8015E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140
R042	Diesel	>2000 cc	Euro 6	1.2988E+03	1.6147E+02	-1.5597E+00	1.2264E-02	0	0	0	1.000	5	140

Table E3: Ultimate CO_2 emission factors for LPG cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R043	LPG	All	Euro 1	2.8981E+03	4.5913E+01	5.1611E-01	-1.4692E-04	2.6332E-05	0	0	1.000	5	120
R044	LPG	All	Euro 2	2.8981E+03	4.5803E+01	5.1611E-01	-1.4692E-04	2.6332E-05	0	0	1.000	5	120
R045	LPG	All	Euro 3	2.8981E+03	4.5675E+01	5.1611E-01	-1.4692E-04	2.6332E-05	0	0	1.000	5	120
R046	LPG	All	Euro 4	2.8981E+03	4.5414E+01	5.1611E-01	-1.4692E-04	2.6332E-05	0	0	1.000	5	120
R047	LPG	All	Euro 5	2.8981E+03	4.5414E+01	5.1611E-01	-1.4692E-04	2.6332E-05	0	0	1.000	5	120
R048	LPG	All	Euro 6	2.8981E+03	4.5414E+01	5.1611E-01	-1.4692E-04	2.6332E-05	0	0	1.000	5	120

Table E4: Ultimate CO_2 emission factors for cars and minibuses 2.5-3.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R049	Petrol	All	Pre-Euro 1	5.8599E+03	1.3439E+01	2.0179E-01	2.1654E-02	0	0	0	1.000	5	120
R050	Petrol	All	Euro 1	5.8599E+03	2.0636E-01	2.0179E-01	2.1654E-02	0	0	0	1.000	5	120
R051	Petrol	All	Euro 2	4.8313E+03	9.3414E+01	9.5204E-01	8.4173E-05	4.5393E-05	0	0	1.000	5	120
R052	Petrol	All	Euro 3	4.8313E+03	9.3325E+01	9.5204E-01	8.4173E-05	4.5393E-05	0	0	1.000	5	120
R053	Petrol	All	Euro 4	4.8313E+03	9.3266E+01	9.5204E-01	8.4173E-05	4.5393E-05	0	0	1.000	5	120
R054	Petrol	All	Euro 5	4.8313E+03	9.2510E+01	9.5204E-01	8.4173E-05	4.5393E-05	0	0	1.000	5	120
R055	Petrol	All	Euro 6	4.8313E+03	9.2510E+01	9.5204E-01	8.4173E-05	4.5393E-05	0	0	1.000	5	120
R056	Diesel	All	Pre-Euro 1	4.9538E+03	8.8452E+01	6.3429E-01	1.3351E-02	-5.5094E-05	6.6419E-07	0	1.000	5	120
R057	Diesel	All	Euro 1	4.9538E+03	8.4885E+01	6.3429E-01	1.3351E-02	-5.5094E-05	6.6419E-07	0	1.000	5	120
R058	Diesel	All	Euro 2	5.4190E+03	9.2699E+01	6.2059E-01	9.7033E-03	-3.0613E-05	3.4575E-07	0	1.000	5	140
R059	Diesel	All	Euro 3	5.4190E+03	9.2348E+01	6.2059E-01	9.7033E-03	-3.0613E-05	3.4575E-07	0	1.000	5	140
R060	Diesel	All	Euro 4	5.4190E+03	9.2208E+01	6.2059E-01	9.7033E-03	-3.0613E-05	3.4575E-07	0	1.000	5	140
R061	Diesel	All	Euro 5	5.4190E+03	9.1992E+01	6.2059E-01	9.7033E-03	-3.0613E-05	3.4575E-07	0	1.000	5	140
R062	Diesel	All	Euro 6	5.4190E+03	9.1992E+01	6.2059E-01	9.7033E-03	-3.0613E-05	3.4575E-07	0	1.000	5	140

Table E5: Ultimate CO_2 emission factors for taxis (black cabs).

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R063	Diesel	All	Pre-Euro 1	2.8469E+03	7.8655E+01	1.0430E+00	-1.2336E-03	6.0884E-05	0	0	1.000	5	120
R064	Diesel	All	Euro 1	3.1559E+03	1.1016E+02	1.1629E+00	1.9000E-04	5.4636E-05	0	0	1.000	5	120
R065	Diesel	All	Euro 2	3.8678E+03	7.6215E+01	1.2838E+00	-3.4167E-03	8.8520E-05	0	0	1.000	5	120
R066	Diesel	All	Euro 3	3.9034E+03	6.5040E+01	4.4246E-01	1.3240E-02	-6.7705E-05	7.0696E-07	0	1.000	5	120
R067	Diesel	All	Euro 4	3.9034E+03	6.5040E+01	4.4246E-01	1.3240E-02	-6.7705E-05	7.0696E-07	0	1.000	5	120
R068	Diesel	All	Euro 5	3.9034E+03	6.5040E+01	4.4246E-01	1.3240E-02	-6.7705E-05	7.0696E-07	0	1.000	5	120
R069	Diesel	All	Euro 6	3.9034E+03	6.5040E+01	4.4246E-01	1.3240E-02	-6.7705E-05	7.0696E-07	0	1.000	5	120

Table E6: Ultimate CO_2 emission factors for N1(I) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R070	Petrol	All	Pre-Euro 1	2.5324E+03	1.3924E+02	-4.3167E-01	6.6776E-03	0	0	0	1.025	5	140
R071	Petrol	All	Euro 1	2.5324E+03	1.3437E+02	-4.3167E-01	6.6776E-03	0	0	0	1.025	5	140
R072	Petrol	All	Euro 2	2.5324E+03	1.2866E+02	-4.3167E-01	6.6776E-03	0	0	0	1.025	5	140
R073	Petrol	All	Euro 3	2.5324E+03	1.1722E+02	-4.3167E-01	6.6776E-03	0	0	0	1.025	5	140
R074	Petrol	All	Euro 4	2.5324E+03	1.0211E+02	-4.3167E-01	6.6776E-03	0	0	0	1.030	5	140
R075	Petrol	All	Euro 5	2.5324E+03	8.3532E+01	-4.3167E-01	6.6776E-03	0	0	0	1.050	5	140
R076	Petrol	All	Euro 6	2.5324E+03	6.7779E+01	-4.3167E-01	6.6776E-03	0	0	0	1.070	5	140
R077	Diesel	All	Pre-Euro 1	1.2988E+03	1.7923E+02	-1.5597E+00	1.2264E-02	0	0	0	1.025	5	140
R078	Diesel	All	Euro 1	1.2988E+03	1.7505E+02	-1.5597E+00	1.2264E-02	0	0	0	1.025	5	140
R079	Diesel	All	Euro 2	1.2988E+03	1.6523E+02	-1.5597E+00	1.2264E-02	0	0	0	1.025	5	140
R080	Diesel	All	Euro 3	1.2988E+03	1.5224E+02	-1.5597E+00	1.2264E-02	0	0	0	1.025	5	140
R081	Diesel	All	Euro 4	1.2988E+03	1.4643E+02	-1.5597E+00	1.2264E-02	0	0	0	1.030	5	140
R082	Diesel	All	Euro 5	1.2988E+03	1.3044E+02	-1.5597E+00	1.2264E-02	0	0	0	1.050	5	140
R083	Diesel	All	Euro 6	1.2988E+03	1.1691E+02	-1.5597E+00	1.2264E-02	0	0	0	1.070	5	140

Table E7: Ultimate CO_2 emission factors for N1(II) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R084	Petrol	All	Pre-Euro 1	4.4902E+03	5.5927E+01	5.9861E-01	5.1703E-05	2.8553E-05	0	0	1.000	5	120
R085	Petrol	All	Euro 1	4.4902E+03	5.5927E+01	5.9861E-01	5.1703E-05	2.8553E-05	0	0	1.000	5	120
R086	Petrol	All	Euro 2	4.4902E+03	5.5927E+01	5.9861E-01	5.1703E-05	2.8553E-05	0	0	1.000	5	120
R087	Petrol	All	Euro 3	4.4902E+03	5.5927E+01	5.9861E-01	5.1703E-05	2.8553E-05	0	0	1.000	5	120
R088	Petrol	All	Euro 4	4.4902E+03	5.5927E+01	5.9861E-01	5.1703E-05	2.8553E-05	0	0	1.000	5	120
R089	Petrol	All	Euro 5	4.4902E+03	5.5927E+01	5.9861E-01	5.1703E-05	2.8553E-05	0	0	1.000	5	120
R090	Petrol	All	Euro 6	4.4902E+03	5.5927E+01	5.9861E-01	5.1703E-05	2.8553E-05	0	0	1.000	5	120
R091	Diesel	All	Pre-Euro 1	3.4180E+03	7.0110E+01	1.1119E+00	-2.5466E-03	7.3876E-05	0	0	1.000	5	120
R092	Diesel	All	Euro 1	4.0862E+03	4.7328E+01	1.9598E-01	1.4393E-02	-9.6190E-05	8.3794E-07	0	1.000	5	120
R093	Diesel	All	Euro 2	4.0862E+03	4.7328E+01	1.9598E-01	1.4393E-02	-9.6190E-05	8.3794E-07	0	1.000	5	120
R094	Diesel	All	Euro 3	4.0862E+03	4.7328E+01	1.9598E-01	1.4393E-02	-9.6190E-05	8.3794E-07	0	1.000	5	120
R095	Diesel	All	Euro 4	4.0862E+03	4.7328E+01	1.9598E-01	1.4393E-02	-9.6190E-05	8.3794E-07	0	1.000	5	120
R096	Diesel	All	Euro 5	4.0862E+03	4.7328E+01	1.9598E-01	1.4393E-02	-9.6190E-05	8.3794E-07	0	1.000	5	120
R097	Diesel	All	Euro 6	4.0862E+03	4.7328E+01	1.9598E-01	1.4393E-02	-9.6190E-05	8.3794E-07	0	1.000	5	120

Table E8: Ultimate CO_2 emission factors for N1(III) light goods/commercial vehicle.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R098	Petrol	All	Pre-Euro 1	4.5298E+03	6.0247E+01	2.8903E-01	1.6975E-02	-1.0858E-04	9.7490E-07	0	1.000	5	120
R099	Petrol	All	Euro 1	5.4206E+03	6.3650E+01	4.8934E-01	9.9656E-03	-4.0076E-05	4.9164E-07	0	1.000	5	120
R100	Petrol	All	Euro 2	4.6932E+03	7.0346E+01	8.1811E-01	-3.1951E-04	4.2487E-05	0	0	1.000	5	120
R101	Petrol	All	Euro 3	4.6932E+03	7.0346E+01	8.1811E-01	-3.1951E-04	4.2487E-05	0	0	1.000	5	120
R102	Petrol	All	Euro 4	4.6932E+03	7.0346E+01	8.1811E-01	-3.1951E-04	4.2487E-05	0	0	1.000	5	120
R103	Petrol	All	Euro 5	4.6932E+03	7.0346E+01	8.1811E-01	-3.1951E-04	4.2487E-05	0	0	1.000	5	120
R104	Petrol	All	Euro 6	4.6932E+03	7.0346E+01	8.1811E-01	-3.1951E-04	4.2487E-05	0	0	1.000	5	120
R105	Diesel	All	Pre-Euro 1	2.8469E+03	7.8655E+01	1.0430E+00	-1.2336E-03	6.0884E-05	0	0	1.000	5	120
R106	Diesel	All	Euro 1	3.1559E+03	1.1016E+02	1.1629E+00	1.9000E-04	5.4636E-05	0	0	1.000	5	120
R107	Diesel	All	Euro 2	3.8678E+03	7.6215E+01	1.2838E+00	-3.4167E-03	8.8520E-05	0	0	1.000	5	120
R108	Diesel	All	Euro 3	3.9034E+03	6.5040E+01	4.4246E-01	1.3240E-02	-6.7705E-05	7.0696E-07	0	1.000	5	120
R109	Diesel	All	Euro 4	3.9034E+03	6.5040E+01	4.4246E-01	1.3240E-02	-6.7705E-05	7.0696E-07	0	1.000	5	120
R110	Diesel	All	Euro 5	3.9034E+03	6.5040E+01	4.4246E-01	1.3240E-02	-6.7705E-05	7.0696E-07	0	1.000	5	120
R111	Diesel	All	Euro 6	3.9034E+03	6.5040E+01	4.4246E-01	1.3240E-02	-6.7705E-05	7.0696E-07	0	1.000	5	120

Table E9(a): Ultimate CO_2 emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R112	Diesel	3.5-7.5 t	Pre-Euro I	1.3473E+03	7.8623E+02	-2.4942E+01	5.2818E-01	-5.3749E-03	2.3209E-05	0	1.000	6	90
R113	Diesel	3.5-7.5 t	Euro I	1.4443E+03	4.9835E+02	-1.2738E+01	2.7751E-01	-3.1794E-03	2.1106E-05	-5.1075E-08	1.000	6	90
R114	Diesel	3.5-7.5 t	Euro II	3.0012E+02	6.6267E+02	-2.3773E+01	5.8518E-01	-7.2187E-03	4.4455E-05	-9.2325E-08	1.000	6	90
R115	Diesel	3.5-7.5 t	Euro III	1.4419E+03	4.6512E+02	-9.6836E+00	1.7209E-01	-1.3312E-03	5.2793E-06	0	1.000	6	90
R116	Diesel	3.5-7.5 t	Euro IV	4.8124E+02	6.7583E+02	-2.5506E+01	6.4658E-01	-8.2349E-03	5.2506E-05	-1.1938E-07	1.000	6	90
R117	Diesel	3.5-7.5 t	Euro V	5.0259E+02	6.9015E+02	-2.6109E+01	6.5957E-01	-8.3582E-03	5.2817E-05	-1.1815E-07	1.000	6	90
R118	Diesel	3.5-7.5 t	Euro VI	5.0259E+02	6.9015E+02	-2.6109E+01	6.5957E-01	-8.3582E-03	5.2817E-05	-1.1815E-07	1.000	6	90
R119	Diesel	7.5-12 t	Pre-Euro I	3.8969E+03	9.1321E+02	-1.4423E+01	-1.6995E-01	1.0516E-02	-1.2985E-04	5.2807E-07	1.000	6	90
R120	Diesel	7.5-12 t	Euro I	2.0498E+03	9.8815E+02	-3.0813E+01	6.2503E-01	-6.0410E-03	2.4603E-05	0	1.000	6	90
R121	Diesel	7.5-12 t	Euro II	1.5623E+03	9.4510E+02	-2.8796E+01	5.8379E-01	-5.6676E-03	2.3344E-05	0	1.000	6	90
R122	Diesel	7.5-12 t	Euro III	1.8793E+03	9.9733E+02	-3.0653E+01	6.1780E-01	-5.9415E-03	2.4141E-05	0	1.000	6	90
R123	Diesel	7.5-12 t	Euro IV	1.9847E+03	9.1446E+02	-2.6234E+01	4.4679E-01	-2.5237E-03	-8.4268E-06	1.1493E-07	1.000	6	90
R124	Diesel	7.5-12 t	Euro V	2.1061E+03	9.3095E+02	-2.6671E+01	4.4814E-01	-2.3895E-03	-1.0378E-05	1.2257E-07	1.000	6	90
R125	Diesel	7.5-12 t	Euro VI	2.1061E+03	9.3095E+02	-2.6671E+01	4.4814E-01	-2.3895E-03	-1.0378E-05	1.2257E-07	1.000	6	90
R126	Diesel	12-14 t	Pre-Euro I	4.7453E+03	9.9779E+02	-1.7398E+01	-9.2415E-02	8.9319E-03	-1.1008E-04	4.3261E-07	1.000	6	90
R127	Diesel	12-14 t	Euro I	3.0301E+03	9.3733E+02	-1.9548E+01	8.5710E-02	5.0117E-03	-7.6600E-05	3.3721E-07	1.000	6	90
R128	Diesel	12-14 t	Euro II	2.3915E+03	9.1691E+02	-1.9163E+01	1.0097E-01	4.4629E-03	-7.1359E-05	3.2168E-07	1.000	6	90
R129	Diesel	12-14 t	Euro III	2.9987E+03	9.0632E+02	-1.5726E+01	-6.6184E-02	7.8185E-03	-1.0096E-04	4.1673E-07	1.000	6	90
R130	Diesel	12-14 t	Euro IV	3.0075E+03	8.3017E+02	-1.3020E+01	-1.3423E-01	8.7170E-03	-1.0686E-04	4.3014E-07	1.000	6	90
R131	Diesel	12-14 t	Euro V	3.2133E+03	8.2607E+02	-1.1627E+01	-2.0286E-01	1.0125E-02	-1.1969E-04	4.7286E-07	1.000	6	90
R132	Diesel	12-14 t	Euro VI	3.2133E+03	8.2607E+02	-1.1627E+01	-2.0286E-01	1.0125E-02	-1.1969E-04	4.7286E-07	1.000	6	90
R133	Diesel	14-20 t	Pre-Euro I	1.2172E+04	4.5595E+02	2.7999E+01	-1.5767E+00	3.1813E-02	-2.7117E-04	8.4325E-07	1.000	6	90
R134	Diesel	14-20 t	Euro I	4.3703E+03	1.2780E+03	-3.7632E+01	6.9487E-01	-6.9992E-03	4.7032E-05	-1.6045E-07	1.000	6	90
R135	Diesel	14-20 t	Euro II	6.4428E+03	5.9005E+02	1.0011E+01	-8.0050E-01	1.6876E-02	-1.4303E-04	4.3819E-07	1.000	6	90
R136	Diesel	14-20 t	Euro III	6.1792E+03	8.5808E+02	-9.0620E+00	-1.4918E-01	5.4047E-03	-4.2433E-05	9.2675E-08	1.000	6	90
R137	Diesel	14-20 t	Euro IV	4.8585E+03	1.0522E+03	-2.4184E+01	2.8021E-01	-4.5833E-04	-4.5445E-06	0	1.000	6	90
R138	Diesel	14-20 t	Euro V	5.1006E+03	1.0637E+03	-2.4317E+01	2.7685E-01	-3.6796E-04	-5.0285E-06	0	1.000	6	90
R139	Diesel	14-20 t	Euro VI	5.1006E+03	1.0637E+03	-2.4317E+01	2.7685E-01	-3.6796E-04	-5.0285E-06	0	1.000	6	90

Table E9(b): Ultimate CO_2 emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R140	Diesel	20-26 t	Pre-Euro I	1.3690E+04	3.9099E+02	5.4374E+01	-2.5872E+00	4.8003E-02	-3.8755E-04	1.1539E-06	1.000	6	90
R141	Diesel	20-26 t	Euro I	1.3662E+04	-2.2021E+02	8.5387E+01	-3.4006E+00	5.9526E-02	-4.7397E-04	1.4196E-06	1.000	6	90
R142	Diesel	20-26 t	Euro II	4.7476E+03	1.3417E+03	-2.3117E+01	1.0257E-01	2.3961E-03	-1.7628E-05	0	1.000	6	90
R143	Diesel	20-26 t	Euro III	9.5848E+03	4.6451E+02	4.2172E+01	-2.0692E+00	3.8277E-02	-3.0560E-04	8.9660E-07	1.000	6	90
R144	Diesel	20-26 t	Euro IV	1.0297E+04	2.1075E+02	5.3532E+01	-2.3671E+00	4.2616E-02	-3.3917E-04	1.0023E-06	1.000	6	90
R145	Diesel	20-26 t	Euro V	1.0538E+04	2.2022E+02	5.4175E+01	-2.4040E+00	4.3304E-02	-3.4447E-04	1.0170E-06	1.000	6	90
R146	Diesel	20-26 t	Euro VI	1.0538E+04	2.2022E+02	5.4175E+01	-2.4040E+00	4.3304E-02	-3.4447E-04	1.0170E-06	1.000	6	90
R147	Diesel	26-28 t	Pre-Euro I	1.4431E+04	2.0715E+02	7.3729E+01	-3.2128E+00	5.7544E-02	-4.5683E-04	1.3479E-06	1.000	6	90
R148	Diesel	26-28 t	Euro I	1.4074E+04	-3.1109E+02	9.7320E+01	-3.7877E+00	6.5295E-02	-5.1419E-04	1.5263E-06	1.000	6	90
R149	Diesel	26-28 t	Euro II	1.2810E+04	-2.9225E+02	9.4477E+01	-3.6427E+00	6.2288E-02	-4.8709E-04	1.4366E-06	1.000	6	90
R150	Diesel	26-28 t	Euro III	1.0194E+04	3.1694E+02	5.7924E+01	-2.5637E+00	4.5534E-02	-3.5591E-04	1.0301E-06	1.000	6	90
R151	Diesel	26-28 t	Euro IV	1.0622E+04	1.1974E+02	6.5130E+01	-2.7314E+00	4.7808E-02	-3.7335E-04	1.0865E-06	1.000	6	90
R152	Diesel	26-28 t	Euro V	1.0979E+04	1.0876E+02	6.7179E+01	-2.8108E+00	4.9137E-02	-3.8340E-04	1.1149E-06	1.000	6	90
R153	Diesel	26-28 t	Euro VI	1.0979E+04	1.0876E+02	6.7179E+01	-2.8108E+00	4.9137E-02	-3.8340E-04	1.1149E-06	1.000	6	90
R154	Diesel	28-32 t	Pre-Euro I	1.6894E+04	-3.3789E+02	1.2214E+02	-4.7478E+00	8.1616E-02	-6.4075E-04	1.8961E-06	1.000	6	90
R155	Diesel	28-32 t	Euro I	5.7078E+03	1.3899E+03	-6.0896E+00	-5.7298E-01	1.3756E-02	-1.0396E-04	2.4645E-07	1.000	6	90
R156	Diesel	28-32 t	Euro II	2.6345E+03	1.6994E+03	-2.6044E+01	6.0430E-02	3.5192E-03	-2.3332E-05	0	1.000	6	90
R157	Diesel	28-32 t	Euro III	2.9506E+03	1.7785E+03	-2.8440E+01	8.7545E-02	3.4624E-03	-2.3681E-05	0	1.000	6	90
R158	Diesel	28-32 t	Euro IV	1.3244E+04	-3.1166E+02	1.0400E+02	-3.9723E+00	6.7378E-02	-5.2318E-04	1.5329E-06	1.000	6	90
R159	Diesel	28-32 t	Euro V	1.2429E+04	-1.1845E+02	9.3490E+01	-3.6772E+00	6.2920E-02	-4.8865E-04	1.4260E-06	1.000	6	90
R160	Diesel	28-32 t	Euro VI	1.2429E+04	-1.1845E+02	9.3490E+01	-3.6772E+00	6.2920E-02	-4.8865E-04	1.4260E-06	1.000	6	90
R161	Diesel	>32 t	Pre-Euro I	1.5675E+04	1.3380E+02	9.5247E+01	-4.0275E+00	7.0900E-02	-5.5684E-04	1.6302E-06	1.000	6	90
R162	Diesel	>32 t	Euro I	1.6282E+04	-4.6540E+02	1.2193E+02	-4.6818E+00	7.9883E-02	-6.2426E-04	1.8413E-06	1.000	6	90
R163	Diesel	>32 t	Euro II	1.5065E+04	-4.5884E+02	1.1981E+02	-4.5503E+00	7.6984E-02	-5.9740E-04	1.7509E-06	1.000	6	90
R164	Diesel	>32 t	Euro III	1.1888E+04	2.5264E+02	7.6737E+01	-3.2882E+00	5.7603E-02	-4.4747E-04	1.2915E-06	1.000	6	90
R165	Diesel	>32 t	Euro IV	1.2440E+04	3.9145E+00	8.6161E+01	-3.5112E+00	6.0674E-02	-4.7121E-04	1.3684E-06	1.000	6	90
R166	Diesel	>32 t	Euro V	1.2690E+04	1.6564E+01	8.6867E+01	-3.5532E+00	6.1462E-02	-4.7730E-04	1.3853E-06	1.000	6	90
R167	Diesel	>32 t	Euro VI	1.2690E+04	1.6564E+01	8.6867E+01	-3.5532E+00	6.1462E-02	-4.7730E-04	1.3853E-06	1.000	6	90

Table E10: Ultimate CO_2 emission factors for articulated heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R168	Diesel	14-20 t	Pre-Euro I	1.0235E+04	5.2731E+02	2.6963E+01	-1.5689E+00	3.1148E-02	-2.5960E-04	7.8747E-07	1.000	6	90
R169	Diesel	14-20 t	Euro I	9.2306E+03	1.7119E+02	4.0776E+01	-1.8206E+00	3.3357E-02	-2.7006E-04	8.1187E-07	1.000	6	90
R170	Diesel	14-20 t	Euro II	2.9726E+03	1.2190E+03	-3.1282E+01	4.9520E-01	-4.3771E-03	3.1423E-05	-1.2651E-07	1.000	6	90
R171	Diesel	14-20 t	Euro III	4.1643E+03	1.1305E+03	-2.3055E+01	1.9726E-01	7.2400E-04	-9.6806E-06	0	1.000	6	90
R172	Diesel	14-20 t	Euro IV	7.5290E+03	3.2085E+02	2.9679E+01	-1.4605E+00	2.7350E-02	-2.2126E-04	6.5840E-07	1.000	6	90
R173	Diesel	14-20 t	Euro V	7.6864E+03	3.3758E+02	2.9578E+01	-1.4717E+00	2.7625E-02	-2.2348E-04	6.6422E-07	1.000	6	90
R174	Diesel	14-20 t	Euro VI	7.6864E+03	3.3758E+02	2.9578E+01	-1.4717E+00	2.7625E-02	-2.2348E-04	6.6422E-07	1.000	6	90
R175	Diesel	20-28 t	Pre-Euro I	1.1331E+04	5.2474E+02	5.1038E+01	-2.4856E+00	4.5584E-02	-3.6072E-04	1.0481E-06	1.000	6	90
R176	Diesel	20-28 t	Euro I	1.1730E+04	4.2251E+01	7.4393E+01	-3.0946E+00	5.4278E-02	-4.2678E-04	1.2538E-06	1.000	6	90
R177	Diesel	20-28 t	Euro II	1.2153E+04	-3.2245E+02	9.5675E+01	-3.6658E+00	6.2218E-02	-4.8322E-04	1.4159E-06	1.000	6	90
R178	Diesel	20-28 t	Euro III	9.3785E+03	3.1278E+02	5.7603E+01	-2.5601E+00	4.5427E-02	-3.5470E-04	1.0257E-06	1.000	6	90
R179	Diesel	20-28 t	Euro IV	9.1752E+03	2.2986E+02	5.7582E+01	-2.5021E+00	4.4091E-02	-3.4361E-04	9.9385E-07	1.000	6	90
R180	Diesel	20-28 t	Euro V	9.6741E+03	1.9260E+02	6.1264E+01	-2.6338E+00	4.6307E-02	-3.6111E-04	1.0466E-06	1.000	6	90
R181	Diesel	20-28 t	Euro VI	9.6741E+03	1.9260E+02	6.1264E+01	-2.6338E+00	4.6307E-02	-3.6111E-04	1.0466E-06	1.000	6	90
R182	Diesel	28-34 t	Pre-Euro I	1.2317E+04	3.3594E+02	7.1351E+01	-3.1603E+00	5.5984E-02	-4.3636E-04	1.2590E-06	1.000	6	90
R183	Diesel	28-34 t	Euro I	1.2887E+04	-1.5232E+02	9.4558E+01	-3.7631E+00	6.4604E-02	-5.0210E-04	1.4645E-06	1.000	6	90
R184	Diesel	28-34 t	Euro II	1.3168E+04	-4.7597E+02	1.1273E+02	-4.2282E+00	7.0753E-02	-5.4390E-04	1.5803E-06	1.000	6	90
R185	Diesel	28-34 t	Euro III	1.0145E+04	1.9040E+02	7.2982E+01	-3.0764E+00	5.3276E-02	-4.1017E-04	1.1743E-06	1.000	6	90
R186	Diesel	28-34 t	Euro IV	9.7827E+03	1.2810E+02	7.1298E+01	-2.9692E+00	5.1215E-02	-3.9387E-04	1.1279E-06	1.000	6	90
R187	Diesel	28-34 t	Euro V	1.0247E+04	9.3314E+01	7.4931E+01	-3.0987E+00	5.3363E-02	-4.1055E-04	1.1772E-06	1.000	6	90
R188	Diesel	28-34 t	Euro VI	1.0247E+04	9.3314E+01	7.4931E+01	-3.0987E+00	5.3363E-02	-4.1055E-04	1.1772E-06	1.000	6	90
R189	Diesel	34-40 t	Pre-Euro I	1.6450E+04	-9.1481E+01	1.1814E+02	-4.7938E+00	8.2359E-02	-6.3618E-04	1.8374E-06	1.000	6	90
R190	Diesel	34-40 t	Euro I	1.6964E+04	-6.4746E+02	1.4136E+02	-5.3373E+00	8.9642E-02	-6.9101E-04	2.0123E-06	1.000	6	90
R191	Diesel	34-40 t	Euro II	1.6188E+04	-7.1166E+02	1.4337E+02	-5.3210E+00	8.8424E-02	-6.7650E-04	1.9581E-06	1.000	6	90
R192	Diesel	34-40 t	Euro III	1.2841E+04	1.6618E+01	9.9356E+01	-4.0293E+00	6.8555E-02	-5.2264E-04	1.4863E-06	1.000	6	90
R193	Diesel	34-40 t	Euro IV	1.3086E+04	-1.7713E+02	1.0468E+02	-4.1229E+00	6.9641E-02	-5.3164E-04	1.5208E-06	1.000	6	90
R194	Diesel	34-40 t	Euro V	1.2470E+04	-1.3132E+01	9.5752E+01	-3.8703E+00	6.5779E-02	-5.0131E-04	1.4257E-06	1.000	6	90
R195	Diesel	34-40 t	Euro VI	1.2470E+04	-1.3132E+01	9.5752E+01	-3.8703E+00	6.5779E-02	-5.0131E-04	1.4257E-06	1.000	6	90
R196	Diesel	40-50 t	Pre-Euro I	1.7723E+04	-1.6481E+02	1.3727E+02	-5.4744E+00	9.3059E-02	-7.1324E-04	2.0463E-06	1.000	6	90
R197	Diesel	40-50 t	Euro I	1.6749E+04	-4.6035E+02	1.4217E+02	-5.4546E+00	9.1618E-02	-7.0167E-04	2.0232E-06	1.000	6	90
R198	Diesel	40-50 t	Euro II	1.5941E+04	-5.1492E+02	1.4415E+02	-5.4359E+00	9.0206E-02	-6.8407E-04	1.9546E-06	1.000	6	90
R199	Diesel	40-50 t	Euro III	1.2773E+04	1.9013E+02	1.0121E+02	-4.1734E+00	7.0792E-02	-5.3390E-04	1.4949E-06	1.000	6	90
R200	Diesel	40-50 t	Euro IV	1.2756E+04	2.3811E+01	1.0377E+02	-4.1696E+00	7.0224E-02	-5.2954E-04	1.4879E-06	1.000	6	90
R201	Diesel	40-50 t	Euro V	1.3399E+04	-2.6422E+01	1.0887E+02	-4.3518E+00	7.3250E-02	-5.5310E-04	1.5579E-06	1.000	6	90
R202	Diesel	40-50 t	Euro VI	1.3399E+04	-2.6422E+01	1.0887E+02	-4.3518E+00	7.3250E-02	-5.5310E-04	1.5579E-06	1.000	6	90

Table E11: Ultimate CO_2 emission factors for buses.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R203	Diesel	<15 t	Pre-Euro I	1.6309E+04	2.3064E+02	8.1559E-02	2.8106E-02	0	0	0	1.000	6	75
R204	Diesel	<15 t	Euro I	6.5643E+03	6.6578E+02	-1.0049E+01	8.8086E-02	0	0	0	1.000	6	75
R205	Diesel	<15 t	Euro II	1.2328E+04	1.6353E+02	1.0315E+00	1.4480E-02	0	0	0	1.000	6	75
R206	Diesel	<15 t	Euro III	1.3419E+04	1.4480E+02	1.5927E+00	1.2305E-02	0	0	0	1.000	6	75
R207	Diesel	<15 t	Euro IV	6.2250E+03	6.4736E+02	-9.8449E+00	8.6774E-02	0	0	0	1.000	6	75
R208	Diesel	<15 t	Euro V	1.1797E+04	2.4282E+02	-7.7708E-01	2.6480E-02	0	0	0	1.000	6	75
R209	Diesel	<15 t	Euro VI	1.1797E+04	2.4282E+02	-7.7708E-01	2.6480E-02	0	0	0	1.000	6	75
R210	Diesel	15-18 t	Pre-Euro I	1.6436E+04	6.3196E+02	-7.8101E+00	8.1449E-02	0	0	0	1.000	6	75
R211	Diesel	15-18 t	Euro I	1.5280E+04	4.1405E+02	-3.5248E+00	4.9729E-02	0	0	0	1.000	6	75
R212	Diesel	15-18 t	Euro II	7.4131E+03	9.0150E+02	-1.3026E+01	1.0675E-01	0	0	0	1.000	6	75
R213	Diesel	15-18 t	Euro III	1.8185E+04	2.0714E+02	1.1296E+00	2.1137E-02	0	0	0	1.000	6	75
R214	Diesel	15-18 t	Euro IV	1.5344E+04	3.3444E+02	-1.9155E+00	3.8582E-02	0	0	0	1.000	6	75
R215	Diesel	15-18 t	Euro V	1.5465E+04	3.6074E+02	-2.4288E+00	4.2388E-02	0	0	0	1.000	6	75
R216	Diesel	15-18 t	Euro VI	1.5465E+04	3.6074E+02	-2.4288E+00	4.2388E-02	0	0	0	1.000	6	75
R217	Diesel	>18 t	Pre-Euro I	2.0611E+04	7.4059E+02	-8.1686E+00	8.9565E-02	0	0	0	1.000	6	75
R218	Diesel	>18 t	Euro I	8.2567E+03	1.3050E+03	-1.9871E+01	1.5517E-01	0	0	0	1.000	6	75
R219	Diesel	>18 t	Euro II	6.6124E+03	1.3586E+03	-2.0563E+01	1.5672E-01	0	0	0	1.000	6	75
R220	Diesel	>18 t	Euro III	7.0812E+03	1.3918E+03	-2.1131E+01	1.6157E-01	0	0	0	1.000	6	75
R221	Diesel	>18 t	Euro IV	7.5072E+03	1.2587E+03	-1.9060E+01	1.4815E-01	0	0	0	1.000	6	75
R222	Diesel	>18 t	Euro V	7.8160E+03	1.2762E+03	-1.9378E+01	1.5092E-01	0	0	0	1.000	6	75
R223	Diesel	>18 t	Euro VI	7.8160E+03	1.2762E+03	-1.9378E+01	1.5092E-01	0	0	0	1.000	6	75

Table E12: Ultimate CO_2 emission factors for coaches.

Code	Fuel	Weight range	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R224	Diesel	15-18 t	Pre-Euro I	1.2563E+04	1.0999E+03	-1.8897E+01	1.4655E-01	0	0	0	1.000	6	105
R225	Diesel	15-18 t	Euro I	1.1431E+04	9.9626E+02	-1.6746E+01	1.2984E-01	0	0	0	1.000	6	105
R226	Diesel	15-18 t	Euro II	1.0431E+04	1.0251E+03	-1.6852E+01	1.2887E-01	0	0	0	1.000	6	105
R227	Diesel	15-18 t	Euro III	1.2594E+04	1.0284E+03	-1.7014E+01	1.3391E-01	0	0	0	1.000	6	105
R228	Diesel	15-18 t	Euro IV	1.2820E+04	9.2707E+02	-1.5399E+01	1.2308E-01	0	0	0	1.000	6	105
R229	Diesel	15-18 t	Euro V	1.3400E+04	9.5405E+02	-1.5995E+01	1.2773E-01	0	0	0	1.000	6	105
R230	Diesel	15-18 t	Euro VI	1.3400E+04	9.5405E+02	-1.5995E+01	1.2773E-01	0	0	0	1.000	6	105
R231	Diesel	>18 t	Pre-Euro I	1.5814E+04	1.2676E+03	-2.1367E+01	1.6833E-01	0	0	0	1.000	6	105
R232	Diesel	>18 t	Euro I	1.3435E+04	1.1424E+03	-1.8858E+01	1.4720E-01	0	0	0	1.000	6	105
R233	Diesel	>18 t	Euro II	1.2161E+04	1.1617E+03	-1.8812E+01	1.4516E-01	0	0	0	1.000	6	105
R234	Diesel	>18 t	Euro III	1.4756E+04	1.1749E+03	-2.0628E+01	1.5956E-01	0	0	0	1.000	6	105
R235	Diesel	>18 t	Euro IV	1.4526E+04	1.0827E+03	-1.9111E+01	1.4897E-01	0	0	0	1.000	6	105
R236	Diesel	>18 t	Euro V	1.5216E+04	1.1214E+03	-1.9940E+01	1.5522E-01	0	0	0	1.000	6	105
R237	Diesel	>18 t	Euro VI	1.5216E+04	1.1214E+03	-1.9940E+01	1.5522E-01	0	0	0	1.000	6	105

Table E13: Ultimate CO_2 emission factors for mopeds.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R238	Petrol	< 50 cc	Pre-Euro I	0	2.5000E+01	0	0	0	0	0	3.177	5	50
R239	Petrol	< 50 cc	Euro I	0	1.5000E+01	0	0	0	0	0	3.177	5	50
R240	Petrol	< 50 cc	Euro II	0	1.2080E+01	0	0	0	0	0	3.177	5	50
R241	Petrol	< 50 cc	Euro III	0	1.0500E+01	0	0	0	0	0	3.177	5	50

Table E14: Ultimate CO_2 emission factors for motorcycles – 2-stroke.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R242	Petrol	<=150	Pre-Euro 1	7.4953E-05	2.8007E+02	-1.2997E+01	3.4861E-01	-4.9149E-03	3.6692E-05	-1.0962E-07	1.000	5	100
R243	Petrol	<=150	Euro 1	6.9171E-05	2.5840E+02	-1.1988E+01	3.2146E-01	-4.5312E-03	3.3823E-05	-1.0104E-07	1.000	5	100
R244	Petrol	<=150	Euro 2	6.9171E-05	2.5840E+02	-1.1988E+01	3.2146E-01	-4.5312E-03	3.3823E-05	-1.0104E-07	1.000	5	100
R245	Petrol	<=150	Euro 3	6.9171E-05	2.5840E+02	-1.1988E+01	3.2146E-01	-4.5312E-03	3.3823E-05	-1.0104E-07	1.000	5	100
R246	Petrol	150-250	Pre-Euro 1	-9.4935E-05	3.9955E+02	-1.6948E+01	3.8640E-01	-4.5725E-03	2.7532E-05	-6.4559E-08	1.000	5	130
R247	Petrol	150-250	Euro 1	-9.4935E-05	3.9955E+02	-1.6948E+01	3.8640E-01	-4.5725E-03	2.7532E-05	-6.4559E-08	1.000	5	130
R248	Petrol	150-250	Euro 2	-9.4935E-05	3.9955E+02	-1.6948E+01	3.8640E-01	-4.5725E-03	2.7532E-05	-6.4559E-08	1.000	5	130
R249	Petrol	150-250	Euro 3	-9.4935E-05	3.9955E+02	-1.6948E+01	3.8640E-01	-4.5725E-03	2.7532E-05	-6.4559E-08	1.000	5	130

Table E15: Ultimate CO_2 emission factors for motorcycles – 4-stroke.

Code	Fuel	Engine capacity (cc)	Emission standard	Coefficients							Adjustment factor (k)	Valid speed range	
				a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)
R250	Petrol	<=150	Pre-Euro 1	4.9986E-05	188.93897	-9.7192296	0.29534654	-0.0045485	3.5473E-05	-1.088E-07	1	5	100
R251	Petrol	<=150	Euro 1	4.9986E-05	188.93897	-9.7192296	0.29534654	-0.0045485	3.5473E-05	-1.088E-07	1	5	100
R252	Petrol	<=150	Euro 2	4.9986E-05	188.93897	-9.7192296	0.29534654	-0.0045485	3.5473E-05	-1.088E-07	1	5	100
R253	Petrol	<=150	Euro 3	4.9986E-05	188.93897	-9.7192296	0.29534654	-0.0045485	3.5473E-05	-1.088E-07	1	5	100
R254	Petrol	150-250	Pre-Euro 1	-7.886E-05	210.485038	-8.7650238	0.20875004	-0.0024955	1.5247E-05	-3.621E-08	1	5	130
R255	Petrol	150-250	Euro 1	-7.886E-05	210.485038	-8.7650238	0.20875004	-0.0024955	1.5247E-05	-3.621E-08	1	5	130
R256	Petrol	150-250	Euro 2	-7.886E-05	210.485038	-8.7650238	0.20875004	-0.0024955	1.5247E-05	-3.621E-08	1	5	130
R257	Petrol	150-250	Euro 3	-7.886E-05	210.485038	-8.7650238	0.20875004	-0.0024955	1.5247E-05	-3.621E-08	1	5	130
R258	Petrol	250-750	Pre-Euro 1	0.00013897	323.193477	-12.683304	0.30398891	-0.003665	2.2107E-05	-5.081E-08	1	5	140
R259	Petrol	250-750	Euro 1	0.00013934	294.544745	-11.202209	0.25677386	-0.0029499	1.7295E-05	-3.903E-08	1	5	140
R260	Petrol	250-750	Euro 2	0.00013024	270.854017	-10.611696	0.24898489	-0.0029103	1.7224E-05	-3.901E-08	1	5	140
R261	Petrol	250-750	Euro 3	0.00013024	270.854017	-10.611696	0.24898489	-0.0029103	1.7224E-05	-3.901E-08	1	5	140
R262	Petrol	>750	Pre-Euro 1	0.00015339	386.217462	-15.348761	0.36282318	-0.0042909	2.5418E-05	-5.792E-08	1	5	140
R263	Petrol	>750	Euro 1	0.00013092	391.602865	-15.51304	0.35964146	-0.0042236	2.4857E-05	-5.653E-08	1	5	140
R264	Petrol	>750	Euro 2	0.00013986	386.407183	-15.730356	0.36860757	-0.0043411	2.5637E-05	-5.839E-08	1	5	140
R265	Petrol	>750	Euro 3	0.00013986	386.407183	-15.730356	0.36860757	-0.0043411	2.5637E-05	-5.839E-08	1	5	140

Appendix F: Basic emission factors for unregulated pollutants

Methane	**Tables F1-F4**
1,3-butadiene	**Tables F5-F14**
Benzene	**Tables F15-F17**
Nitrous oxide and ammonia	**Tables F18-F21**
PAHs	**Tables F22-F24**
NO_2	**Table F25**
PM_{10}, $PM_{2.5}$ and PM_1	**Table F26**

Table F1: Methane emission factors for cars, LGV N1(I), LGV N1(II) and taxis.

Code	Fuel	Emission standard	Average speed functions $y = k \cdot (a + bx + cx^2 + dx^3 + ex^4 + fx^5 + gx^6) / x$ (y=EF in g/km; x=speed in km/h)										Urban/rural/motorway emission factors		
			Coefficients							Adjustment factor (k)	Valid speed range		Urban (g/km)	Rural (g/km)	Motorway (g/km)
			a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)			
U01	Petrol	Pre-Euro 1	2.0748E-12	2.7000E-01	-6.2836E-03	3.9580E-05	0	0	0	1	5	120	1.3596E-01	7.2432E-02	4.3662E-02
U02	Petrol	Euro 1	7.1054E-13	6.4268E-02	-1.6275E-03	1.1214E-05	0	0	0	1	5	120	2.9806E-02	1.3569E-02	1.3057E-02
U03	Petrol	Euro 2	4.9738E-13	3.4254E-02	-5.5991E-04	3.0585E-06	0	0	0	1	5	120	2.2480E-02	1.3168E-02	1.1350E-02
U04	Petrol	Euro 3	3.0553E-13	1.1726E-02	-2.2995E-04	1.7185E-06	0	0	0	1	5	120	7.6871E-03	4.5826E-03	6.9426E-03
U05	Petrol	Euro 4	1.5277E-13	5.8630E-03	-1.1497E-04	8.5926E-07	0	0	0	0.5	5	120	3.8435E-03	2.2913E-03	3.4713E-03
U06	Petrol	Euro 5	1.5277E-13	5.8630E-03	-1.1497E-04	8.5926E-07	0	0	0	0.5	5	120	3.8435E-03	2.2913E-03	3.4713E-03
U07	Petrol	Euro 6	1.5277E-13	5.8630E-03	-1.1497E-04	8.5926E-07	0	0	0	0.5	5	120	3.8435E-03	2.2913E-03	3.4713E-03
U08	Diesel	Pre-Euro 1	1.1200E-01	6.1291E-02	-3.2364E-03	7.8717E-05	-9.4602E-07	5.6112E-09	-1.3113E-11	1	5	120	2.9103E-02	1.2291E-02	7.8697E-03
U09	Diesel	Euro 1	6.5893E-01	-1.8820E-02	-3.4148E-04	2.9017E-05	-5.1301E-07	3.7637E-09	-1.0102E-11	1	5	120	1.2177E-02	7.8909E-03	3.2414E-03
U10	Diesel	Euro 2	3.0619E-01	-2.4019E-02	1.1728E-03	-2.7736E-05	3.4080E-07	-2.0875E-09	5.0342E-12	1	5	120	7.4932E-03	1.7027E-03	1.0130E-03
U11	Diesel	Euro 3	2.4942E-02	9.7620E-03	-5.8016E-04	1.4552E-05	-1.7851E-07	1.0742E-09	-2.5372E-12	1	5	120	4.4939E-03	1.3153E-03	7.0226E-04
U12	Diesel	Euro 4	2.0785E-02	8.1350E-03	-4.8347E-04	1.2127E-05	-1.4876E-07	8.9519E-10	-2.1143E-12	0.8333	5	120	3.7449E-03	1.0961E-03	5.8522E-04
U13	Diesel	Euro 5	2.0785E-02	8.1350E-03	-4.8347E-04	1.2127E-05	-1.4876E-07	8.9519E-10	-2.1143E-12	0.8333	5	120	3.7449E-03	1.0961E-03	5.8522E-04
U14	Diesel	Euro 6	3.7413E-02	1.4643E-02	-8.7024E-04	2.1828E-05	-2.6776E-07	1.6113E-09	-3.8058E-12	1.5	5	120	6.7408E-03	1.9730E-03	1.0534E-03
U15	LPG	Euro 1	No function										8.0000E-02	3.5000E-02	2.5000E-02
U16	LPG	Euro 2	No function										6.0337E-02	3.3965E-02	2.1732E-02
U17	LPG	Euro 3	No function										2.0632E-02	1.1820E-02	1.3293E-02
U18	LPG	Euro 4	No function										1.0316E-02	5.9100E-03	6.6466E-03
U19	LPG	Euro 5	No function										1.0316E-02	5.9100E-03	6.6466E-03
U20	LPG	Euro 6	No function										1.0316E-02	5.9100E-03	6.6466E-03

Table F2: Methane emission factors for LGV N1(III).

Code	Fuel	Emission standard	Average speed functions $y = k \cdot (a + bx + cx^2 + dx^3 + ex^4 + fx^5 + gx^6) / x$ (y=EF in g/km; x=speed in km/h)										Urban/rural/motorway emission factors		
			Coefficients							Adjustment factor (k)	Valid speed range		Urban (g/km)	Rural (g/km)	Motorway (g/km)
			a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)			
U21	Petrol	Pre-Euro 1	2.0748E-12	2.7000E-01	-6.2836E-03	3.9580E-05	0	0	0	1	5	120	1.3596E-01	7.2432E-02	4.3662E-02
U22	Petrol	Euro 1	7.1054E-13	6.4268E-02	-1.6275E-03	1.1214E-05	0	0	0	1	5	120	2.9806E-02	1.3569E-02	1.3057E-02
U23	Petrol	Euro 2	5.3291E-13	4.3016E-02	-6.7846E-04	3.4781E-06	0	0	0	1	5	120	2.8780E-02	1.7188E-02	1.1350E-02
U24	Petrol	Euro 3	3.0553E-13	1.1726E-02	-2.2995E-04	1.7185E-06	0	0	0	1	5	120	7.6871E-03	4.5826E-03	6.9426E-03
U25	Petrol	Euro 4	1.5277E-13	5.8630E-03	-1.1497E-04	8.5926E-07	0	0	0	0.5	5	120	3.8435E-03	2.2913E-03	3.4713E-03
U26	Petrol	Euro 5	1.5277E-13	5.8630E-03	-1.1497E-04	8.5926E-07	0	0	0	0.5	5	120	3.8435E-03	2.2913E-03	3.4713E-03
U27	Petrol	Euro 6	1.5277E-13	5.8630E-03	-1.1497E-04	8.5926E-07	0	0	0	0.5	5	120	3.8435E-03	2.2913E-03	3.4713E-03
U28	Diesel	Pre-Euro 1	7.6739E-13	5.8160E-02	-1.5605E-03	1.1198E-05	0	0	0	1	5	120	2.9103E-02	1.2291E-02	7.8697E-03
U29	Diesel	Euro 1	2.0606E-13	2.6832E-02	-6.4409E-04	4.1165E-06	0	0	0	1	5	120	1.2177E-02	7.8909E-03	3.2414E-03
U30	Diesel	Euro 2	3.0619E-01	-2.4019E-02	1.1728E-03	-2.7736E-05	3.4080E-07	-2.0875E-09	5.0342E-12	1	5	120	7.4932E-03	1.7027E-03	1.0130E-03
U31	Diesel	Euro 3	3.7303E-14	7.4032E-03	-1.6059E-04	9.2745E-07	0	0	0	1	5	120	4.4939E-03	1.3153E-03	7.0226E-04
U32	Diesel	Euro 4	2.9310E-14	6.1693E-03	-1.3382E-04	7.7287E-07	0	0	0	0.8333	5	120	3.7449E-03	1.0961E-03	5.8522E-04
U33	Diesel	Euro 5	2.9310E-14	6.1693E-03	-1.3382E-04	7.7287E-07	0	0	0	0.8333	5	120	3.7449E-03	1.0961E-03	5.8522E-04
U34	Diesel	Euro 6	5.2403E-14	1.1105E-02	-2.4088E-04	1.3912E-06	0	0	0	1.5	5	120	6.7408E-03	1.9730E-03	1.0534E-03

Table F3: Methane emission factors for heavy-duty vehicles (all diesel).

Code	Type	Emission standard	Urban/rural/motorway emission factors		
			Urban (g/km)	Rural (g/km)	Motorway (g/km)
U35	Rigid HGV	Pre-Euro I	1.8545E-01	5.0182E-02	4.3636E-02
U36	Rigid HGV	Euro I	8.5000E-02	2.3000E-02	2.0000E-02
U37	Rigid HGV	Euro II	5.4400E-02	2.0010E-02	1.8600E-02
U38	Rigid HGV	Euro III	4.7600E-02	2.1390E-02	1.8200E-02
U39	Rigid HGV	Euro IV	2.5500E-03	1.6100E-03	1.2000E-03
U40	Rigid HGV	Euro V	2.2950E-03	1.4490E-03	1.0800E-03
U41	Rigid HGV	Euro VI	7.6500E-04	4.8300E-04	3.6000E-04
U42	Artic HGV	Pre-Euro I	3.8182E-01	1.7455E-01	1.5273E-01
U43	Artic HGV	Euro I	1.7500E-01	8.0000E-02	7.0000E-02
U44	Artic HGV	Euro II	1.1200E-01	6.9600E-02	6.5100E-02
U45	Artic HGV	Euro III	9.8000E-02	7.4400E-02	6.3700E-02
U46	Artic HGV	Euro IV	5.2500E-03	5.6000E-03	4.2000E-03
U47	Artic HGV	Euro V	4.7250E-03	5.0400E-03	3.7800E-03
U48	Artic HGV	Euro VI	1.5750E-03	1.6800E-03	1.2600E-03
U49	Bus/coach	Pre-Euro I	3.8182E-01	1.7455E-01	1.5273E-01
U50	Bus/coach	Euro I	1.7500E-01	8.0000E-02	7.0000E-02
U51	Bus/coach	Euro II	1.1375E-01	5.2000E-02	4.5500E-02
U52	Bus/coach	Euro III	1.0325E-01	4.7200E-02	4.1300E-02
U53	Bus/coach	Euro IV	5.2500E-03	5.6000E-03	4.2000E-03
U54	Bus/coach	Euro V	4.7250E-03	5.0400E-03	3.7800E-03
U55	Bus/coach	Euro VI	1.5750E-03	1.6800E-03	1.2600E-03

Table F4: Methane emission factors for two-wheel vehicles (all petrol).

Code	Engine capacity (cc) and type.	Emission standard	Urban/rural/motorway emission factors		
			Urban (g/km)	Rural (g/km)	Motorway (g/km)
U56	<50	Pre-Euro 1	2.1900E-01	2.1900E-01	2.1900E-01
U57	<50	Euro 1	4.3800E-02	2.1900E-01	2.1900E-01
U58	<50	Euro 2	2.4090E-02	2.1900E-01	2.1900E-01
U59	<50	Euro 3	1.9710E-02	2.1900E-01	2.1900E-01
U60	>50 2-stroke	Pre-Euro 1	1.5000E-01	1.5000E-01	1.5000E-01
U61	>50 2-stroke	Euro 1	9.9000E-02	1.0650E-01	9.7500E-02
U62	>50 2-stroke	Euro 2	3.0000E-02	3.1500E-02	3.0000E-02
U63	>50 2-stroke	Euro 3	1.2000E-02	1.3500E-02	1.2000E-02
U64	<250 4-stroke	Pre-Euro 1	2.0000E-01	2.0000E-01	2.0000E-01
U65	<250 4-stroke	Euro 1	1.4200E-01	1.4400E-01	1.3200E-01
U66	<250 4-stroke	Euro 2	1.3600E-01	9.2000E-02	9.2000E-02
U67	<250 4-stroke	Euro 3	8.2000E-02	3.2000E-02	2.8000E-02
U68	250-750 4-stroke	Pre-Euro 1	2.0000E-01	2.0000E-01	2.0000E-01
U69	250-750 4-stroke	Euro 1	1.4800E-01	1.7400E-01	1.5600E-01
U70	250-750 4-stroke	Euro 2	1.5600E-01	1.2000E-01	1.2200E-01
U71	250-750 4-stroke	Euro 3	9.4000E-02	4.2000E-02	3.6000E-02
U72	>750 4-stroke	Pre-Euro 1	2.0000E-01	2.0000E-01	2.0000E-01
U73	>750 4-stroke	Euro 1	9.2000E-02	9.2000E-02	1.5400E-01
U74	>750 4-stroke	Euro 2	8.4000E-02	6.2000E-02	1.0200E-01
U75	>750 4-stroke	Euro 3	5.0000E-02	2.2000E-02	3.0000E-02

Table F5: 1,3-butadiene emission factors for petrol and diesel cars and minibuses < 2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Urban/rural/motorway emission factors			Code	Fuel	Engine capacity (cc)	Emission standard	Urban/rural/motorway emission factors		
				Urban (g/km)	Rural (g/km)	Motorway (g/km)					Urban (g/km)	Rural (g/km)	Motorway (g/km)
R001	Petrol	<1400	Pre-Euro 1	4.1585E-02	1.6053E-02	9.5250E-03	**R022**	Diesel	<1400	Pre-Euro 1	1.9756E-03	8.9651E-04	6.4552E-04
R002	Petrol	<1400	Euro 1	4.9015E-03	1.2595E-03	1.1633E-03	**R023**	Diesel	<1400	Euro 1	1.3274E-03	4.8877E-04	3.2234E-04
R003	Petrol	<1400	Euro 2	6.3737E-04	1.9858E-04	3.6957E-04	**R024**	Diesel	<1400	Euro 2	7.4141E-04	3.4300E-04	2.4294E-04
R004	Petrol	<1400	Euro 3	2.2790E-04	2.1224E-04	2.5318E-04	**R025**	Diesel	<1400	Euro 3	3.9961E-04	1.5695E-04	9.7747E-05
R005	Petrol	<1400	Euro 4	3.9486E-05	4.2635E-05	4.7500E-05	**R026**	Diesel	<1400	Euro 4	3.1684E-04	1.2842E-04	8.2449E-05
R006	Petrol	<1400	Euro 5	3.9486E-05	4.2635E-05	4.7500E-05	**R027**	Diesel	<1400	Euro 5	3.1684E-04	1.2842E-04	8.2449E-05
R007	Petrol	<1400	Euro 6	3.9486E-05	4.2635E-05	4.7500E-05	**R028**	Diesel	<1400	Euro 6	2.8778E-04	1.2044E-04	7.8189E-05
R008	Petrol	1400-2000	Pre-Euro 1	3.1711E-02	1.3101E-02	8.3891E-03	**R029**	Diesel	1400-2000	Pre-Euro 1	1.9756E-03	8.9651E-04	6.4552E-04
R009	Petrol	1400-2000	Euro 1	1.9411E-03	5.6951E-04	4.7910E-04	**R030**	Diesel	1400-2000	Euro 1	1.3274E-03	4.8877E-04	3.2234E-04
R010	Petrol	1400-2000	Euro 2	8.1122E-04	3.3392E-04	3.5551E-04	**R031**	Diesel	1400-2000	Euro 2	7.4141E-04	3.4300E-04	2.4294E-04
R011	Petrol	1400-2000	Euro 3	1.8739E-04	9.9646E-05	1.1457E-04	**R032**	Diesel	1400-2000	Euro 3	3.9961E-04	1.5695E-04	9.7747E-05
R012	Petrol	1400-2000	Euro 4	5.3679E-04	1.3243E-04	8.2533E-05	**R033**	Diesel	1400-2000	Euro 4	3.1684E-04	1.2842E-04	8.2449E-05
R013	Petrol	1400-2000	Euro 5	5.3679E-04	1.3243E-04	8.2533E-05	**R034**	Diesel	1400-2000	Euro 5	3.1684E-04	1.2842E-04	8.2449E-05
R014	Petrol	1400-2000	Euro 6	5.3679E-04	1.3243E-04	8.2533E-05	**R035**	Diesel	1400-2000	Euro 6	2.8778E-04	1.2044E-04	7.8189E-05
R015	Petrol	>2000	Pre-Euro 1	1.9511E-02	1.1051E-02	9.7293E-03	**R036**	Diesel	>2000	Pre-Euro 1	1.7506E-03	8.5157E-04	6.4415E-04
R016	Petrol	>2000	Euro 1	1.8916E-03	3.4245E-04	1.2773E-03	**R037**	Diesel	>2000	Euro 1	1.3431E-03	4.6357E-04	2.8666E-04
R017	Petrol	>2000	Euro 2	6.9182E-04	1.3642E-04	1.7807E-04	**R038**	Diesel	>2000	Euro 2	1.3115E-03	5.5712E-04	3.7289E-04
R018	Petrol	>2000	Euro 3	7.3250E-05	4.1047E-05	5.5001E-05	**R039**	Diesel	>2000	Euro 3	2.2809E-04	1.0604E-04	6.3485E-05
R019	Petrol	>2000	Euro 4	4.1226E-05	5.2848E-05	1.3453E-04	**R040**	Diesel	>2000	Euro 4	1.9008E-04	8.8365E-05	5.2904E-05
R020	Petrol	>2000	Euro 5	4.1226E-05	5.2848E-05	1.3453E-04	**R041**	Diesel	>2000	Euro 5	1.9008E-04	8.8365E-05	5.2904E-05
R021	Petrol	>2000	Euro 6	4.1226E-05	5.2848E-05	1.3453E-04	**R042**	Diesel	>2000	Euro 6	1.6102E-04	8.0385E-05	4.8644E-05

Table F6: 1,3-butadiene emission factors for LPG cars and minibuses <2.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Urban/rural/motorway emission factors		
				Urban (g/km)	Rural (g/km)	Motorway (g/km)
R043	LPG	All	Euro 1	2.6168E-06	5.0220E-05	5.9998E-05
R044	LPG	All	Euro 2	1.0946E-04	5.9109E-05	4.1701E-05
R045	LPG	All	Euro 3	2.1631E-04	6.7998E-05	2.3403E-05
R046	LPG	All	Euro 4	1.0815E-04	3.3999E-05	1.1701E-05
R047	LPG	All	Euro 5	1.0815E-04	3.3999E-05	1.1701E-05
R048	LPG	All	Euro 6	1.0815E-04	3.3999E-05	1.1701E-05

Table F7: 1,3-butadiene emission factors for cars and minibuses 2.5-3.5 tonnes GVW.

Code	Fuel	Engine capacity (cc)	Emission standard	Urban/rural/motorway emission factors		
				Urban (g/km)	Rural (g/km)	Motorway (g/km)
R049	Petrol	All	Pre-Euro 1	7.3638E-03	4.3784E-03	4.3129E-03
R050	Petrol	All	Euro 1	1.1941E-03	7.2898E-04	6.5890E-04
R051	Petrol	All	Euro 2	1.5633E-03	2.1382E-04	7.8654E-04
R052	Petrol	All	Euro 3	1.0350E-03	1.6683E-04	4.9296E-04
R053	Petrol	All	Euro 4	6.0587E-04	1.0010E-04	2.9097E-04
R054	Petrol	All	Euro 5	4.9980E-04	8.0080E-05	2.3758E-04
R055	Petrol	All	Euro 6	4.9980E-04	8.0080E-05	2.3758E-04
R056	Diesel	All	Pre-Euro 1	1.2275E-02	5.9912E-03	4.3421E-03
R057	Diesel	All	Euro 1	2.9711E-03	1.4297E-03	1.0564E-03
R058	Diesel	All	Euro 2	2.8348E-03	1.3977E-03	1.0128E-03
R059	Diesel	All	Euro 3	1.2648E-03	6.2395E-04	4.5350E-04
R060	Diesel	All	Euro 4	7.9959E-04	3.9631E-04	2.8850E-04
R061	Diesel	All	Euro 5	5.9969E-04	2.9915E-04	2.1823E-04
R062	Diesel	All	Euro 6	3.2531E-04	1.7194E-04	1.2774E-04

Table F8: 1,3-butadiene emission factors for taxis.

Code	Fuel	Engine capacity (cc)	Emission standard	Urban/rural/motorway emission factors		
				Urban (g/km)	Rural (g/km)	Motorway (g/km)
R063	Diesel	All	Pre-Euro 1	6.0595E-04	3.8960E-04	3.4276E-04
R064	Diesel	All	Euro 1	4.2038E-04	2.3220E-04	2.2172E-04
R065	Diesel	All	Euro 2	4.2695E-04	2.6657E-04	2.2387E-04
R066	Diesel	All	Euro 3	2.6730E-04	1.6354E-04	1.3864E-04
R067	Diesel	All	Euro 4	1.3022E-04	8.4048E-05	7.2370E-05
R068	Diesel	All	Euro 5	9.1360E-05	6.2109E-05	5.4241E-05
R069	Diesel	All	Euro 6	2.8990E-05	3.5325E-05	3.4441E-05

Table F9: 1,3-butadiene emission factors for LGV N1(I).

Code	Fuel	Engine capacity (cc)	Emission standard	Urban/rural/motorway emission factors		
				Urban (g/km)	Rural (g/km)	Motorway (g/km)
R070	Petrol	All	Pre-Euro 1	4.1585E-02	1.6053E-02	9.5250E-03
R071	Petrol	All	Euro 1	4.9015E-03	1.2595E-03	1.1633E-03
R072	Petrol	All	Euro 2	6.3737E-04	1.9858E-04	3.6957E-04
R073	Petrol	All	Euro 3	2.2790E-04	2.1224E-04	2.5318E-04
R074	Petrol	All	Euro 4	1.1395E-04	1.0612E-04	1.2659E-04
R075	Petrol	All	Euro 5	1.1395E-04	1.0612E-04	1.2659E-04
R076	Petrol	All	Euro 6	1.1395E-04	1.0612E-04	1.2659E-04
R077	Diesel	All	Pre-Euro 1	5.7102E-03	2.4465E-03	1.6829E-03
R078	Diesel	All	Euro 1	1.4529E-03	5.9891E-04	4.3047E-04
R079	Diesel	All	Euro 2	6.1677E-04	2.5537E-04	1.6299E-04
R080	Diesel	All	Euro 3	4.9264E-04	1.5381E-04	7.0890E-05
R081	Diesel	All	Euro 4	4.1054E-04	1.2818E-04	5.9075E-05
R082	Diesel	All	Euro 5	4.1054E-04	1.2818E-04	5.9075E-05
R083	Diesel	All	Euro 6	3.8148E-04	1.2020E-04	5.4814E-05

Table F10: 1,3-butadiene emission factors for LGV N1(II).

Code	Fuel	Engine capacity (cc)	Emission standard	Urban/rural/motorway emission factors		
				Urban (g/km)	Rural (g/km)	Motorway (g/km)
R084	Petrol	All	Pre-Euro 1	2.6776E-02	1.3520E-02	1.0213E-02
R085	Petrol	All	Euro 1	1.2026E-04	1.4476E-04	4.0113E-04
R086	Petrol	All	Euro 2	6.5555E-05	3.6051E-05	9.4424E-05
R087	Petrol	All	Euro 3	5.0291E-05	4.0687E-05	9.6521E-05
R088	Petrol	All	Euro 4	2.9340E-05	2.3217E-05	5.3832E-05
R089	Petrol	All	Euro 5	2.2349E-05	1.8427E-05	4.4547E-05
R090	Petrol	All	Euro 6	2.2349E-05	1.8427E-05	4.4547E-05
R091	Diesel	All	Pre-Euro 1	3.7844E-03	1.0717E-03	4.2134E-04
R092	Diesel	All	Euro 1	6.6847E-04	2.1518E-04	1.3916E-04
R093	Diesel	All	Euro 2	6.5773E-04	2.5099E-04	1.4739E-04
R094	Diesel	All	Euro 3	3.6094E-04	1.3562E-04	8.0346E-05
R095	Diesel	All	Euro 4	1.8280E-04	6.9971E-05	4.1657E-05
R096	Diesel	All	Euro 5	1.2942E-04	5.0497E-05	3.0212E-05
R097	Diesel	All	Euro 6	4.4176E-05	2.2019E-05	1.3905E-05

Table F11: 1,3-butadiene emission factors for LGV N1(III).

Code	Fuel	Engine capacity (cc)	Emission standard	Urban/rural/motorway emission factors		
				Urban (g/km)	Rural (g/km)	Motorway (g/km)
R098	Petrol	All	Pre-Euro 1	3.9322E-02	2.1354E-02	1.6811E-02
R099	Petrol	All	Euro 1	2.0828E-03	8.7197E-04	2.0304E-03
R100	Petrol	All	Euro 2	1.3029E-03	7.4643E-04	1.3575E-03
R101	Petrol	All	Euro 3	9.0802E-04	5.2257E-04	8.4981E-04
R102	Petrol	All	Euro 4	4.9313E-04	2.8386E-04	4.6142E-04
R103	Petrol	All	Euro 5	4.3836E-04	2.5226E-04	4.1030E-04
R104	Petrol	All	Euro 6	4.3836E-04	2.5226E-04	4.1030E-04
R105	Diesel	All	Pre-Euro 1	2.0148E-03	1.2420E-03	1.0720E-03
R106	Diesel	All	Euro 1	1.4492E-03	5.7662E-04	3.8167E-04
R107	Diesel	All	Euro 2	1.1535E-03	6.9488E-04	7.3441E-04
R108	Diesel	All	Euro 3	6.5300E-04	2.5278E-04	2.1252E-04
R109	Diesel	All	Euro 4	5.7320E-04	2.2168E-04	1.8622E-04
R110	Diesel	All	Euro 5	5.7320E-04	2.2168E-04	1.8622E-04
R111	Diesel	All	Euro 6	7.1828E-04	2.7989E-04	2.3669E-04

Table F12: 1,3-butadiene emission factors for rigid heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Urban/rural/motorway emission factors			Code	Fuel	Weight range	Emission standard	Urban/rural/motorway emission factors		
				Urban (g/km)	Rural (g/km)	M'way (g/km)					Urban (g/km)	Rural (g/km)	M'way (g/km)
R112	Diesel	3.5-7.5 t	Pre-Euro I	6.4485E-02	2.8444E-02	2.6431E-02	**R140**	Diesel	20-26 t	Pre-Euro I	4.2746E-02	1.8001E-02	1.5797E-02
R113	Diesel	3.5-7.5 t	Euro I	1.0714E-02	5.6027E-03	5.5735E-03	**R141**	Diesel	20-26 t	Euro I	3.9143E-02	1.7409E-02	1.6136E-02
R114	Diesel	3.5-7.5 t	Euro II	6.9252E-03	3.3935E-03	3.3017E-03	**R142**	Diesel	20-26 t	Euro II	2.4922E-02	1.0925E-02	9.7982E-03
R115	Diesel	3.5-7.5 t	Euro III	6.4220E-03	2.9424E-03	2.7731E-03	**R143**	Diesel	20-26 t	Euro III	2.2967E-02	9.4074E-03	8.5362E-03
R116	Diesel	3.5-7.5 t	Euro IV	3.4078E-04	1.2384E-04	1.2306E-04	**R144**	Diesel	20-26 t	Euro IV	1.2080E-03	4.5080E-04	4.0437E-04
R117	Diesel	3.5-7.5 t	Euro V	3.5476E-04	1.3148E-04	1.2915E-04	**R145**	Diesel	20-26 t	Euro V	1.2420E-03	4.6604E-04	4.1713E-04
R118	Diesel	3.5-7.5 t	Euro VI	9.9991E-05	3.6220E-05	3.6058E-05	**R146**	Diesel	20-26 t	Euro VI	3.5811E-04	1.3355E-04	1.1983E-04
R119	Diesel	7.5-12 t	Pre-Euro I	4.9016E-02	2.0541E-02	1.8186E-02	**R147**	Diesel	26-28 t	Pre-Euro I	4.3957E-02	1.9249E-02	1.6710E-02
R120	Diesel	7.5-12 t	Euro I	1.9594E-02	9.0653E-03	8.5699E-03	**R148**	Diesel	26-28 t	Euro I	3.9558E-02	1.8209E-02	1.6514E-02
R121	Diesel	7.5-12 t	Euro II	1.2686E-02	5.6044E-03	5.2817E-03	**R149**	Diesel	26-28 t	Euro II	2.5520E-02	1.1509E-02	1.0259E-02
R122	Diesel	7.5-12 t	Euro III	1.1858E-02	4.8808E-03	4.5449E-03	**R150**	Diesel	26-28 t	Euro III	2.3574E-02	1.0134E-02	8.8977E-03
R123	Diesel	7.5-12 t	Euro IV	6.3121E-04	2.2027E-04	2.0617E-04	**R151**	Diesel	26-28 t	Euro IV	1.2348E-03	4.8487E-04	4.2789E-04
R124	Diesel	7.5-12 t	Euro V	6.5632E-04	2.3191E-04	2.1711E-04	**R152**	Diesel	26-28 t	Euro V	1.2695E-03	5.0090E-04	4.4137E-04
R125	Diesel	7.5-12 t	Euro VI	1.8772E-04	6.5436E-05	6.1648E-05	**R153**	Diesel	26-28 t	Euro VI	3.6609E-04	1.4369E-04	1.2689E-04
R126	Diesel	12-14 t	Pre-Euro I	5.2573E-02	2.2570E-02	2.0500E-02	**R154**	Diesel	28-32 t	Pre-Euro I	4.5307E-02	1.9528E-02	1.7929E-02
R127	Diesel	12-14 t	Euro I	2.1176E-02	1.0137E-02	9.5486E-03	**R155**	Diesel	28-32 t	Euro I	4.1395E-02	1.9239E-02	1.8441E-02
R128	Diesel	12-14 t	Euro II	1.3550E-02	6.1979E-03	5.8459E-03	**R156**	Diesel	28-32 t	Euro II	2.6539E-02	1.2066E-02	1.1362E-02
R129	Diesel	12-14 t	Euro III	1.2387E-02	5.3102E-03	4.8635E-03	**R157**	Diesel	28-32 t	Euro III	2.4279E-02	1.0499E-02	9.8039E-03
R130	Diesel	12-14 t	Euro IV	6.4595E-04	2.4138E-04	2.2109E-04	**R158**	Diesel	28-32 t	Euro IV	1.2662E-03	4.9738E-04	4.6854E-04
R131	Diesel	12-14 t	Euro V	6.6939E-04	2.5267E-04	2.3039E-04	**R159**	Diesel	28-32 t	Euro V	1.3055E-03	5.1484E-04	4.8417E-04
R132	Diesel	12-14 t	Euro VI	1.9152E-04	7.1476E-05	6.5510E-05	**R160**	Diesel	28-32 t	Euro VI	3.7658E-04	1.4774E-04	1.3934E-04
R133	Diesel	14-20 t	Pre-Euro I	7.9706E-02	3.4520E-02	3.1537E-02	**R161**	Diesel	>32 t	Pre-Euro I	4.7209E-02	1.9467E-02	1.7545E-02
R134	Diesel	14-20 t	Euro I	3.1459E-02	1.4568E-02	1.3627E-02	**R162**	Diesel	>32 t	Euro I	4.4142E-02	1.9600E-02	1.8251E-02
R135	Diesel	14-20 t	Euro II	2.0202E-02	9.0528E-03	8.4826E-03	**R163**	Diesel	>32 t	Euro II	2.7928E-02	1.2264E-02	1.0946E-02
R136	Diesel	14-20 t	Euro III	1.8740E-02	7.9363E-03	7.2528E-03	**R164**	Diesel	>32 t	Euro III	2.5496E-02	1.0466E-02	9.5004E-03
R137	Diesel	14-20 t	Euro IV	9.8796E-04	3.7894E-04	3.4533E-04	**R165**	Diesel	>32 t	Euro IV	1.3297E-03	4.9790E-04	4.4623E-04
R138	Diesel	14-20 t	Euro V	1.0170E-03	3.9238E-04	3.5679E-04	**R166**	Diesel	>32 t	Euro V	1.3675E-03	5.1468E-04	4.6015E-04
R139	Diesel	14-20 t	Euro VI	2.9264E-04	1.1212E-04	1.0228E-04	**R167**	Diesel	>32 t	Euro VI	3.9461E-04	1.4770E-04	1.3235E-04

Table F13: 1,3-butadiene emission factors for articulated heavy goods vehicles.

Code	Fuel	Weight range	Emission standard	Urban/rural/motorway emission factors		
				Urban (g/km)	Rural (g/km)	M'way (g/km)
R168	Diesel	14-20 t	Pre-Euro I	6.4731E-02	2.6749E-02	2.3797E-02
R169	Diesel	14-20 t	Euro I	2.5587E-02	1.1331E-02	1.0707E-02
R170	Diesel	14-20 t	Euro II	1.6495E-02	6.6564E-03	6.0514E-03
R171	Diesel	14-20 t	Euro III	1.5234E-02	5.3935E-03	5.0115E-03
R172	Diesel	14-20 t	Euro IV	7.9527E-04	2.0568E-04	2.0660E-04
R173	Diesel	14-20 t	Euro V	8.3274E-04	2.3232E-04	2.2771E-04
R174	Diesel	14-20 t	Euro VI	2.3564E-04	6.0529E-05	6.0952E-05
R175	Diesel	20-28 t	Pre-Euro I	3.2188E-02	1.2617E-02	1.1497E-02
R176	Diesel	20-28 t	Euro I	3.3232E-02	1.4740E-02	1.3900E-02
R177	Diesel	20-28 t	Euro II	2.1160E-02	8.6777E-03	8.0363E-03
R178	Diesel	20-28 t	Euro III	1.9420E-02	7.1806E-03	6.6204E-03
R179	Diesel	20-28 t	Euro IV	1.0121E-03	2.9404E-04	2.8331E-04
R180	Diesel	20-28 t	Euro V	1.0540E-03	3.2197E-04	3.0568E-04
R181	Diesel	20-28 t	Euro VI	3.0000E-04	8.6609E-05	8.3633E-05
R182	Diesel	28-34 t	Pre-Euro I	3.1625E-02	1.2430E-02	1.1317E-02
R183	Diesel	28-34 t	Euro I	3.3245E-02	1.4849E-02	1.4060E-02
R184	Diesel	28-34 t	Euro II	2.1128E-02	8.7834E-03	7.9529E-03
R185	Diesel	28-34 t	Euro III	1.9252E-02	7.1403E-03	6.6063E-03
R186	Diesel	28-34 t	Euro IV	9.9947E-04	2.9025E-04	2.8083E-04
R187	Diesel	28-34 t	Euro V	1.0412E-03	3.1793E-04	3.0273E-04
R188	Diesel	28-34 t	Euro VI	2.9627E-04	8.5432E-05	8.2774E-05
R189	Diesel	34-40 t	Pre-Euro I	4.0160E-02	1.5275E-02	1.3832E-02
R190	Diesel	34-40 t	Euro I	4.1096E-02	1.7672E-02	1.6513E-02
R191	Diesel	34-40 t	Euro II	2.5934E-02	1.0614E-02	9.3979E-03
R192	Diesel	34-40 t	Euro III	2.3587E-02	8.6571E-03	7.9319E-03
R193	Diesel	34-40 t	Euro IV	1.2271E-03	3.6381E-04	3.4528E-04
R194	Diesel	34-40 t	Euro V	1.2737E-03	3.9369E-04	3.6886E-04
R195	Diesel	34-40 t	Euro VI	3.6392E-04	1.0747E-04	1.0201E-04
R196	Diesel	40-50 t	Pre-Euro I	4.1808E-02	1.5945E-02	1.4382E-02
R197	Diesel	40-50 t	Euro I	4.3042E-02	1.8839E-02	1.7274E-02
R198	Diesel	40-50 t	Euro II	2.7174E-02	1.1290E-02	9.9722E-03
R199	Diesel	40-50 t	Euro III	2.4386E-02	9.2026E-03	8.1917E-03
R200	Diesel	40-50 t	Euro IV	1.2659E-03	3.8178E-04	3.6282E-04
R201	Diesel	40-50 t	Euro V	1.3135E-03	4.1156E-04	3.8634E-04
R202	Diesel	40-50 t	Euro VI	3.7549E-04	1.1267E-04	1.0710E-04

Table F14: 1,3-butadiene emission factors for buses and coaches.

Buses							Coaches						
Code	Fuel	Weight range	Emission standard	Urban/rural/motorway emission factors			Code	Fuel	Weight range	Emission standard	Urban/rural/motorway emission factors		
				Urban (g/km)	Rural (g/km)	M'way (g/km)					Urban (g/km)	Rural (g/km)	M'way (g/km)
R203	Diesel	<15 t	Pre-Euro I	2.5815E-02	1.1925E-02	3.3885E-02	**R224**	Diesel	15-18 t	Pre-Euro I	3.9606E-02	1.3806E-02	5.3252E-03
R204	Diesel	<15 t	Euro I	1.8501E-02	9.4400E-03	2.5865E-02	**R225**	Diesel	15-18 t	Euro I	4.1186E-02	1.6388E-02	1.0083E-02
R205	Diesel	<15 t	Euro II	1.2172E-02	6.0496E-03	1.7034E-02	**R226**	Diesel	15-18 t	Euro II	2.7229E-02	1.1132E-02	5.9130E-03
R206	Diesel	<15 t	Euro III	1.0680E-02	5.4000E-03	1.5550E-02	**R227**	Diesel	15-18 t	Euro III	2.5843E-02	1.0352E-02	7.0152E-03
R207	Diesel	<15 t	Euro IV	5.6767E-04	1.5670E-04	6.8816E-04	**R228**	Diesel	15-18 t	Euro IV	1.3830E-03	4.2327E-04	2.7448E-04
R208	Diesel	<15 t	Euro V	6.0430E-04	1.8493E-04	7.2683E-04	**R229**	Diesel	15-18 t	Euro V	1.4554E-03	4.6412E-04	3.0285E-04
R209	Diesel	<15 t	Euro VI	1.6918E-04	4.6742E-05	2.0615E-04	**R230**	Diesel	15-18 t	Euro VI	4.1679E-04	1.2796E-04	8.2810E-05
R210	Diesel	15-18 t	Pre-Euro I	6.6597E-02	2.6438E-02	5.6015E-02	**R231**	Diesel	>18 t	Pre-Euro I	4.4717E-02	1.6785E-02	9.8592E-03
R211	Diesel	15-18 t	Euro I	2.5996E-02	1.1750E-02	2.8512E-02	**R232**	Diesel	>18 t	Euro I	4.4936E-02	1.8830E-02	1.2624E-02
R212	Diesel	15-18 t	Euro II	1.7134E-02	7.7443E-03	2.1288E-02	**R233**	Diesel	>18 t	Euro II	2.9596E-02	1.2061E-02	8.1279E-03
R213	Diesel	15-18 t	Euro III	1.5080E-02	6.8226E-03	1.9243E-02	**R234**	Diesel	>18 t	Euro III	2.9254E-02	1.1096E-02	7.4049E-03
R214	Diesel	15-18 t	Euro IV	8.0221E-04	2.2410E-04	8.8254E-04	**R235**	Diesel	>18 t	Euro IV	1.5513E-03	4.5758E-04	2.9665E-04
R215	Diesel	15-18 t	Euro V	8.3999E-04	2.5118E-04	9.2527E-04	**R236**	Diesel	>18 t	Euro V	1.6222E-03	4.9702E-04	3.2550E-04
R216	Diesel	15-18 t	Euro VI	2.3775E-04	6.6015E-05	2.6388E-04	**R237**	Diesel	>18 t	Euro VI	4.6529E-04	1.3753E-04	8.9400E-05
R217	Diesel	>18 t	Pre-Euro I	7.0402E-02	2.7532E-02	5.7057E-02							
R218	Diesel	>18 t	Euro I	2.8705E-02	1.3282E-02	2.9979E-02							
R219	Diesel	>18 t	Euro II	1.8831E-02	8.6171E-03	2.2905E-02							
R220	Diesel	>18 t	Euro III	1.6352E-02	7.4375E-03	2.0436E-02							
R221	Diesel	>18 t	Euro IV	8.6390E-04	2.4912E-04	9.4145E-04							
R222	Diesel	>18 t	Euro V	9.0125E-04	2.7572E-04	9.7571E-04							
R223	Diesel	>18 t	Euro VI	2.5557E-04	7.3154E-05	2.7855E-04							

Table F15: Benzene emission factors for cars, LGV N1(I), LGV N1(II) and taxis.

Code	Fuel	Emission standard	Average speed functions $y = k \cdot (a + bx + cx^2 + dx^3 + ex^4 + fx^5 + gx^6) / x$ (y=EF in g/km; x=speed in km/h)										Urban/rural/motorway emission factors		
			Coefficients							Adjustment factor (k)	Valid speed range		Urban (g/km)	Rural (g/km)	Motorway (g/km)
			a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)			
U01	Petrol	Pre-Euro 1	-6.8394E-10	1.3534E-01	-5.1302E-03	1.0132E-04	-9.5072E-07	3.3969E-09	0	1	5	120	6.7874E-02	3.4188E-02	3.4410E-02
U02	Petrol	Euro 1	-1.2733E-10	5.0273E-02	-2.1798E-03	4.1366E-05	-3.5547E-07	1.1409E-09	0	2	5	120	1.9119E-02	6.7796E-03	4.8991E-03
U03	Petrol	Euro 2	-6.3665E-11	2.5136E-02	-1.0899E-03	2.0683E-05	-1.7774E-07	5.7046E-10	0	1	5	120	9.5597E-03	3.3898E-03	2.4495E-03
U04	Petrol	Euro 3	-3.6209E-11	2.6657E-03	-6.8547E-05	1.4239E-06	-2.0138E-08	1.0972E-10	0	1	5	120	1.7304E-03	8.3219E-04	2.2354E-03
U05	Petrol	Euro 4	-1.8105E-11	1.3329E-03	-3.4273E-05	7.1194E-07	-1.0069E-08	5.4861E-11	0	0.5	5	120	8.6522E-04	4.1609E-04	1.1177E-03
U06	Petrol	Euro 5	-1.8105E-11	1.3329E-03	-3.4273E-05	7.1194E-07	-1.0069E-08	5.4861E-11	0	0.5	5	120	4.3261E-04	2.0805E-04	5.5884E-04
U07	Petrol	Euro 6	-1.8105E-11	1.3329E-03	-3.4273E-05	7.1194E-07	-1.0069E-08	5.4861E-11	0	0.5	5	120	2.1631E-04	1.0402E-04	2.7942E-04
U08	Diesel	Pre-Euro 1	-2.2638E-11	1.5263E-02	-7.2486E-04	1.4672E-05	-1.3179E-07	4.3043E-10	0	2.5	5	120	5.6321E-03	1.6283E-03	8.6082E-04
U09	Diesel	Euro 1	-1.3607E-11	9.1577E-03	-4.3492E-04	8.8031E-06	-7.9077E-08	2.5826E-10	0	1.5	5	120	3.3793E-03	9.7700E-04	5.1649E-04
U10	Diesel	Euro 2	-9.0594E-12	6.1051E-03	-2.8994E-04	5.8688E-06	-5.2718E-08	1.7217E-10	0	1	5	120	2.2528E-03	6.5133E-04	3.4433E-04
U11	Diesel	Euro 3	-6.2954E-12	4.2736E-03	-2.0296E-04	4.1081E-06	-3.6902E-08	1.2052E-10	0	0.7	5	120	1.5770E-03	4.5593E-04	2.4103E-04
U12	Diesel	Euro 4	-3.4017E-12	2.2894E-03	-1.0873E-04	2.2008E-06	-1.9769E-08	6.4565E-11	0	0.375	5	120	8.4482E-04	2.4425E-04	1.2912E-04
U13	Diesel	Euro 5	-2.6006E-12	1.7552E-03	-8.3359E-05	1.6873E-06	-1.5156E-08	4.9500E-11	0	0.2875	5	120	6.4769E-04	1.8726E-04	9.8994E-05
U14	Diesel	Euro 6	-1.9238E-12	1.2973E-03	-6.1613E-05	1.2471E-06	-1.1203E-08	3.6587E-11	0	0.2125	5	120	4.7873E-04	1.3841E-04	7.3170E-05

Table F16: Benzene emission factors for LGV N1(III).

Code	Fuel	Emission standard	Average speed functions $y = k \cdot (a + bx + cx^2 + dx^3 + ex^4 + fx^5 + gx^6) / x$ (y=EF in g/km; x=speed in km/h)										Urban/rural/motorway emission factors		
			Coefficients							Adjustment factor (k)	Valid speed range		Urban (g/km)	Rural (g/km)	Motorway (g/km)
			a	b	c	d	e	f	g		Minimum (km/h)	Maximum (km/h)			
U21	Petrol	Pre-Euro 1	-6.8394E-10	1.3534E-01	-5.1302E-03	1.0132E-04	-9.5072E-07	3.3969E-09	0	1	5	120	6.7874E-02	3.4188E-02	3.4410E-02
U22	Petrol	Euro 1	-1.2733E-10	5.0273E-02	-2.1798E-03	4.1366E-05	-3.5547E-07	1.1409E-09	0	2	5	120	1.9119E-02	6.7796E-03	4.8991E-03
U23	Petrol	Euro 2	-6.3665E-11	2.5136E-02	-1.0899E-03	2.0683E-05	-1.7774E-07	5.7046E-10	0	1	5	120	9.5597E-03	3.3898E-03	2.4495E-03
U24	Petrol	Euro 3	-3.6209E-11	2.6657E-03	-6.8547E-05	1.4239E-06	-2.0138E-08	1.0972E-10	0	1	5	120	1.7304E-03	8.3219E-04	2.2354E-03
U25	Petrol	Euro 4	-1.8105E-11	1.3329E-03	-3.4273E-05	7.1194E-07	-1.0069E-08	5.4861E-11	0	0.5	5	120	8.6522E-04	4.1609E-04	1.1177E-03
U26	Petrol	Euro 5	-1.8105E-11	1.3329E-03	-3.4273E-05	7.1194E-07	-1.0069E-08	5.4861E-11	0	0.5	5	120	4.3261E-04	2.0805E-04	5.5884E-04
U27	Petrol	Euro 6	-1.8105E-11	1.3329E-03	-3.4273E-05	7.1194E-07	-1.0069E-08	5.4861E-11	0	0.5	5	120	2.1631E-04	1.0402E-04	2.7942E-04
U28	Diesel	Pre-Euro 1	2.9149E-02	-1.4666E-04	1.6458E-05	-3.9620E-07	5.6177E-09	-3.9563E-11	1.1766E-13	1.6667	5	120	2.2776E-03	6.7438E-04	6.3700E-04
U29	Diesel	Euro 1	2.4777E-02	-1.2466E-04	1.3989E-05	-3.3677E-07	4.7750E-09	-3.3628E-11	1.0001E-13	1.4167	5	120	1.9359E-03	5.7322E-04	5.4145E-04
U30	Diesel	Euro 2	1.7490E-02	-8.7997E-05	9.8748E-06	-2.3772E-07	3.3706E-09	-2.3738E-11	7.0595E-14	1	5	120	1.3665E-03	4.0463E-04	3.8220E-04
U31	Diesel	Euro 3	2.2919E-02	-6.2490E-04	1.4228E-05	-2.0376E-07	1.8575E-09	-9.4099E-12	1.9957E-14	1	5	120	1.2594E-03	1.3406E-04	1.2313E-04
U32	Diesel	Euro 4	2.0054E-02	-5.4679E-04	1.2449E-05	-1.7829E-07	1.6253E-09	-8.2336E-12	1.7463E-14	0.875	5	120	1.1019E-03	1.1730E-04	1.0774E-04
U33	Diesel	Euro 5	2.0054E-02	-5.4679E-04	1.2449E-05	-1.7829E-07	1.6253E-09	-8.2336E-12	1.7463E-14	0.875	5	120	1.1019E-03	1.1730E-04	1.0774E-04
U34	Diesel	Euro 6	2.5784E-02	-7.0301E-04	1.6006E-05	-2.2923E-07	2.0897E-09	-1.0586E-11	2.2452E-14	1.125	5	120	1.4168E-03	1.5082E-04	1.3853E-04

Table F17: Benzene emission factors for heavy-duty vehicles (all diesel).

Code	Type	Emission standard	Urban/rural/motorway emission factors		
			Urban (g/km)	Rural (g/km)	Motorway (g/km)
U35	Rigid HGV	Pre-Euro I	1.7423E-02	2.1322E-02	2.4414E-02
U36	Rigid HGV	Euro I	5.9799E-03	3.6268E-03	2.1870E-03
U37	Rigid HGV	Euro II	4.0788E-03	1.7421E-03	1.6138E-03
U38	Rigid HGV	Euro III	7.5752E-03	3.2093E-03	3.6792E-03
U39	Rigid HGV	Euro IV	5.3027E-03	2.2465E-03	2.5754E-03
U40	Rigid HGV	Euro V	4.7724E-03	2.0219E-03	2.3179E-03
U41	Rigid HGV	Euro VI	1.4317E-03	6.0656E-04	6.9536E-04
U42	Artic HGV	Pre-Euro I	1.7423E-02	2.1322E-02	2.4414E-02
U43	Artic HGV	Euro I	5.9799E-03	3.6268E-03	2.1870E-03
U44	Artic HGV	Euro II	4.0788E-03	1.7421E-03	1.6138E-03
U45	Artic HGV	Euro III	7.5752E-03	3.2093E-03	3.6792E-03
U46	Artic HGV	Euro IV	5.3027E-03	2.2465E-03	2.5754E-03
U47	Artic HGV	Euro V	4.7724E-03	2.0219E-03	2.3179E-03
U48	Artic HGV	Euro VI	1.4317E-03	6.0656E-04	6.9536E-04
U49	Bus/coach	Pre-Euro I	1.0998E-02	1.0998E-02	1.0998E-02
U50	Bus/coach	Euro I	6.2686E-03	6.2686E-03	6.2686E-03
U51	Bus/coach	Euro II	1.2170E-02	6.5540E-03	6.0065E-03
U52	Bus/coach	Euro III	1.8231E-02	9.4043E-03	8.4436E-03
U53	Bus/coach	Euro IV	9.1155E-03	4.7021E-03	4.2218E-03
U54	Bus/coach	Euro V	8.2040E-03	4.2319E-03	3.7996E-03
U55	Bus/coach	Euro VI	2.4612E-03	1.2696E-03	1.1399E-03

Table F18: Nitrous oxide and ammonia emission factors for cars, LGV N1(I), LGV N1(II) and taxis.

Code	Fuel	Emission standard	N_2O			NH_3		
			Urban (g/km)	Rural (g/km)	Motorway (g/km)	Urban (g/km)	Rural (g/km)	Motorway (g/km)
U01	Petrol	Pre-Euro 1	0.0100	0.0065	0.0065	0.00200	0.00200	0.00200
U02	Petrol	Euro 1	0.0232	0.0092	0.0047	0.07000	0.13100	0.07330
U03	Petrol	Euro 2	0.0111	0.0040	0.0022	0.14300	0.14800	0.08330
U04	Petrol	Euro 3	0.0013	0.0003	0.0002	0.00190	0.02950	0.06460
U05	Petrol	Euro 4	0.0019	0.0003	0.0002	0.00190	0.02950	0.06460
U06	Petrol	Euro 5	0.0019	0.0003	0.0002	0.00190	0.02950	0.06460
U07	Petrol	Euro 6	0.0019	0.0003	0.0002	0.00190	0.02950	0.06460
U08	Diesel	Pre-Euro 1	0	0	0	0.00100	0.00100	0.00100
U09	Diesel	Euro 1	0.0020	0.0040	0.0040	0.00100	0.00100	0.00100
U10	Diesel	Euro 2	0.0040	0.0060	0.0060	0.00100	0.00100	0.00100
U11	Diesel	Euro 3	0.0090	0.0040	0.0040	0.00100	0.00100	0.00100
U12	Diesel	Euro 4	0.0090	0.0040	0.0040	0.00100	0.00100	0.00100
U13	Diesel	Euro 5	0.0090	0.0040	0.0040	0.00100	0.00100	0.00100
U14	Diesel	Euro 6	0.0090	0.0040	0.0040	0.00100	0.00100	0.00100
U15	LPG	Euro 1	0.0210	0.0130	0.0080	No data		
U16	LPG	Euro 2	0.0130	0.0030	0.0020	No data		
U17	LPG	Euro 3	0.0050	0.0020	0.0010	No data		
U18	LPG	Euro 4	0.0050	0.0020	0.0010	No data		
U19	LPG	Euro 5	0.0050	0.0020	0.0010	No data		
U20	LPG	Euro 6	0.0050	0.0020	0.0010	No data		

Table F19: Nitrous oxide and ammonia emission factors for LGV N1(III).

Code	Fuel	Emission standard	N_2O			NH_3		
			Urban (g/km)	Rural (g/km)	Motorway (g/km)	Urban (g/km)	Rural (g/km)	Motorway (g/km)
U21	Petrol	Pre-Euro 1	0.0100	0.0065	0.0065	0.002	0.002	0.0020
U22	Petrol	Euro 1	0.0415	0.0185	0.0094	0.070	0.131	0.0733
U23	Petrol	Euro 2	0.0239	0.0122	0.0077	0.1430	0.1480	0.0833
U24	Petrol	Euro 3	0.0074	0.0014	0.0014	0.0019	0.0295	0.0646
U25	Petrol	Euro 4	0.0012	0.0003	0.0003	0.0019	0.0295	0.0646
U26	Petrol	Euro 5	0.0012	0.0003	0.0003	0.0019	0.0295	0.0646
U27	Petrol	Euro 6	0.0012	0.0003	0.0003	0.0019	0.0295	0.0646
U28	Diesel	Pre-Euro 1	0.0000	0.0000	0.0000	0.001	0.001	0.001
U29	Diesel	Euro 1	0.0020	0.0040	0.0040	0.001	0.001	0.001
U30	Diesel	Euro 2	0.0040	0.0060	0.0060	0.001	0.001	0.001
U31	Diesel	Euro 3	0.0090	0.0040	0.0040	0.001	0.001	0.001
U32	Diesel	Euro 4	0.0090	0.0040	0.0040	0.001	0.001	0.001
U33	Diesel	Euro 5	0.0090	0.0040	0.0040	0.001	0.001	0.001
U34	Diesel	Euro 6	0.0090	0.0040	0.0040	0.001	0.001	0.001

Table F20: Nitrous oxide and ammonia emission factors for heavy-duty vehicles (all diesel).

Code	Type	Emission standard	N_2O			NH_3		
			Urban (g/km)	Rural (g/km)	Motorway (g/km)	Urban (g/km)	Rural (g/km)	Motorway (g/km)
U35	Rigid HGV	Pre-Euro I	0.03	0.03	0.03	0.003	0.003	0.003
U36	Rigid HGV	Euro I	0.03	0.03	0.03	0.003	0.003	0.003
U37	Rigid HGV	Euro II	0.03	0.03	0.03	0.003	0.003	0.003
U38	Rigid HGV	Euro III	0.03	0.03	0.03	0.003	0.003	0.003
U39	Rigid HGV	Euro IV	0.03	0.03	0.03	0.003	0.003	0.003
U40	Rigid HGV	Euro V	0.03	0.03	0.03	0.003	0.003	0.003
U41	Rigid HGV	Euro VI	0.03	0.03	0.03	0.003	0.003	0.003
U42	Artic HGV	Pre-Euro I	0.03	0.03	0.03	0.003	0.003	0.003
U43	Artic HGV	Euro I	0.03	0.03	0.03	0.003	0.003	0.003
U44	Artic HGV	Euro II	0.03	0.03	0.03	0.003	0.003	0.003
U45	Artic HGV	Euro III	0.03	0.03	0.03	0.003	0.003	0.003
U46	Artic HGV	Euro IV	0.03	0.03	0.03	0.003	0.003	0.003
U47	Artic HGV	Euro V	0.03	0.03	0.03	0.003	0.003	0.003
U48	Artic HGV	Euro VI	0.03	0.03	0.03	0.003	0.003	0.003
U49	Bus/coach	Pre-Euro I	0.03	0.03	0.03	0.003	0.003	0.003
U50	Bus/coach	Euro I	0.03	0.03	0.03	0.003	0.003	0.003
U51	Bus/coach	Euro II	0.03	0.03	0.03	0.003	0.003	0.003
U52	Bus/coach	Euro III	0.03	0.03	0.03	0.003	0.003	0.003
U53	Bus/coach	Euro IV	0.03	0.03	0.03	0.003	0.003	0.003
U54	Bus/coach	Euro V	0.03	0.03	0.03	0.003	0.003	0.003
U55	Bus/coach	Euro VI	0.03	0.03	0.03	0.003	0.003	0.003

Table F21: Nitrous oxide and ammonia emission factors for two-wheel vehicles (all petrol).

Code	Engine capacity (cc) and type.	Emission standard	N_2O			NH_3		
			Urban (g/km)	Rural (g/km)	Motorway (g/km)	Urban (g/km)	Rural (g/km)	Motorway (g/km)
U56	<50	Pre-Euro 1	0.001	0.001	0.001	0.001	0.001	0.001
U57	<50	Euro 1	0.001	0.001	0.001	0.001	0.001	0.001
U58	<50	Euro 2	0.001	0.001	0.001	0.001	0.001	0.001
U59	<50	Euro 3	0.001	0.001	0.001	0.001	0.001	0.001
U60	>50 2-stroke	Pre-Euro 1	0.002	0.002	0.002	0.002	0.002	0.002
U61	>50 2-stroke	Euro 1	0.002	0.002	0.002	0.002	0.002	0.002
U62	>50 2-stroke	Euro 2	0.002	0.002	0.002	0.002	0.002	0.002
U63	>50 2-stroke	Euro 3	0.002	0.002	0.002	0.002	0.002	0.002
U64	<250 4-stroke	Pre-Euro 1	0.002	0.002	0.002	0.002	0.002	0.002
U65	<250 4-stroke	Euro 1	0.002	0.002	0.002	0.002	0.002	0.002
U66	<250 4-stroke	Euro 2	0.002	0.002	0.002	0.002	0.002	0.002
U67	<250 4-stroke	Euro 3	0.002	0.002	0.002	0.002	0.002	0.002
U68	250-750 4-stroke	Pre-Euro 1	0.002	0.002	0.002	0.002	0.002	0.002
U69	250-750 4-stroke	Euro 1	0.002	0.002	0.002	0.002	0.002	0.002
U70	250-750 4-stroke	Euro 2	0.002	0.002	0.002	0.002	0.002	0.002
U71	250-750 4-stroke	Euro 3	0.002	0.002	0.002	0.002	0.002	0.002
U72	>750 4-stroke	Pre-Euro 1	0.002	0.002	0.002	0.002	0.002	0.002
U73	>750 4-stroke	Euro 1	0.002	0.002	0.002	0.002	0.002	0.002
U74	>750 4-stroke	Euro 2	0.002	0.002	0.002	0.002	0.002	0.002
U75	>750 4-stroke	Euro 3	0.002	0.002	0.002	0.002	0.002	0.002

Table F22: PAH emission factors for cars, LGV N1(I), LGV N1(II) and taxis.

Code	Fuel	Emission standard	PAH emission factor (g/km)																		
			Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(ghi)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3cd)pyrene	1-Methylnaphthalene	2-Methylnaphthalene	Napthalene	Phenanthrene	Perylene	Pyrene
U01	Petrol	Pre-Euro 1	4.60E-05	5.25E-04	5.46E-05	2.04E-05	2.30E-05	2.51E-07	2.48E-07	1.03E-04	1.84E-05	2.63E-06	1.17E-04	3.06E-04	2.80E-05	1.15E-04	6.10E-05	1.48E-03	2.25E-04	3.59E-06	1.93E-04
U02	Petrol	Euro 1	6.85E-06	3.52E-05	2.07E-06	4.61E-07	9.14E-07	1.26E-07	1.24E-07	1.09E-06	1.69E-06	5.28E-07	3.58E-06	8.69E-06	9.25E-07	5.75E-05	3.05E-05	2.47E-04	1.97E-05	4.89E-06	2.90E-06
U03	Petrol	Euro 2	3.40E-06	5.88E-05	3.48E-06	6.90E-07	2.17E-06	1.56E-07	6.32E-08	1.52E-06	8.31E-07	2.47E-07	3.37E-06	1.92E-05	1.39E-06	1.91E-06	1.21E-06	8.61E-05	1.70E-05	3.20E-07	4.21E-06
U04	Petrol	Euro 3	5.10E-06	2.02E-05	6.60E-06	6.27E-07	5.71E-07	1.83E-07	2.20E-04	7.62E-07	7.08E-05	2.32E-07	6.07E-06	5.72E-06	5.85E-07	4.09E-06	2.98E-06	3.24E-04	2.02E-05	3.01E-06	6.02E-06
U05	Petrol	Euro 4	2.55E-06	1.01E-05	3.30E-06	3.13E-07	2.85E-07	9.16E-08	1.10E-04	3.81E-07	3.54E-05	1.16E-07	3.03E-06	2.86E-06	2.92E-07	2.05E-06	1.49E-06	1.62E-04	1.01E-05	1.50E-06	3.01E-06
U06	Petrol	Euro 5	1.28E-06	5.05E-06	1.65E-06	1.57E-07	1.43E-07	4.58E-08	5.50E-05	1.91E-07	1.77E-05	5.81E-08	1.52E-06	1.43E-06	1.46E-07	1.02E-06	7.45E-07	8.10E-05	5.04E-06	7.52E-07	1.50E-06
U07	Petrol	Euro 6	6.38E-07	2.53E-06	8.25E-07	7.84E-08	7.13E-08	2.29E-08	2.75E-05	9.53E-08	8.85E-06	2.90E-08	7.58E-07	7.14E-07	7.31E-08	5.12E-07	3.73E-07	4.05E-05	2.52E-06	3.76E-07	7.52E-07
U08	Diesel	Pre-Euro 1	1.51E-06	7.64E-05	6.47E-07	9.50E-07	3.64E-07	3.59E-07	1.33E-07	4.15E-07	7.13E-07	6.58E-08	3.29E-06	2.49E-06	3.47E-07	2.34E-04	3.19E-04	4.31E-05	9.81E-06	4.97E-06	4.11E-06
U09	Diesel	Euro 1	6.46E-07	2.59E-05	1.59E-07	2.09E-07	4.51E-08	7.32E-08	2.13E-08	1.99E-08	1.92E-07	1.07E-08	1.18E-06	7.45E-07	1.72E-07	1.40E-04	1.91E-04	2.85E-04	4.37E-06	2.98E-06	9.62E-07
U10	Diesel	Euro 2	1.79E-06	1.73E-05	1.55E-06	2.41E-07	9.51E-07	7.22E-08	2.01E-08	2.06E-07	5.66E-07	2.49E-07	3.48E-06	4.46E-06	1.14E-07	1.27E-03	1.17E-04	1.17E-04	2.21E-05	1.99E-06	3.07E-06
U11	Diesel	Euro 3	9.68E-06	1.03E-05	2.32E-06	1.04E-06	6.34E-07	1.65E-06	1.64E-07	5.44E-07	1.45E-06	1.37E-07	4.47E-06	7.82E-06	4.46E-07	5.74E-06	7.47E-06	6.62E-05	1.42E-05	7.87E-07	4.28E-06
U12	Diesel	Euro 4	1.80E-05	1.41E-06	2.69E-05	8.68E-07	1.59E-06	2.69E-05	1.37E-07	4.84E-07	1.21E-06	1.15E-07	4.45E-06	1.94E-05	3.72E-07	5.49E-05	8.60E-05	1.19E-04	1.82E-05	6.56E-07	3.56E-06
U13	Diesel	Euro 5	1.80E-05	1.41E-06	2.69E-05	8.68E-07	1.59E-06	2.69E-05	1.37E-07	4.84E-07	1.21E-06	1.15E-07	4.45E-06	1.94E-05	3.72E-07	5.49E-05	8.60E-05	1.19E-04	1.82E-05	6.56E-07	3.56E-06
U14	Diesel	Euro 6	3.25E-05	2.53E-06	4.84E-05	1.56E-06	2.85E-06	4.85E-05	2.46E-07	8.71E-07	2.18E-06	2.06E-07	8.02E-06	3.49E-05	6.69E-07	9.88E-05	1.55E-04	2.15E-04	3.27E-05	1.18E-06	6.41E-06
U15	LPG	Euro 1	2.02E-05	1.55E-05	2.98E-05	2.71E-06	6.44E-06	2.66E-05	No data	3.63E-06	6.77E-06	No data	8.53E-06	3.12E-05	3.49E-06	8.10E-05	1.33E-04	2.18E-04	2.30E-05	No data	1.17E-06
U16	LPG	Euro 2	2.02E-05	1.55E-05	2.98E-05	2.71E-06	6.44E-06	2.66E-05	No data	3.63E-06	6.77E-06	No data	8.53E-06	3.12E-05	3.49E-06	8.10E-05	1.33E-04	2.18E-04	2.30E-05	No data	1.17E-06
U17	LPG	Euro 3	2.02E-05	1.55E-05	2.98E-05	2.71E-06	6.44E-06	2.66E-05	No data	3.63E-06	6.77E-06	No data	8.53E-06	3.12E-05	3.49E-06	8.10E-05	1.33E-04	2.18E-04	2.30E-05	No data	1.17E-06
U18	LPG	Euro 4	2.02E-05	1.55E-05	2.98E-05	2.71E-06	6.44E-06	2.66E-05	No data	3.63E-06	6.77E-06	No data	8.53E-06	3.12E-05	3.49E-06	8.10E-05	1.33E-04	2.18E-04	2.30E-05	No data	1.17E-06
U19	LPG	Euro 5	2.02E-05	1.55E-05	2.98E-05	2.71E-06	6.44E-06	2.66E-05	No data	3.63E-06	6.77E-06	No data	8.53E-06	3.12E-05	3.49E-06	8.10E-05	1.33E-04	2.18E-04	2.30E-05	No data	1.17E-06
U20	LPG	Euro 6	2.02E-05	1.55E-05	2.98E-05	2.71E-06	6.44E-06	2.66E-05	No data	3.63E-06	6.77E-06	No data	8.53E-06	3.12E-05	3.49E-06	8.10E-05	1.33E-04	2.18E-04	2.30E-05	No data	1.17E-06

Table F23: PAH emission factors for LGV N1(III).

Code	Fuel	Emission standard	PAH emission factor (g/km)																		
			Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(ghi)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3cd)pyrene	1-Methylnaphthalene	2-Methylnaphthalene	Napthalene	Phenanthrene	Perylene	Pyrene
U21	Petrol	Pre-Euro 1	4.60E-05	5.25E-04	5.46E-05	2.04E-05	2.30E-05	2.51E-07	2.48E-07	1.03E-04	1.84E-05	2.63E-06	1.17E-04	3.06E-04	2.80E-05	1.15E-04	6.10E-05	1.48E-03	2.25E-04	3.59E-06	1.93E-04
U22	Petrol	Euro 1	6.85E-06	3.52E-05	2.07E-06	4.61E-07	9.14E-07	1.26E-07	1.24E-07	1.09E-06	1.69E-06	5.28E-07	3.58E-06	8.69E-06	9.25E-07	5.75E-05	3.05E-05	2.47E-04	1.97E-05	4.89E-06	2.90E-06
U23	Petrol	Euro 2	3.40E-06	5.88E-05	3.48E-06	6.90E-07	2.17E-06	1.56E-07	6.32E-08	1.52E-06	8.31E-07	2.47E-07	3.37E-06	1.92E-05	1.39E-06	1.91E-06	1.21E-06	8.61E-05	1.70E-05	3.20E-07	4.21E-06
U24	Petrol	Euro 3	5.10E-06	2.02E-05	6.60E-06	6.27E-07	5.71E-07	1.83E-07	2.20E-04	7.62E-07	7.08E-05	2.32E-07	6.07E-06	5.72E-06	5.85E-07	4.09E-06	2.98E-06	3.24E-04	2.02E-05	3.01E-06	6.02E-06
U25	Petrol	Euro 4	2.55E-06	1.01E-05	3.30E-06	3.13E-07	2.85E-07	9.16E-08	1.10E-04	3.81E-07	3.54E-05	1.16E-07	3.03E-06	2.86E-06	2.92E-07	2.05E-06	1.49E-06	1.62E-04	1.01E-05	1.50E-06	3.01E-06
U26	Petrol	Euro 5	1.28E-06	5.05E-06	1.65E-06	1.57E-07	1.43E-07	4.58E-08	5.50E-05	1.91E-07	1.77E-05	5.81E-08	1.52E-06	1.43E-06	1.46E-07	1.02E-06	7.45E-07	8.10E-05	5.04E-06	7.52E-07	1.50E-06
U27	Petrol	Euro 6	6.38E-07	2.53E-06	8.25E-07	7.84E-08	7.13E-08	2.29E-08	2.75E-05	9.53E-08	8.85E-06	2.90E-08	7.58E-07	7.14E-07	7.31E-08	5.12E-07	3.73E-07	4.05E-05	2.52E-06	3.76E-07	7.52E-07
U28	Diesel	Pre-Euro 1	7.40E-06	3.91E-05	1.49E-05	1.65E-06	5.73E-07	6.08E-07	1.33E-07	4.95E-07	2.39E-06	7.70E-07	3.34E-05	2.94E-05	2.60E-07	2.82E-04	3.81E-04	1.20E-03	1.68E-04	4.97E-06	1.85E-05
U29	Diesel	Euro 1	6.29E-06	3.33E-05	1.27E-05	1.40E-06	4.87E-07	5.16E-07	2.13E-08	4.21E-07	2.03E-06	6.54E-07	2.84E-05	2.50E-05	2.21E-07	2.39E-04	3.24E-04	1.34E-03	1.43E-04	2.98E-06	1.57E-05
U30	Diesel	Euro 2	4.44E-06	2.35E-05	8.96E-06	9.90E-07	3.44E-07	3.65E-07	2.01E-08	2.97E-07	1.43E-06	4.62E-07	2.00E-05	1.76E-05	1.56E-07	1.69E-04	2.29E-04	5.22E-04	1.01E-04	1.99E-06	1.11E-05
U31	Diesel	Euro 3	2.25E-06	7.60E-06	4.54E-06	2.94E-07	2.75E-07	5.15E-07	1.64E-07	1.69E-07	3.90E-07	3.60E-07	7.31E-06	7.59E-06	8.04E-08	9.58E-05	1.44E-04	2.26E-04	5.79E-05	7.87E-07	4.71E-06
U32	Diesel	Euro 4	1.96E-06	6.65E-06	3.97E-06	2.57E-07	2.40E-07	4.51E-07	1.37E-07	1.48E-07	3.41E-07	3.15E-07	6.39E-06	6.64E-06	7.03E-08	8.38E-05	1.26E-04	1.98E-04	5.07E-05	6.56E-07	4.12E-06
U33	Diesel	Euro 5	1.72E-06	5.82E-06	3.48E-06	2.25E-07	2.10E-07	3.94E-07	1.37E-07	1.29E-07	2.99E-07	2.76E-07	5.59E-06	5.81E-06	6.16E-08	7.33E-05	1.11E-04	1.73E-04	4.43E-05	6.56E-07	3.61E-06
U34	Diesel	Euro 6	1.50E-06	5.09E-06	3.04E-06	1.97E-07	1.84E-07	3.45E-07	2.46E-07	1.13E-07	2.61E-07	2.41E-07	4.89E-06	5.08E-06	5.39E-08	6.42E-05	9.67E-05	1.51E-04	3.88E-05	1.18E-06	3.16E-06

Table F24: PAH emission factors for heavy-duty vehicles (all diesel).

Code	Type	Emission standard	PAH emission factor (g/km)																		
			Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(ghi)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3cd)pyrene	1-Methylnaphthalene	2-Methylnaphthalene	Napthalene	Phenanthrene	Perylene	Pyrene
U35	Rigid HGV	Pre-Euro I	3.02E-04	1.98E-04	8.65E-06	2.39E-06	9.00E-07	5.45E-06	6.09E-06	7.70E-07	1.62E-05	3.40E-07	2.14E-05	4.00E-05	1.40E-06	1.50E-03	1.49E-03	5.67E-05	2.30E-05	2.00E-07	3.16E-05
U36	Rigid HGV	Euro I	1.38E-04	9.08E-05	8.65E-06	2.39E-06	9.00E-07	5.45E-06	6.09E-06	7.70E-07	1.62E-05	3.40E-07	2.14E-05	4.00E-05	1.40E-06	6.90E-04	6.82E-04	5.67E-05	2.30E-05	2.00E-07	3.16E-05
U37	Rigid HGV	Euro II	1.38E-04	9.08E-05	6.71E-05	1.57E-05	1.20E-05	1.60E-05	6.09E-06	1.07E-05	2.39E-05	6.30E-06	1.73E-05	1.38E-04	7.64E-06	6.90E-04	6.82E-04	9.12E-04	1.09E-04	2.00E-07	8.49E-06
U38	Rigid HGV	Euro III	2.13E-04	1.31E-04	2.58E-04	1.19E-05	2.54E-05	2.98E-05	6.09E-06	2.69E-05	1.88E-05	1.25E-05	4.76E-05	1.78E-04	1.85E-05	8.94E-04	1.11E-03	1.18E-03	2.55E-04	2.00E-07	2.01E-05
U39	Rigid HGV	Euro IV	1.48E-04	9.16E-05	1.80E-04	8.30E-06	1.77E-05	2.08E-05	4.24E-06	1.88E-05	1.31E-05	8.73E-06	3.32E-05	1.24E-04	1.29E-05	6.23E-04	7.74E-04	8.24E-04	1.78E-04	1.39E-07	1.40E-05
U40	Rigid HGV	Euro V	1.48E-04	9.16E-05	1.80E-04	8.30E-06	1.77E-05	2.08E-05	4.24E-06	1.88E-05	1.31E-05	8.73E-06	3.32E-05	1.24E-04	1.29E-05	6.23E-04	7.74E-04	8.24E-04	1.78E-04	1.39E-07	1.40E-05
U41	Rigid HGV	Euro VI	4.19E-05	2.59E-05	5.09E-05	2.34E-06	5.00E-06	5.87E-06	1.20E-06	5.30E-06	3.70E-06	2.47E-06	9.37E-06	3.51E-05	3.64E-06	1.76E-04	2.19E-04	2.33E-04	5.03E-05	3.94E-08	3.96E-06
U42	Artic HGV	Pre-Euro I	3.02E-04	1.98E-04	8.65E-06	2.39E-06	9.00E-07	5.45E-06	6.09E-06	7.70E-07	1.62E-05	3.40E-07	2.14E-05	4.00E-05	1.40E-06	1.50E-03	1.49E-03	5.67E-05	2.30E-05	2.00E-07	3.16E-05
U43	Artic HGV	Euro I	1.38E-04	9.08E-05	8.65E-06	2.39E-06	9.00E-07	5.45E-06	6.09E-06	7.70E-07	1.62E-05	3.40E-07	2.14E-05	4.00E-05	1.40E-06	6.90E-04	6.82E-04	5.67E-05	2.30E-05	2.00E-07	3.16E-05
U44	Artic HGV	Euro II	1.38E-04	9.08E-05	6.71E-05	1.57E-05	1.20E-05	1.60E-05	6.09E-06	1.07E-05	2.39E-05	6.30E-06	1.73E-05	1.38E-04	7.64E-06	6.90E-04	6.82E-04	9.12E-04	1.09E-04	2.00E-07	8.49E-06
U45	Artic HGV	Euro III	2.13E-04	1.31E-04	2.58E-04	1.19E-05	2.54E-05	2.98E-05	6.09E-06	2.69E-05	1.88E-05	1.25E-05	4.76E-05	1.78E-04	1.85E-05	8.94E-04	1.11E-03	1.18E-03	2.55E-04	2.00E-07	2.01E-05
U46	Artic HGV	Euro IV	1.48E-04	9.16E-05	1.80E-04	8.30E-06	1.77E-05	2.08E-05	4.24E-06	1.88E-05	1.31E-05	8.73E-06	3.32E-05	1.24E-04	1.29E-05	6.23E-04	7.74E-04	8.24E-04	1.78E-04	1.39E-07	1.40E-05
U47	Artic HGV	Euro V	1.48E-04	9.16E-05	1.80E-04	8.30E-06	1.77E-05	2.08E-05	4.24E-06	1.88E-05	1.31E-05	8.73E-06	3.32E-05	1.24E-04	1.29E-05	6.23E-04	7.74E-04	8.24E-04	1.78E-04	1.39E-07	1.40E-05
U48	Artic HGV	Euro VI	4.19E-05	2.59E-05	5.09E-05	2.34E-06	5.00E-06	5.87E-06	1.20E-06	5.30E-06	3.70E-06	2.47E-06	9.37E-06	3.51E-05	3.64E-06	1.76E-04	2.19E-04	2.33E-04	5.03E-05	3.94E-08	3.96E-06
U49	Bus/coach	Pre-Euro I	3.02E-04	1.98E-04	8.65E-06	2.39E-06	9.00E-07	5.45E-06	6.09E-06	7.70E-07	1.62E-05	3.40E-07	2.14E-05	4.00E-05	1.40E-06	1.50E-03	1.49E-03	5.67E-05	2.30E-05	2.00E-07	3.16E-05
U50	Bus/coach	Euro I	1.38E-04	9.08E-05	8.65E-06	2.39E-06	9.00E-07	5.45E-06	6.09E-06	7.70E-07	1.62E-05	3.40E-07	2.14E-05	4.00E-05	1.40E-06	6.90E-04	6.82E-04	5.67E-05	2.30E-05	2.00E-07	3.16E-05
U51	Bus/coach	Euro II	1.38E-04	9.08E-05	6.71E-05	1.57E-05	1.20E-05	1.60E-05	6.09E-06	1.07E-05	2.39E-05	6.30E-06	1.73E-05	1.38E-04	7.64E-06	6.90E-04	6.82E-04	9.12E-04	1.09E-04	2.00E-07	8.49E-06
U52	Bus/coach	Euro III	2.13E-04	1.31E-04	2.58E-04	1.19E-05	2.54E-05	2.98E-05	6.09E-06	2.69E-05	1.88E-05	1.25E-05	4.76E-05	1.78E-04	1.85E-05	8.94E-04	1.11E-03	1.18E-03	2.55E-04	2.00E-07	2.01E-05
U53	Bus/coach	Euro IV	1.48E-04	9.16E-05	1.80E-04	8.30E-06	1.77E-05	2.08E-05	4.24E-06	1.88E-05	1.31E-05	8.73E-06	3.32E-05	1.24E-04	1.29E-05	6.23E-04	7.74E-04	8.24E-04	1.78E-04	1.39E-07	1.40E-05
U54	Bus/coach	Euro V	1.48E-04	9.16E-05	1.80E-04	8.30E-06	1.77E-05	2.08E-05	4.24E-06	1.88E-05	1.31E-05	8.73E-06	3.32E-05	1.24E-04	1.29E-05	6.23E-04	7.74E-04	8.24E-04	1.78E-04	1.39E-07	1.40E-05
U55	Bus/coach	Euro VI	4.19E-05	2.59E-05	5.09E-05	2.34E-06	5.00E-06	5.87E-06	1.20E-06	5.30E-06	3.70E-06	2.47E-06	9.37E-06	3.51E-05	3.64E-06	1.76E-04	2.19E-04	2.33E-04	5.03E-05	3.94E-08	3.96E-06

Table F25: NO_2 proportions of NO_x, adaped from COPERT 4.

Vehicle type	Fuel type	Emission standard	NO_2 percentage of NO_x (%)	Vehicle type	Fuel type	Emission standard	NO_2 percentage of NO_x (%)
Car (all)+LGV N1(I)+LGV N1(II) +taxi	Petrol	Pre-Euro 1	4	HGV - rigid	Diesel	Pre-Euro	11
	Petrol	Euro 1	4		Diesel	Euro I	11
	Petrol	Euro 2	4		Diesel	Euro II	11
	Petrol	Euro 3	3		Diesel	Euro III[a]	14
	Petrol	Euro 4	3		Diesel	Euro IV	14
	Petrol	Euro 5	3		Diesel	Euro V	10
	Petrol	Euro 6	2		Diesel	Euro VI	10
	Diesel	Pre-Euro 1	11	HGV - artic	Diesel	Pre-Euro	11
	Diesel	Euro 1	11		Diesel	Euro I	11
	Diesel	Euro 2	11		Diesel	Euro II	11
	Diesel	Euro 3	25		Diesel	Euro III[a]	14
	Diesel	Euro 4	55		Diesel	Euro IV	14
	Diesel	Euro 5	5-70		Diesel	Euro V	10
	Diesel	Euro 6	5-70		Diesel	Euro VI	10
	LPG	Euro 1	5	Buses and coaches	Diesel	Pre-Euro	11
	LPG	Euro 2	5		Diesel	Euro I	11
	LPG	Euro 3	5		Diesel	Euro II	11
	LPG	Euro 4	5		Diesel	Euro III[a]	14
	LPG	Euro 5	5		Diesel	Euro IV	14
	LPG	Euro 6	5		Diesel	Euro V	10
LGV N1(III)	Petrol	Pre-Euro 1	4		Diesel	Euro VI	10
	Petrol	Euro 1	4				
	Petrol	Euro 2	4				
	Petrol	Euro 3	3				
	Petrol	Euro 4	3				
	Petrol	Euro 5	3				
	Petrol	Euro 6	2				
	Diesel	Pre-Euro 1	11				
	Diesel	Euro 1	11				
	Diesel	Euro 2	11				
	Diesel	Euro 3	25				
	Diesel	Euro 4	55				
	Diesel	Euro 5	5-70				
	Diesel	Euro 6	5-70				

[a] Euro III+catalysed DPF = 35%

Table F26: Proportions of PM_{10}, $PM_{2.5}$ and PM_1 in total PM for Euro 2 and Euro 3 petrol and diesel cars/LGVs.

	$\%PM_{10}$	$\%PM_{2.5}$	$\%PM_1$
Petrol car/LGV	92	68	57
Diesel car/LGV	98	88	81

Emission factors 2009: Report 3 – exhaust emission factors for road vehicles in the United Kingdom

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 describes the development of new exhaust emission factors. Emission data for light-duty vehicles (LDVs) and heavy-duty vehicles (HDVs) from various European test programmes were collected. The methods used for determining emission factors are described in detail. Separate databases were compiled for LDVs and HDVs, and in each case for regulated and unregulated pollutants. For LDVs, the emission factors for regulated pollutants were developed from the relevant databases for vehicles complying with pre-Euro 1 to Euro 6 emission standards. For HDVs, the emission factors for regulated pollutants were not calculated from the corresponding database; in order to provide greater flexibility they were based upon the average-speed functions from the European ARTEMIS project. The emission factors for HDVs covered the pre-Euro I to Euro VI emission standards. For petrol and diesel cars the CO_2 emission functions were derived from the type approval data for new cars. The emission factors for mopeds were taken from the COPERT 4 model, and those for motorcycles were taken from ARTEMIS. The unregulated pollutants considered were methane, 1,3-butadiene, benzene, nitrous oxide, ammonia, polycyclic aromatic hydrocarbons, nitrogen dioxide and particle size fractions. The emission factors for these pollutants were based upon a combination of the relevant databases and the literature.

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TRL
Crowthorne House, Nine Mile Ride
Wokingham, Berkshire RG40 3GA
United Kingdom
T: +44 (0) 1344 773131
F: +44 (0) 1344 770356
E: enquiries@trl.co.uk
W: www.trl.co.uk

Published by

IHS
Willoughby Road, Bracknell
Berkshire RG12 8FB
United Kingdom
T: +44 (0) 1344 328038
F: +44 (0) 1344 328005
E: trl@ihs.com
W: http://emeastore.ihs.com