



Department
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Food & Rural Affairs

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Emissions Factors Toolkit User Guide

June 2014



Llywodraeth Cymru
Welsh Government



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This document/publication is also available on the [LAQM website](#)¹.

Any enquiries regarding this document/publication should be sent to us at:

laqmhlpdesk@uk.bureauveritas.com

¹ <http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

Change Log

Version	Date	Details of Changes Made
1	June 2014	Issue

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Introduction

This road traffic Emissions Factors Toolkit (EFT) user guide has been compiled by Bureau Veritas in the role of Project Manager for the Local Air Quality Management (LAQM) Helpdesk.

The EFT is published by Defra and the Devolved Administrations to assist local authorities in carrying out Review and Assessment of local air quality as part of their duties under the [Environment Act 1995](#)². It is a tool that allows users to calculate road vehicle pollutant emission rates for oxides of nitrogen (NO_x), Particulate Matter (PM₁₀ and PM_{2.5}), and hydrocarbons (HC), for a specified year, road type, vehicle speed and vehicle fleet composition. Carbon dioxide (CO₂) emission rates can also be calculated for petrol and diesel fuelled vehicles.

The purpose of this user guide is to explain in detail the methodology, datasets and assumptions used in the development of the EFT, and to provide guidance on its use. This user guide also consolidates information regarding previous versions of the EFT, their main changes and updates.

² <http://www.legislation.gov.uk/ukpga/1995/25/contents>

The Emissions Factors Toolkit (EFT)

About the EFT

The latest EFT can be downloaded from the [LAQM website](#)³. It provides emission rates for 2008 through to 2030 and takes into consideration the following information available from the [National Atmospheric Emissions Inventory \(NAEI\)](#)⁴:

- fleet composition data for motorways, urban and rural roads in London and rest of the UK;
- fleet composition based on European emission standards from pre-Euro I to Euro 6/VI;
- scaling factors reflecting improvements in the quality of fuel and some degree of retrofitting; and
- technology conversions in the national fleet.

The EFT can be used to provide the following information:

- emission rate as g/km/s or g/km from the total traffic;
- calculation of PM₁₀ and PM_{2.5} from tyre and brake wear and road abrasion emission sources;
- breakdown of emissions for conventional vehicle types which include 8 conventional vehicle categories (such as petrol and diesel cars) for the UK plus taxis for London, and alternative vehicles such as hybrid petrol cars (depending on user information). A full list of the vehicle categories available within the EFT is provided below.

³ <http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

⁴ <http://naei.defra.gov.uk/>

Conventional Vehicles Types	Alternative Vehicle Types	
Petrol Cars	Full Hybrid Petrol Cars	E85 Bioethanol LGV
Diesel Cars	Plug-In Hybrid Petrol Cars	LPG LGV
Petrol LGV	Full Hybrid Diesel Cars	B100 Rigid HGV
Diesel LGV	Battery EV Cars	B100 Artic HGV
Rigid HGV	FCEV Cars	B100 Bus
Artic HGV	E85 Bioethanol Cars	CNG Bus
Buses/Coaches	LPG Cars	Biomethane Bus
Motorcycles	Full Hybrid Petrol LGV	Biogas Bus
Taxi (London only)	Plug-In Hybrid Petrol LGV	Hybrid Bus
	Battery EV LGV	FCEV Bus
	FCEV LGV	B100 Coach

- source apportionment for Light Duty Vehicles (LDVs) and Heavy Duty Vehicles (HDVs) and individual vehicle classes.

All the calculations are based on average fleet composition for a given year and for a given road type (urban, rural, motorway) and whether the road is in London or outside London. However, advanced options are also available to users to alter fleet composition information.

The calculations procedure for generating the vehicle emissions in g/km, g/km/s and kg/year or tonnes/year can be found in Appendix A and the EFT process map can be found in Appendix B.

Details of the Current EFT

Defra and the Devolved Administrations have provided an updated Emissions Factors Toolkit (Version 6.0) which replaces all previous versions, which should no longer be used.

The EFT is updated regularly in order to keep it current with the latest available data.

For version 6.0 of the EFT, through close liaison with the NAEI team, Road Traffic Emission Projection assumptions for NO_x and NO₂ have recently undergone technical peer review.

Version 6.0 incorporates:

1. updated NO_x emission coefficients for Euro 5 and 6 diesel cars taken from the European Environment Agency (EEA) COPERT 4v10 emission calculation tool, reflecting more recent evidence on the real-world emission performance of these vehicles;
2. updated NO_x emission coefficients for Euro 5 and 6 LGVs (Vans), based on scaling of the diesel car emission factors;
3. updated Hydrocarbon and PM speed emission equations for all vehicles using COPERT 4v10;
4. updated fleet composition, accounting for:
 - NAEI changes to uptake rates for newer vehicles and low emission vehicles based on information from DfT on projected sales of new cars and LGVs.
 - updated forecasts in the vehicle mix on different road types based on the January 2013 Department for Transport (DfT) traffic projections (RS2013); and
 - updates to traffic and fleet projections in London based on information from Transport for London (TfL).
5. updated scaling factors to take into account the effects of changing fuel quality on emission factors, particularly the addition of small amounts of biodiesel and bioethanol at up to 10% strength blends in commercial petrol and diesel fuels. The

factors are based on evidence of the effect of biofuels on pollutant emissions reviewed by the NAEI⁵.

6. bug Fixes:

- For the “Detailed Option 3” traffic format, the functionality to allow you to specify the petrol/diesel split when the alternative technologies box is ticked has been corrected.

Note: CO₂ emissions calculated by EFT v 6.0 are those associated with tailpipe emissions from petrol and diesel vehicles only. While new alternative fuelled vehicles, such as hybrids, are now included within the national fleet, CO₂ emissions from these vehicles are not included as the EFT does not calculate the full impact of these technologies on CO₂, for example from electricity or hydrogen production, etc.

Tools¹ are available for calculating Greenhouse Gas (GHG) emissions from a range of fuels and technologies, such as Defra/DECC GHG Conversion Factors at:

<https://www.gov.uk/measuring-and-reporting-environmental-impacts-guidance-for-businesses>

¹ <http://www.ukconversionfactorscarbonsmart.co.uk/>

A list of the data sources used for the development of the current EFT can be found in Appendix C.

⁵ Reported in http://uk-air.defra.gov.uk/reports/cat15/0901151441_NAEI_Road_Transport_Biofuels_report_2008_v1.pdf and also by the Air Quality Expert Group (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69338/pb13464-road-transport-biofuels-110228.pdf)

Details of Historic Versions of the EFT

Version of EFT	Release Date	Reason for Release / Summary of Changes
Version 6.0 (Current Version)	June 2014	See "Details of the Current EFT" page 4.
Version 5.2c	January 2013	Added 'Advanced Options' to the Input Data worksheet allowing Advanced Users to provide a User Defined Euro Compositions and Alternative Technologies, and output relative percentage contributions from Euro Classes.
Version 5.1.1	June 2012	Updated NO _x emission factor and vehicle fleet information. NO _x Emission Factors were taken from the EEA COPERT 4 (v8.1) emission calculation tool. Emission Factors for other pollutants were those published by the DfT on 29 June 2009.
Version 4.2.2	November 2010	Bug Fix Bugs were related to PM ₁₀ and PM _{2.5} emissions due to brake and tyre wear and only affected emissions calculated using the 'Traffic Fleet' option.
Version 4.2.1	October 2010	Bug Fix Bug occurred when modelling specific vehicle classes (e.g. buses only).
Version 4.2	June 2010	Updated version included advanced options for User Defined Traffic Fleet and Euro Composition information.
Version 4.1	February 2010	Updated vehicle exhaust emission factors based on Department of Transport emissions factors published on 29 th June 2009, Also included brake and tyre wear for PM ₁₀ and PM _{2.5} .

Local Authorities are not required to redo any work already carried out using previous versions but are advised to use the latest version for future work.

Using the EFT

In order to use the EFT v6.0 you must enable macros in your MS Excel security settings before opening the spreadsheet. When using Excel 2010 this can be found under: DEVELOPER⁶ > MACRO SECURITY > MACRO SETTINGS > ENABLE ALL MACROS⁷. For previous versions of Excel this can be found in: TOOLS > MACROS > SECURITY LEVEL > MEDIUM.

Basic Operation

1. Go to the **Input Data** sheet using the tabs at the bottom of the workbook.
2. In the **Select Pollutants** box, select the pollutants for which you require emissions information. NO_x uses the COPERT 4 v10 NO_x emission factors and supersede the COPERT v8 emission factors used in the previous version.

Select Pollutants	
<input type="checkbox"/> NOx	<input type="checkbox"/> Carbon Dioxide
<input type="checkbox"/> PM10	<input type="checkbox"/> Hydrocarbons
<input type="checkbox"/> PM2.5	

3. In the **Select Outputs** box, select your required output from the following categories:

Select Outputs	Additional Outputs
<input type="checkbox"/> Air Quality Modelling (g/km/s)	<input type="checkbox"/> Breakdown by Vehicle
<input type="checkbox"/> Emissions Rates (g/km)	<input type="checkbox"/> Source Apportionment
<input type="checkbox"/> Annual Link Emissions	<input type="checkbox"/> PM by Source

⁶ FILE>OPTIONS>CUSTOMIZE RIBBON>Tick DEVELOPER box on right hand side menu

⁷ Ensure this option is turned off after using the EFT as potentially dangerous code can run

Air Quality Modelling	Selecting this option provides outputs as total emissions as g/km/s for the pollutant(s) selected.
Emission Rates	Selecting this option provides outputs as total emissions as g/km for the pollutant(s) selected.
Annual Link Emissions	Selecting this option generates emissions of each pollutant per year for each road link in kg/yr for all pollutants with the exception of CO ₂ , which is in tonnes/yr. This option requires the length of each link to be specified.

4. In the **Additional Outputs** box, select your required output from the following categories:

PM by Source	Selecting this option generates a separate output sheet showing the proportion of particulate emissions from Exhaust, Brake, Tyre and Road Abrasion.
Source Apportionment	Selecting this option provides the relative percentage contribution from the specified vehicle types for the pollutant(s) selected.
Breakdown by Vehicle	All output options above are provided for each vehicle type on the road link for the possible 31 vehicle categories within the EFT, which include conventional and alternative vehicles types. If you specify the Basic Split option, then the emissions are based entirely on the vehicle fleet composition embedded in the EFT.

5. Enter **Area** using drop-down box. This incorporates area specific information from detailed traffic surveys on fleet composition. The areas available are:

- a. England (Not London);
- b. London;
- c. Northern Ireland;
- d. Scotland; and
- e. Wales.

- Enter the **Year** for which you wish to predict emissions. Years 2008 to 2030 can be selected.
- Select one of the following **Traffic Formats** which matches your available data, using the drop-down box:

Please Select from the Following Options:	
Area	England (not London)
Year	2008
Traffic Format	Basic Split
Select 'Basic Split' or 'Detailed Option 1 to 3' above	

Basic Split	Assumes standard fleet composition for the selected road type, with specified %HDV (HGV and buses/coaches).
Detailed Option 1	Allows fleet input by %Car, %Taxi, %LGV, %HGV, %Bus and Coach, %Motorcycle.
Detailed Option 2	Allows fleet input by %Car, %Taxi, %LGV, %Rigid HGV, %Articulated HGV, %Bus and Coach, %Motorcycle.
Detailed Option 3	Allows fleet input by %Petrol Car, %Diesel car, %Taxi, %LGV, %Rigid HGV, %Articulated HGV, %Bus and Coach, %Motorcycle.

Note 1: Taxi refers to Black Cabs and can only be entered when London is selected in Area Type.

- Under the header **SourceID** enter a name for each of your roads (this can be anything you like). You can enter up to 10,000 road links. The SourceID doesn't have to be unique, although if there are duplicate names and the data are to be used in detailed dispersion modelling, this may cause errors.
- Under the **Road Type** header, select a road type from the following list:

Urban (Not London)	Use this option for roads that are not motorways or similarly fast flowing roads in urban areas (by the DfT definition of an urban area with a population of 10,000 or more).
Rural (Not London)	Use this option for roads that are not motorways or similarly fast flowing roads outside urban areas.
Motorway (Not London)	Use this option for motorways and fast dual carriageways.
London – Central ⁸	Use this option for roads in ‘Central London’ as defined in the London Atmospheric Emissions Inventory (LAEI ⁹).
London – Inner ¹⁰	Use this option for roads in ‘Inner London’ as defined in the LAEI.
London – Outer ¹¹	Use this option for roads in ‘Outer London’ as defined in the LAEI.
London – Motorway	Use this option for motorways and fast dual carriageways in Greater London.

Note 2: *The urban categorisation relates to the DfT definition of an urban area with a population of 10,000 or more. The London road types use the area categories defined in LAEI.*

10. Under **Traffic Flow** header, enter the number of vehicles on each road. This will usually be vehicles per day (i.e. AADT (Annual Average Daily Traffic) flow) but can be any time period up to one day (24-hours).

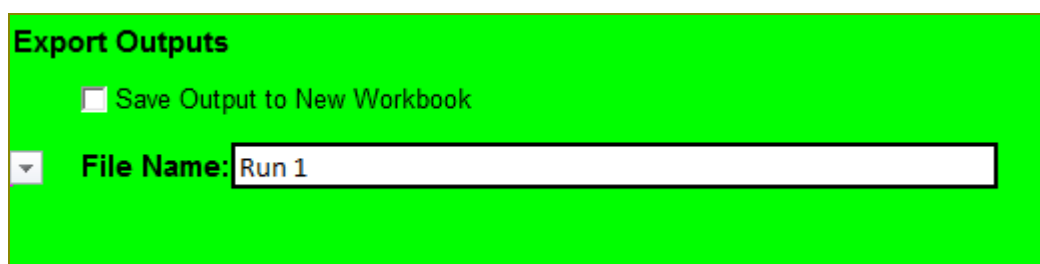
⁸ Roughly corresponds to the original boundary of the Central London Congestion Charging Zone (CCZ – implemented in February 2003) and is made up of some of the LAEI 1 km² grid squares in the London boroughs of Camden, City of London, Islington, Lambeth, Southwark, Tower Hamlets, and Westminster – see LAEI documentation for full details.

⁹ <http://data.london.gov.uk/datastore/package/london-atmospheric-emissions-inventory-2010>

¹⁰ Consists of some of the LAEI 1 km² grid squares in the London boroughs of Camden, Greenwich, Hackney, Hammersmith and Fulham, Haringey, Barnet, Islington, Kensington and Chelsea, Lambeth, Lewisham, Newham, Southwark, Tower Hamlets, Wandsworth, Westminster, Waltham Forest and Redbridge – see LAEI documentation for full details.

¹¹ Consists of some of the 1 km² grid squares in the London boroughs of Enfield, Barking and Dagenham, Barnet, Bexley, Brent, Bromley, Croydon, Ealing, Harrow, Havering, Hillingdon, Hounslow, Kingston-upon-Thames, Merton, Richmond-upon-Thames, Redbridge, Sutton and Waltham Forest – see LAEI documentation for full details.

11. Enter the percentage of the total traffic flow of each vehicle type in the categories depending on the **Traffic Format** selected. If a vehicle category has no vehicles – a “0” must be entered.
12. Under the **Speed (kph)** header, enter the average traffic speed on each road (this should relate to the same time period as the Traffic Flow). This can be between 5kph and 140kph. Where the maximum possible speed for a vehicle defined within emissions functions is below the specified speed, the emissions for the maximum speed in the range designated for that vehicle’s emission factors will be used. Similarly, where the speed entered is below the minimum speed allowed for that vehicle type, the minimum will be assumed¹².
13. Under the **No of Hours** header, enter the time period used for the Traffic Flow (for example, if you entered the number of vehicles per day, this will be 24; but if you entered the number of vehicles per hour, this will be 1).
14. Under the **Link Length (km)** enter the length of each road link. This is **only required** if the **Annual Link Emissions** option has been specified.
15. If you require the output to be saved in a new workbook, tick the box, and specify a file name next to **File Name**. The file will be generated in the directory where you have saved the EFT.



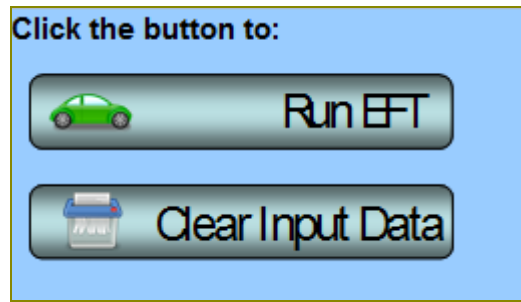
Export Outputs

Save Output to New Workbook

▼ **File Name:** Run 1

16. Click on **Run EFT** to run the calculations, or **Clear Input Data** to recommence data entry.

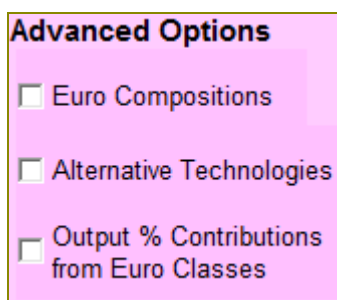
¹² Please consult the Data Sources provided in Appendix C for more information.



17. You will automatically be taken to the **Output** sheet of the workbook, where the requested emission information for each source name and pollutant will be displayed.

Advanced Options

The following Advanced Options have been added to the EFT to provide greater choice in input options so that a user can more accurately represent the situation in their locality or test the impact of proposed intervention measures. It is recommended that these features are only used by experienced air quality modellers. If you are unfamiliar with using vehicle emissions factors and are not comfortable with the underlying methodology¹³ and limitations of these features, their use is not recommended as results may be misinterpreted. Further information can be obtained from the LAQM Helpdesk at <http://laqm.defra.gov.uk/helpdesks.html>.



Advanced Options

- Euro Compositions
- Alternative Technologies
- Output % Contributions from Euro Classes

Advanced options: Input

- *Euro Compositions*

Should you wish to specify the Euro classification of the fleet used in the emission calculations to more accurately reflect local conditions or test intervention measures under consideration, then the following procedure should be followed:

1. In the **Advanced Options** box of the **Input Data** sheet select **Euro Compositions**. Go to the **UserEuro** sheet that is generated. This displays all of the Euro class splits that will be used in the calculation of emission factors. The proportions in each box add up to 1 (100%). The boxes with headings in blue display the default proportions built into the toolkit based on the selected **Road Type**, **Area** and **Year**. Using the **UserEuro** option allows users to define the following information:

¹³ Scaling factors used for Alternative Technology vehicles will shortly be available from <http://naei.defra.gov.uk/>

- a. The Euro proportions for the conventional fleet;
- b. Euro proportions for alternative technologies;
- c. Vehicle size distribution for the conventional fleet; and
- d. Vehicle size distribution for alternative technologies.

This is accomplished by manually populating the relevant User Defined orange boxes (boxes with headings in orange).

2. The boxes with headings in orange will be used in the calculations if the **Euro compositions** option has been selected. The proportions in each box should always add up to 1 (100%) or 0 (0%). The text adjacent to each box confirms whether the proportions add up to 1.
3. Users must populate the orange boxes with the default Euro class and size information first by clicking the '**Populate User Defined Euro Proportions with Default Year and Area Euro Proportions**' button before manually editing the orange boxes for those vehicle types they wish to alter.

An error message will be shown if proportions in all orange boxes do not add up to 1 and the EFT will not run.

4. Users must remember to enter the traffic fleet information for each road link on the **Input Data** sheet in order to run the model.

IMPORTANT: Unlike Fleet Data entered into the Input Data worksheet which refer to vehicle mix by main vehicle type based on automatic or manual traffic count data, the Euro Class proportions entered into the UserEuro worksheet must be based on more detailed information on the age mix of vehicles seen on the road, e.g from Automatic Number Plate Recognition activity data.

5. The Euro compositions incorporated within the EFT are different for NO_x and PM (and other pollutants) as in some cases the standards that apply differ. Therefore, your entered fleet data should be added in both sets of tables where necessary.

Note 3: *Emission reductions that can be achieved by retrofitting HGVs with Selective Catalytic Reduction (SCR) systems have not been confirmed at this stage. As a result, if any proportion information is input next to boxes ending in SCRRF, the standard emission factor for the Euro class of that HGV will be used. It is intended that the EFT will be updated as and when further data becomes available on the likely effectiveness of such systems.*

- *Alternative Technologies*

Should you wish to predict the impact on emissions of introducing vehicles with alternative technologies to the traffic fleet under consideration, then the following procedure should be followed:

1. In the **Advanced Options** box of the **Input Data** sheet select **Alternative Technologies**.
2. Select **Alternative Technologies** in the drop-down box adjacent to **Traffic Format**.
3. Under **Traffic Flow** header, enter the number of vehicles on each road. This will usually be vehicles per day (i.e. AADT flow) but can be any time period up to one day (24-hours).
4. Enter the percentage of the total traffic flow of each vehicle type in all categories. If a vehicle category has no vehicles – a “0” must be entered. The following additional vehicle categories are available:

Full Hybrid Petrol Cars	Petrol Hybrid Electric Vehicle Cars
Plug-In Hybrid Petrol Cars	Petrol Plug-in Hybrid Electric Vehicle Cars
Full Hybrid Diesel Cars	Diesel Hybrid Electric Vehicle Cars
Battery EV Cars	Battery Electric Vehicle Cars
FCEV Cars	Fuel Cell Electric Vehicle Cars
E85 Bioethanol Cars	Bioethanol Cars
LPG Cars	Liquefied Petroleum Gas Cars
Full Hybrid Petrol LGV	Petrol Hybrid Electric Vehicle LGVs
Plug-In Hybrid Petrol LGV	Petrol Plug-in Hybrid Electric Vehicle LGVs
Battery EV LGV	Battery Electric Vehicle LGVs
FCEV LGV	Fuel Cell Electric Vehicle LGVs
E85 Bioethanol LGV	Bioethanol LGVs
LPG LGV	Liquefied Petroleum Gas LGVs
B100 Rigid HGV	B100 Biodiesel Rigid HGVs
B100 Artic HGV	B100 Biodiesel Articulated HGVs
B100 Bus	B100 Biodiesel Buses
CNG Bus	Compressed Natural Gas Buses
Biomethane Bus	Biomethane Buses
Biogas Bus	Biogas Buses
Hybrid Bus	Hybrid Buses
FCEV Bus	Fuel Cell Electric Vehicle Buses
B100 Coach	B100 Biodiesel Coaches

5. Enter the **Speed (kph)**, **No of Hours** and **Link Length (km)** details as normal.

Note 4: When running the EFT with the Advanced Option for Alternative Technology Vehicles then the vehicle category **Bus and Coach** category only refers to conventional diesel vehicles (unlike the standard Traffic Formats (Basic, Options 1-3) whereby default fleet assumptions include some alternative vehicles). There is no need to apply any correction to allow for alternative buses such as hybrids. For example, if your fleet is 100% buses, and 10% are hybrids, then you would enter 90 under “**bus and coach**” and 10 under “**hybrid bus**”. Users may also use the “Euro Defined” Advanced Option to alter the proportion of Buses and Coaches.

Note 5: If a user is running the EFT with the Advanced Options for Alternative Technology Vehicles with the London area then Note 4 also applies. Default assumptions used for standard Traffic Formats (Basic, Options 1 -3) for Bus and Coaches incorporate the detailed TFL bus fleet which includes hybrid buses. The Advanced Option allows users to overwrite these assumptions. The user can make further amendments to the conventional or hybrid fleet of London buses by also selecting the UserEuro option.

Advanced options: Output

- *Output % Contributions from Euro Classes*

Selecting this option provides outputs broken down into the percentage contribution from each Euro Class within each Vehicle Category. Using this option increases the model run time especially where a large number of road links are entered.

Glossary

AADT	Annual Average Daily Traffic
CO₂	Carbon dioxide
EEA	European Environment Agency
EFT	Emissions Factors Toolkit
DfT	Department for Transport
DEEC	Department for Energy and Climate Change
HDV	Heavy Duty Vehicles. It encompasses Rigid and Artic Heavy Goods Vehicles and Buses/Coaches
HC	Hydrocarbons
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LDV	Light Duty Vehicles. It encompasses cars, taxis (black cabs London), and vans
NAEI	National Atmospheric Emissions Inventory
NO₂	Nitric oxide (NO) is mainly derived from road transport emissions and other combustion processes such as the electricity supply industry. NO is not considered to be harmful to health. However, once released to the atmosphere, NO is usually very rapidly oxidized, mainly by ozone (O ₃), to nitrogen dioxide (NO ₂), which can be harmful to health
NO_x	NO ₂ and NO are both oxides of nitrogen and together are referred to as nitrogen oxides (NO _x)
PM₁₀	Particulate Matter less than 10µm in aerodynamic diameter
PM_{2.5}	Particulate Matter less than 2.5µm in aerodynamic diameter
TRL	Transport Research Laboratory

Local Air Quality Management Helpdesk

This Helpdesk has been set up on behalf of Defra and the Devolved Administrations to offer assistance to Local Authorities in managing air pollution in their area. The Helpdesk provides:

- answers to Local Authorities' questions on air quality monitoring, modelling and emissions inventories;
- information and guidance to assist Local Authorities in carrying out the Local Air Quality Review and Assessment process required under Part IV of the Environment Act 1995; and
- information and guidance to assist Local Authorities in preparing and implementing Air Quality Action Plans for improvement of local air quality.

Contact details for the Local Air Quality Management Helpdesk can be found at <http://laqm.defra.gov.uk/helpdesks.html>.

Appendices

Appendix A: Calculation Procedure

The following documents the calculation procedure for generating the vehicle emissions in g/km, g/km/s and kg/year or tonnes/year (please see the User Guide for more information).

NOx and HC COPERT4.10

Vehicle Type	x	Emissions	x	Constants	x	Degradation [#]	x	Fuel	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Emissions	x	Constants	x	Degradation [#]	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Emissions	x	Constants	x	Degradation [#]	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) /1000 = kg/year

* Degradation in emissions due to accumulated mileage only calculated for some petrol cars and petrol LGVs.

NOx, PM and HC COPERT4.10

Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) /1000 = kg/year

CO₂ TRL/DFT

Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) /1000 = kg/year

PM_{2.5}

PM ₁₀ g/km	x	0.95 = PM _{2.5} g/km
PM ₁₀ g/km/s	x	0.95 = PM _{2.5} g/km/s

The following documents the calculation procedure for generating the brake, tyre wear and road abrasion emissions for PM₁₀ and PM_{2.5} in g/km and g/km/s

PM₁₀

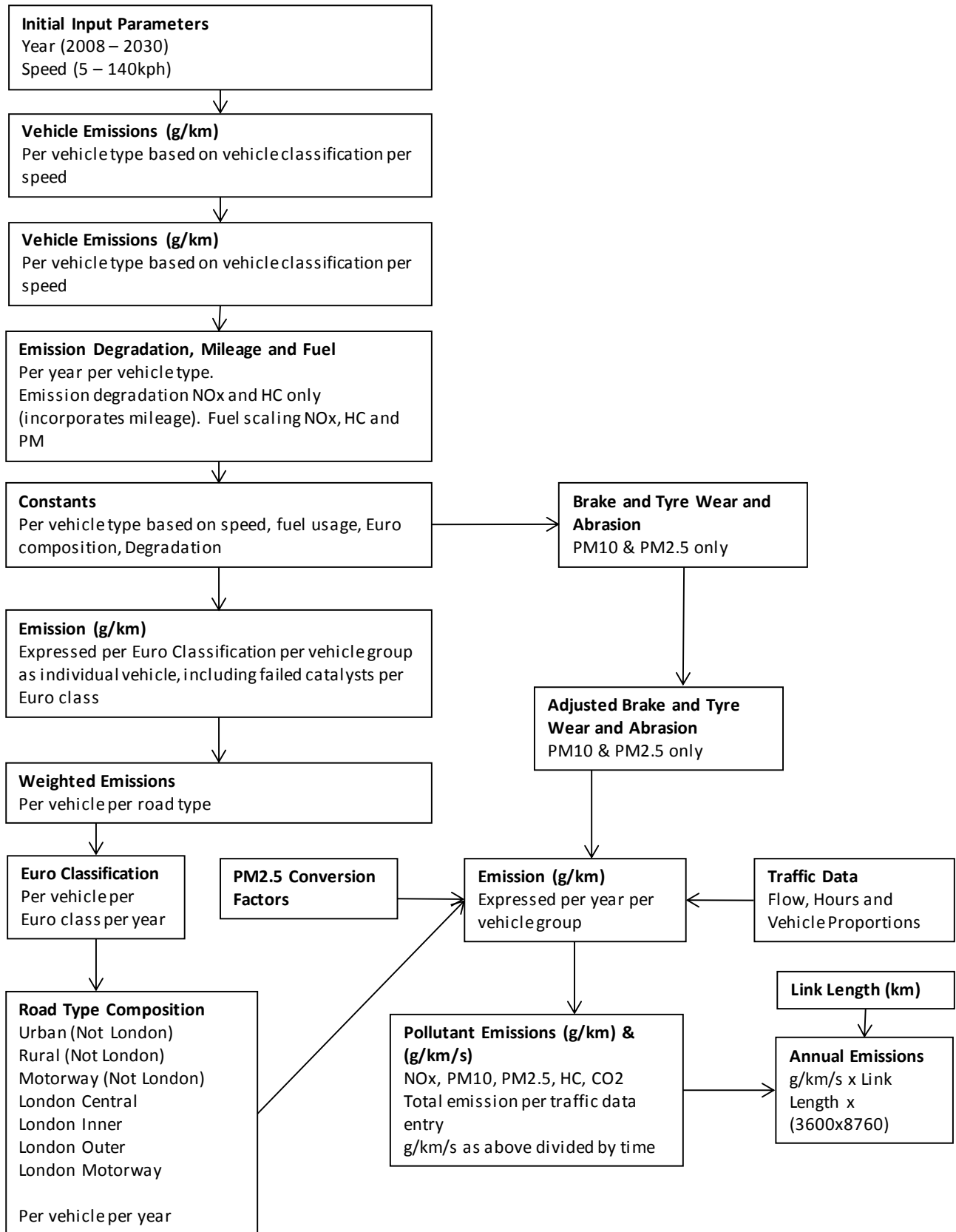
Vehicle Type	x	Brake Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Tyre Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Road Abrasion	Emissions	x	Constants	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Brake Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Tyre Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Road Abrasion	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Brake Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) /1000 = kg/year
Vehicle Type	x	Tyre Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) /1000 = kg/year
Vehicle Type	x	Road Abrasion	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) /1000 = kg/year

PM_{2.5}

PM ₁₀ Brake Wear	Emissions	x	0.4 = PM _{2.5} g/km
PM ₁₀ Tyre Emissions	Emissions	x	0.7 = PM _{2.5} g/km
PM ₁₀ Road Abrasion	Emissions	x	0.54 = PM _{2.5} g/km

Source: EFT v6.0-Background Information

Appendix B: EFT Process Map



Appendix C: Data Sources

Source Organisation	Data set	Date
Ricardo-AEA / AEA Technology ¹⁴	UK (Outside London) Euro Compositions ¹⁵	03/10/2013
	Fleet Compositions per Road Type (Outside London) ¹²	03/10/2013
	Vehicle Size Proportions ¹¹	03/10/2013
	PM ₁₀ to PM _{2.5} Conversion ¹⁶	23/05/2010
	PM ₁₀ Assumptions	11/08/2009
	Brake, Tyre and Road Abrasion PM assumptions ¹³	30/10/2009
	HDV SCR/EGR Proportions ¹³	13/02/2012
	Treatment of Failed Catalytic Convertors ¹¹	13/02/2012
	Fuel Scaling ¹⁷	03/10/2013
	Alternative Vehicle Emissions Assumptions ¹⁸	06/02/2013
EEA (COPERT 4v10)	NO _x vehicle emissions	November 2012
	PM vehicle emissions	November 2012
	HC vehicle emissions	November 2012
TRL	C vehicle emissions	07/08/2009
	Mileage Rates	07/08/2009

¹⁴ Data listed here are data developed for or by the 2011 version of the National Atmospheric Emissions Inventory and NAEI UK road transport emission projections (Base 2013 version). The methodology used in the NAEI can be found at http://naei.defra.gov.uk/reports/reports?section_id=2

¹⁵ Fleet projections based on fleet turnover model used in NAEI UK road transport emission projections (Base 2013 version) using vehicle sales projections provided by DfT (2013)

¹⁶ Assumptions used in the NAEI based on information from the EMEP/EEA Emissions Inventory Guidebook (2013), <http://www.eea.europa.eu/publications/emep-eea-guidebook-2013>

¹⁷ Factors used in NAEI UK road transport emission projections (Base 2013 version) derived from the effects of fuel quality on emission factors, including effect of low-strength biofuel blends. Biofuel effects report at http://uk-air.defra.gov.uk/reports/cat15/0901151441_NAEI_Road_Transport_Biofuels_report_2008_v1.pdf

¹⁸ http://naei.defra.gov.uk/resources/NAEI_Emission_factors_for_alternative_vehicle_technologies_Final_Feb_13.pdf

Source Organisation	Data set	Date
TfL	London Basic Fleet Compositions	02/10/2013
	London LEZ Euro Compositions	02/10/2013
	London Taxi Euro Compositions	02/10/2013
	London Bus Fleet and Euro Compositions	02/10/2013
	London Bus retrofit assumptions	02/10/2013