



## What's New in EMIT 3.4? Including EMIT 3.4.1

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EMIT 3.4 is the latest general release of CERC's simple, fast and comprehensive tool for compiling, editing and analysing emissions inventories. EMIT 3.4 includes a number of major new features, most notably:

- New road traffic emission factors and fleet data based on the UK National Atmospheric Emissions Inventory 2014;
- New road traffic emission factors from the most recent version of Defra's Emission Factor Toolkit (version 6.0);
- Source apportionment features to quantify the contributions from particular road vehicles, such as diesel cars, to emissions and concentrations (when used with ADMS-Urban); and
- Substantial increases in calculation speed.

The EMIT 3.4.1 upgrade contains additional new features that were not available in the original EMIT 3.4 release:

- EMIT can now export sources to ADMS *.spt* file format, for use with ADMS Urban version 4; and
- EMIT now provides user-editable scaling factors for non-exhaust emissions from road traffic.

This document describes the new features and model changes in EMIT since the release of EMIT 3.2 in July 2013.

**USERS OF ADMS-Urban** should note that EMIT 3.4 may be used with ADMS-Urban versions 3.1, 3.2 and 3.4; and version 4.0 by exporting to emissions inventory databases. EMIT 3.4.1 may be used with ADMS-Urban 4 by exporting to emissions inventory databases or to ADMS *.spt* files.

**USERS OF ADMS-Roads** should note that EMIT 3.4 may be used with ADMS-Roads versions 3.1, 3.2 and 3.4; and version 4.0 by exporting to emissions inventory databases. EMIT 3.4.1 may be used with ADMS-Roads 4 by exporting to emissions inventory databases or to ADMS *.spt* files.

**USERS OF ADMS-Airport** should note that EMIT 3.4 may be used with ADMS-Airport versions 3.1, 3.2 and 3.4; and version 4.0 by exporting to emissions inventory databases. EMIT 3.4.1 may be used with ADMS-Airport 4 by exporting to emissions inventory databases or to ADMS *.spt* files.

## Installing EMIT 3.4

The EMIT 3.4 User Guide contains full instructions on how to install EMIT 3.4. A copy of the User Guide can be found with the installation files in *.pdf* format. It is also available from [www.cerc.co.uk](http://www.cerc.co.uk). See Section 2.2 of the User Guide for the following:

- Steps to take *before* installing EMIT 3.4, if you have been using an earlier version of EMIT;
- How to install EMIT 3.4; and
- How to upgrade databases from earlier versions of EMIT, if you have been using an earlier version of EMIT.

## Installing the EMIT 3.4.1 upgrade

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*If you have been supplied with EMIT 3.4.1 as an upgrade patch rather than a full installation, please follow these instructions to patch your EMIT 3.4.0 installation.*

*If you have been supplied with EMIT 3.4.1 as a full installation, please follow the instructions in the section above.*

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This upgrade to EMIT 3.4 includes an updated EMIT executable and an updated template database. The required files are contained within the ‘*EMIT 3.4.1 patch.zip*’ file, which is now available.

In addition to a *.pdf* copy of this document, the following two model files are contained within the ‘*EMIT 3.4.1 patch.zip*’ file:

*EMIT.exe*  
*Empty.mde*

In order to upgrade an installed version of EMIT 3.4.0 to EMIT 3.4.1, the above files should replace those in the installation directory of the model. It is advisable to keep the original versions of these files, although these can also be found in your EMIT 3.4.0 installation *.zip* file or CD.

An updated User Guide is not supplied with this model upgrade. Please see the following section for details of the new features in the upgrade.

Databases from EMIT 3.4.0 must be upgraded to 3.4.1. This can be done by following the instructions in section 2.2 of the User Guide.

## New Features in EMIT 3.4.1

1. EMIT can now export sources to ADMS *.spt* file format, for use in ADMS Urban version 4. The file format is described in the ADMS-Urban 4 User Guide. The EMIT User Guide has not been updated for the upgrade and describes the earlier ADMS *.csv* format.

This feature replaces the previous ADMS *.csv* file export feature which was compatible with ADMS-Urban version 3.4.

Both EMIT 3.4.1 and EMIT 3.4 can export sources to ADMS Emissions Inventory Database format, which is compatible with ADMS-Urban 3.4 and 4.0.

2. EMIT now provides user-editable scaling factors for non-exhaust emissions from road traffic. These scaling factors can be edited in the same way as scaling factors for exhaust emissions: please refer to section 4.3.3 of the User Guide for more details.

## New Features in EMIT 3.4

1. Three new road traffic emission factor datasets have been added to the EMIT database: **NAEI 2014 Mway**, **NAEI 2014 Rural** and **NAEI 2014 Urban**.

These ‘**NAEI 2014**’ datasets have been compiled based on data from two sources. Emission factors for the pollutants PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>x</sub>, NO<sub>2</sub> and VOC are based on data released in June 2014 as part of the UK National Atmospheric Emissions Inventory (NAEI, <http://naei.defra.gov.uk/data/ef-transport>), which have been calculated using version 10.0 of the COPERT 4 tool.

Emission factors for all other pollutants included in the dataset are those released by DfT in June 2009. These DfT factors are the same as those used in the ‘**NAEI 2012**’ datasets and have been compiled by TRL.

These ‘**NAEI 2014**’ datasets include the effects of vehicle mileage and new fuels. They include factors for:

- The regulated pollutants NO<sub>x</sub>, VOC, CO and CO<sub>2</sub>;
- PM<sub>10</sub>, which are set equal to the factors for the regulated pollutant, PM;
- PM<sub>2.5</sub>, which are taken to be 95% of the PM<sub>10</sub> factors;
- NO<sub>2</sub>, which are taken as vehicle type-dependent proportions of the NO<sub>x</sub> factor;
- SO<sub>2</sub>, which are calculated from the regulated values of fuel consumption from vehicles; and
- The unregulated pollutants Ammonia, Benzene, 1,3 Butadiene, Methane, N<sub>2</sub>O, and Benzo[a]Pyrene.

Recent fleet data from the NAEI have been used to compile new route types that may be used with these new ‘**NAEI 2014**’ emission factors. The route types

include fleet predictions for London, England (outside London), Wales, Scotland and Northern Ireland, up to the year 2030; within London, the fleet data have been partitioned according to central, inner and outer London, and motorways, and for the other regions, there are separate route types for urban and rural areas, and motorways.

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*Note that the London fleet data for particulates and NO<sub>x</sub> were supplied separately due to an issue with LEZ compliance; these data cannot be consolidated. As a consequence, there are separate route types for particulate and non-particulate pollutants.*

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The speeds associated with these new datasets are: 5 to 50 km/hr in 1 km/hr increments, and 50 to 140 km/hr in 5 km/hr increments.

There are some differences between emissions calculated from these EMIT datasets and those calculated from Defra's Emission Factor Toolkit (EFT). These differences appear to be due to issues in the EFT. Please refer to Appendix A of the User Guide for more details of these differences and for a full description of the new EMIT datasets.

2. A new road traffic emission factor dataset extracted from the most recent version of Defra's Emission Factor Toolkit (version 6.0.1, 2014) has been included: **EFT v6.0.1**. This dataset includes factors for pollutants NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, VOC and CO<sub>2</sub>. The NO<sub>2</sub> emissions are not calculated by the EFT v6.0.1, so these have been estimated as a proportion the NO<sub>x</sub> emissions by using data from version 4.1 of the Defra 'NO<sub>x</sub> to NO<sub>2</sub> conversion spreadsheet' (released in June 2013). The particulate emissions from EFT v6.0.1 include contributions from brake wear, tyre wear and road wear.

Defra released a new version of their Emission Factor Toolkit, version 6.0.2, in November 2014. The emission factors in the EMIT dataset **EFT v6.0.1** are still valid, since they are unaffected by the changes made for the release of EFT version 6.0.2.

In **EFT v6.0.1**, factors are given for heavy vehicles, light vehicles and motorcycles, and they are also divided into regions:

- England (not London), Northern Ireland, Scotland and Wales, all of which have the road type categorisation: urban, rural and motorway; and
- London, which has the road type categorisation: central, inner, outer and motorway.

Emission factors are given for speeds 5 to 140 km/hr in 1 km/hr increments.

Please refer to Appendix A of the User Guide for more details.

3. EMIT now allows the user to apportion road traffic emissions for any given pollutant, to determine the contributions from different types of vehicle. The apportioned emissions can also be exported to ADMS-Urban for dispersion

modelling; this allows apportionment of calculated concentrations due to the different categories, as well as emissions. The apportioned concentrations take account of non-linear effects from vehicle-induced turbulence.

Road traffic exhaust emissions can be apportioned by user-defined vehicle categories such as petrol cars and diesel cars. EMIT contains the following default vehicle categories:

- Motorcycles
- Petrol cars
- Diesel cars
- Other cars
- LGVs
- Buses and Coaches
- Rigid HGVs
- Articulated HGVs

The user can modify these categories or create new ones, for example apportioning emissions by EURO class or by vehicle size. A user-friendly screen allows full control of the vehicle sub-categories within each vehicle category.

EMIT also now allows non-exhaust emissions from road traffic to be apportioned into the following categories:

- Brake wear
- Tyre wear
- Road wear
- Resuspension

These categories cannot be edited by the user. Non-exhaust emissions cannot be apportioned by vehicle type.

Please refer to the User Guide for more details about apportionment of road traffic emissions.

4. The following non-exhaust road traffic datasets have been corrected:

- EMEP brake wear: “EMEP BW \* *RT* 10”
- EMEP tyre wear: “EMEP TW \* *RT* 10”
- EMEP road wear: “EMEP RW \* *RT* 10”
- Defra resuspension “Defra PPR110 RS \*” and “Defra PPR224 RS \*”

Where \* denotes the number of fleet components and *RT* indicates road type: “Urb”, “Rur”, “Mway” for urban, rural and motorway respectively.

The specific cases when the issue occurs are described in the Appendix at the end of this document. This correction was also included in the EMIT 3.2.2 upgrade.

5. An updated aircraft engine emissions dataset has been included in EMIT, **ICAO 20 + Other**. This dataset includes emissions for jet, piston and turboprop engines, and it includes factors for CO<sub>2</sub> emissions, an improvement over the earlier 'ICAO' datasets in EMIT. The data have been taken from Issue 20B of the ICAO Aircraft Engine Emissions Databank, in addition to other sources. Please refer to Appendix B of the User Guide for more details of these and other aircraft emission factor datasets included within EMIT.
6. EMIT 3.4 provides a substantial increase in calculation speed compared to earlier versions. Part of the calculation code has been completely re-implemented in order to improve the performance. The effect on speed will vary depending on the user-input data in each database, but we expect an increase in speed in the majority of cases. For some large databases the speed has increased by more than a factor of ten.
7. EMIT 3.4 includes a new feature for exporting emissions data to a .csv in ADMS format, for further processing using other packages, or for import into ADMS-Urban or ADMS-Roads for air quality modelling. This feature was also included in the EMIT 3.2.2 upgrade.
8. The following emission factor datasets have been removed from EMIT 3.4, as they are now out of date:
  - The **EFT v4.2**, **EURO 2009 Mway**, **EURO 2009 Rural**, and **EURO 2009 Urban** road traffic emission factor datasets;
  - The **ICAO (Issue 13) 2005** and **ICAO 15 + Other** aircraft engine emission factor datasets.

# Appendix 1. Corrections to non-exhaust datasets

The following non-exhaust datasets have been corrected in EMIT 3.4 and 3.2.2.

- EMEP brake wear: “EMEP BW \* *RT* 10”
- EMEP tyre wear: “EMEP TW \* *RT* 10”
- EMEP road wear: “EMEP RW \* *RT* 10”
- Defra resuspension “Defra PPR110 RS \*” and “Defra PPR224 RS \*”

Where \* denotes the number of fleet components and *RT* indicates road type: “Urb”, “Rur”, “Mway” for urban, rural and motorway respectively. Please refer to the EMIT User Guide for further details of these datasets.

## How to determine whether your calculations were affected in EMIT 3.2.0

The issue arose in EMIT 3.2.0 when these datasets are used with ROAD or MINORRD sources with speeds which are not a whole multiple of 5 km/hr. It is only possible to create such a source in EMIT when using one of the following exhaust datasets:

- NAEI 2012 Mway, NAEI 2012 Rural, NAEI 2012 Urban
- EFT v5.2

Your EMIT calculations will only be affected if all the following are true:

- you are using EMIT 3.2.0, not the EMIT 3.2.2 upgrade;
- you are using one of the non-exhaust datasets from the first list,
- in conjunction with one of the exhaust datasets from the second list,
- for sources with speeds that are not a whole multiple of 5 km/hr.

## Consequence

The consequence of this issue is that when the calculation is performed with EMIT 3.2.0 the contribution from non-exhaust emissions to total particulate emissions for the specific dataset/speed combinations described above is zero.

## Correcting the issue

The issue has been corrected in EMIT 3.4. To calculate the correct emissions, you should install EMIT 3.4 upgrade as described above, upgrade your EMIT database to EMIT 3.4 format by opening it in EMIT 3.4, and recalculate the emissions for your inventories.

The correction for this issue was also included in the EMIT 3.2.2 upgrade.