Primary NO_2 Emission Factors for Road Vehicles

June 2016

Nitrogen oxides (NO_x) are emitted in the form of nitric oxide (NO) and nitrogen dioxide (NO_2). The fraction emitted directly as NO_2 (f-NO_2) is of particular interest for air quality modelling. Road transport is the major source of primary NO_2 emissions especially in urban areas and different vehicle types emit different proportions of NO_x as NO_2. Evidence has shown that diesel vehicles are particularly prone to high f-NO_2 values and especially those vehicles fitted with certain types of catalyst systems for controlling other pollutant emissions such as oxidation catalysts and diesel particulate filters for controlling CO, HC and PM. Thus, diesel vehicles meeting more recent Euro standards tend to have higher f-NO_2 values.

Values of f-NO_2 are provided in the EMEP/EEA Emissions Inventory Guidebook (2013) for different vehicle types and Euro standards[1]. These factors are included in COPERT 4, a software tool developed by the European Environment Agency and used widely to calculate emissions from road transport in Europe.

Values of f-NO_2 for each main vehicle type and Euro standard are provided in the spreadsheet "By Euro" tab. These figures refer to the mixing ratio of NO_2 in emitted NO_x, i.e. the molar/volume fraction of NO_2 in the emitted NO_x. The values are taken from COPERT 4 v11 and are the same as used in the December 2015 version of these factors.

Other work sheets provide weighted values of f-NO_2 for years between 2005 and 2035. The averaging has been done in different ways for use when the user does not have detailed information on the mix of Euro standards in the fleet. The weighting of the factors are by the NOx emissions from each detailed vehicle category.

'***Fleet-avg by area_road_type'***. This sheet provides values for each main vehicle class weighted by NO_x emissions by each fuel type and Euro standard in the fleet. The different values for cars and taxis on urban, rural and motorway roads reflect the different mix of NO_x emissions coming from petrol and diesel cars on each road type. The values for different parts of London reflect the different proportions of NO_x emissions coming from diesel taxis and cars in each part of London. The different values for cars in Northern Ireland reflect the different proportions of NO_x emissions coming from diesel and petrol cars in Northern Ireland due to the different petrol/diesel car fleet in this country. The different values for LGVs, HGVs and buses for London and the rest of the UK reflect the different fleet age mix of these vehicles in London as a result of the current Low Emission Zone and future Ultra Low Emission Zone.

'***Fleet-avg by_vehicle_fuel_type'***. This sheet shows values weighted by NO_x emissions occurring from each Euro class in the mix of vehicles on all roads outside London, but provides separate values for cars and LGVs by fuel type. This should be used when the user knows the fuel mix of vehicles on the road(s) being modelled, but not the mix of Euro standards. The factors for each vehicle type are weighted by the NO_x emissions coming from the mix of Euro standards on all roads.

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[1] http://www.eea.europa.eu/publications/emep-eea-guidebook-2013

'**_Fleet-avg all_traffic'_**. This sheet provides the most aggregated values of f-NO$_2$ which can be used when the user does not know the mix of vehicles on the roads being modelled. The factors for individual vehicle types are weighted by the relative amounts of NO$_x$ emissions occurring from the mix of vehicle types on urban, non-urban and for all UK roads combined.

These Base 2016 figures are an update of the December 2015 (Base 2015) f-NO$_2$ factors (PrimaryNO2_factors_NAEIBase_2015_v1.xls) by using updated traffic projections from DfT on different road types and by accounting for the effects of the Ultra Low Emission Zone operating in London from 2020, according to fleet information from TfL. They are consistent with the Base 2016 version of emission projections produced by the NAEI

The projected values of f-NO$_2$ are based on the fleet turnover and traffic growth assumptions in the NAEI's road transport emission projections (LRTAP Base 2016).

Fleet turnover is calculated from assumed survival rates of vehicles in the fleet derived from historic licensing data and estimates of projected new vehicle sales including advice from DfT in February 2013 on future sales of diesel car vehicles, DfT's traffic projections (March 2015) and fleet projections data for London based on information from TfL. Projections are from a 2014 base year taking into account the introduction of new vehicles up to Euro 6/VI standards - the second stage of Euro 6 introduced from 2018 with RDE regulations (Euro 6c) are not included.

Evidence is used from DfT's Automatic Number Plate Recognition data (2007-2013) on how the age and fuel mix of vehicles on different types of roads vary across the country.

Traffic growth assumptions come from DfT's Road Transport Forecasts (RTF2015) for Great Britain (GB) projected to 2035. The Scenario 1 forecast is used.

These factors will be updated annually after submission of each version of the NAEI's UK inventory figures.