Primary NO$_2$ Emission Factors for Road Vehicles

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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 (2009) 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 v10 and are unchanged from those taken from v9 and used in the NAEI Base 2013 version of these factors (April 2013).[2]

Other work sheets provide fleet-weighted values of f-NO$_2$ for years between 2005 and 2030. 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.

'***Fleet-avg by area_road_type'***. This sheet provides values for each main vehicle class weighted by the fuel mix (petrol/diesel) and the mix of different Euro standards in the fleet. The different values for cars and taxis on urban, rural and motorway roads reflect the different mix of petrol and diesel cars on each road type. The values for different parts of London reflect the different proportions of diesel taxis and cars in each part of London. The different values for cars in Northern Ireland reflect the different mix of diesel and petrol cars in Northern Ireland. 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 Low Emission Zone.

'***Fleet-avg by_vehicle_fuel_type'***. This sheet shows values weighted by the age 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. The factors for each vehicle type are weighted by the mix of Euro standards on all roads.

'***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

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[1] http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009

[2] http://www.emisia.com/copert/Copert4.html

factors for individual vehicle types are weighted by the traffic mix on urban, non-urban and for all UK roads combined.

These Base 2014 figures are a very minor update of the April 2013 f-NO$_2$ factors (PrimaryNO2 factors_NAEIBase 2013_v1.xls) for consistency with the final set of vehicle fleet projections available on this site (Base 2013) currently used in the NAEI (Base 2013) road transport emission projections and incorporated in the Emission Factor Toolkit , EFT v6.0 (June 2014)

The projected values of f-NO$_2$ are based on the fleet turnover and traffic growth assumptions in the NAEI's latest road transport emission projections (Base 2013c).

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 (January 2013) and fleet projections data for London based on information from TfL. Projections are from a 2011 base year taking into account the introduction of new vehicles up to Euro 6/VI standards.

Evidence is used from DfT's Automatic Number Plate Recognition data (2007-2011) 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 (RS2013) for Great Britain (GB) projected to 2030. The central forecast scenario is used.

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

Any queries regarding the factors should be directed to air.emissions@ricardo-aea.com