

Report on proposed methodology for traffic emissions modelling framework

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Aim

Traffic emissions are a major health hazard for people who live in cities. To reduce this harm, first we need to understand their distribution. Unfortunately, they are difficult to measure, because instruments are expensive and air pollution often exhibits significant changes in composition and concentration over even small distances and times. This also means that modelling is not a simple process; there are a number of options and they can be expensive. This framework is intended to address a lack of uniformity in the modelling of traffic emissions across Australia. The inconsistency between methods makes comparisons between jurisdictions difficult. In addition, the data are used as inputs for various atmospheric models with domains that cross regional and state boundaries. A uniform approach will enable nationally comparable estimates for the purposes of accounting and health impact assessments. The current National Traffic Emissions Inventory is produced as a project for the whole country, but its level of resolution is states or territories. There are currently no standardised methods for making more detailed estimates. Nationally consistent data would improve the quality of the modelling of pollution. It would enable better comparisons to be made in levels of exposure between people living in different cities.

Design

The design comprises a chained sequence of models (Fig. 1) that can be applied to roads anywhere in the country where there is adequate traffic data. The output will be spatially resolved data about the concentration of a range of pollutants; the level of detail will depend on the resolution of the traffic model. The framework is built to be flexible, so that it should accommodate different traffic models without too much effort. The default emissions and dispersion models have been chosen because they are well documented, widely used and are supported by sizeable communities of users; they are also open source and free.

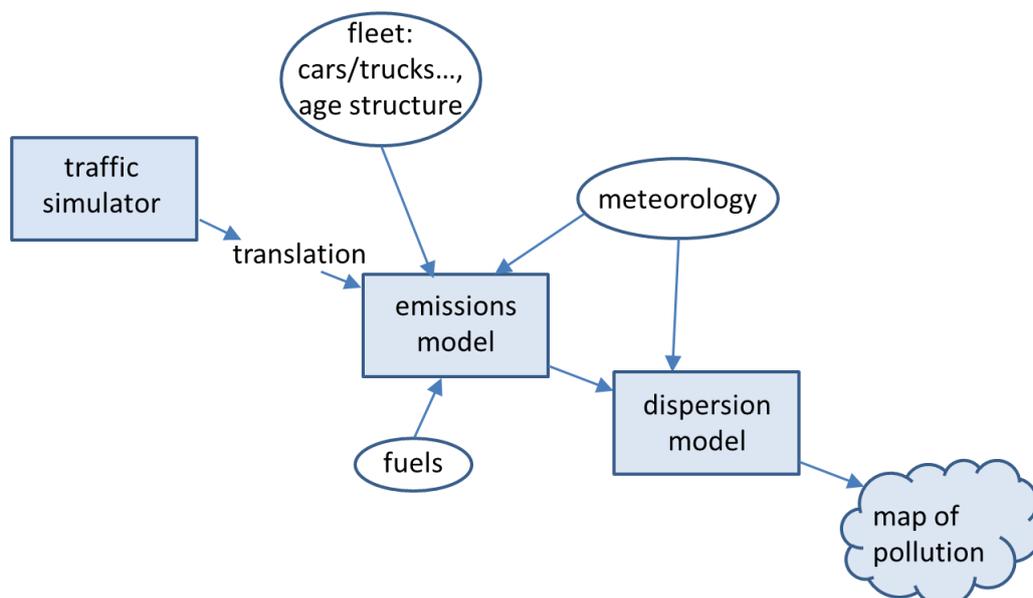


Figure 1. Chain of elements and inputs that comprise the traffic emissions modelling framework (Forehead and Huynh 2018)

The work comprises distinct models for traffic emissions and for the dispersion of emissions away from the road, with a dashboard interface to display the results. The links between modules are made by Python routines.

The emissions model is called MOtor Vehicle Emission Simulator (MOVES) 2014b, freely available software (<https://www.epa.gov/moves>) developed by the US EPA. It is used throughout the US for compliance purposes, so is well documented, supported and updated. The dispersion model, AERMOD (<https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod>), is also freely available and published by the US EPA for use with MOVES. The model operates at a range of scales and deals with simple or complex representations of terrain. Inputs are terrain and meteorology, data is prepared for input with pre-processing software. An important feature of this software is that it accounts for the secondary formation of ozone and fine particulate matter (PM_{2.5}).

The framework will be tested in 2 to 3 locations and measurements will be taken to validate results where possible.

Reference

Forehead, H. and N. Huynh (2018). "Review of modelling air pollution from traffic at street-level - The state of the science." Environmental Pollution **241**: 775-786.

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