RP2002

ETWW DEMAND FORECASTING

EMISSION RATES OF VEHICLE CLASSES APPLICABLE TO THE AUSTRALIAN LIGHT VEHICLE FLEET

Problem

Road transport is a major contributor to transport GHG emissions. Its share is expected to increase in the future considering current and predicted growth trends. Forecasting road transport GHG emission is an essential part of the development of low carbon living communities in Australia and worldwide.

Solution

Forecasting road transport GHG emissions is performed in two steps: 1) representing transport activities by mutually exclusive and exhaustive travelled distances; and 2) obtaining transport GHG emissions applicable to each travelled distance by applying the formula in Equation 1. This approach is generic and flexible.

Equation 1: Obtaining transport GHG emissions.

$$G = D \times R$$

G = Transport GHG emission applicable to travelled distance D;

D = Travelled distance. This parameter represents and quantifies transport activity. It combines distance, time and traffic volume into a single value;

R = Emission rate applicable to travelled distance D. Complete life cycle analysis is used for determining this emission rate.

Selecting vehicle class and average traffic speed as criteria for disaggregating the analysed transport activities into mutually exclusive and exhaustive travelled distances has the following advantages:

- The required travelled distances can be predicted with reasonable confidence and in efficient way by using a well-established and trusted modelling theories (e.g. 4-step transport demand model, discrete choice analysis) and available data sources (e.g. ABS MVC, SMVU);

- The required emission rates can be determined with reasonable accuracy by using available data sources for rigorously performed emission tests on vehicles (e.g. GVG database for ADR emission test, NISE2 database for CUEDC emission test) and for the composition of vehicle fleet (e.g. ABS MVC).

This study develops confidence intervals for the GHG emission rates of vehicle classes applicable to the Australian light vehicle fleet by using a novel procedure that is explained by Figure 1. The procedure consists of one thousand runs and each of these runs determines an estimate of the emission rate, which is the result of a linear combination of emission rates of vehicle models belonging to the vehicle class of interest. The representative sample of estimates of emission rates of vehicle class is obtained by varying every emission rate of vehicle model and every weight associated to the emission rate of vehicle model. The (100*α/2)th and the (100*(1-α/2))th sample percentiles of the obtained sample of estimates define the (100*(1-α))% confidence interval.

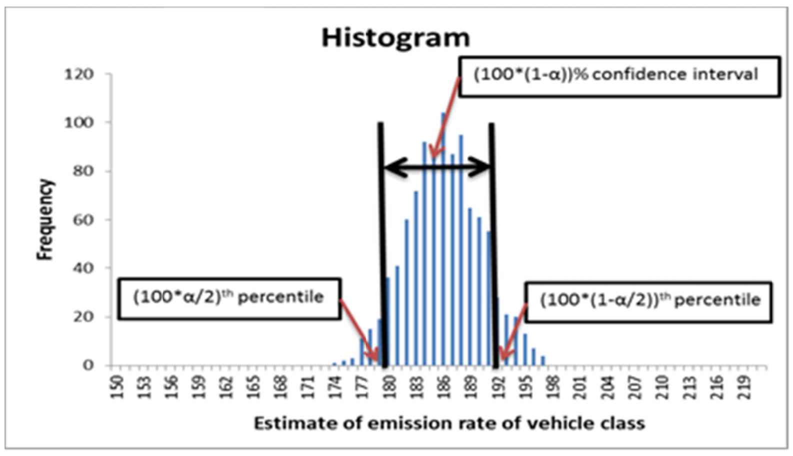

Figure 1: Procedure for determining (100*(1-α))% confidence interval for an emission rate of vehicle class.

Benefits

This study provides practical and statistically robust confidence intervals for emission rates of vehicle classes. The results can assist stakeholders from research, government and industry when forecasting transport GHG emissions and performing important sensitivity analysis in reliable way.

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