

Well-to-wheels approach for the environmental impact assessment of road freight services

ABSTRACT

The diffuse nature of road transport and the heterogeneity of heavy vehicles have hindered the implementation of emissions accounting systems. Even though there are emission factors in well-known databases, these factors have commonly been designed in industrialized countries, which might have geography, type of roads, and operating conditions different to other countries. This paper proposes a method for the energy consumption and emissions estimation based on vehicle operating conditions in regions with different topology, such as Colombia, Malaysia, and Spain, as case studies. Moreover, the environmental impacts of fuel production in each country are calculated. The diesel consumption on mountainous roads for a full loaded rigid truck in Colombia was 45 L/100 km, compared to averages between 22–26 L/100 km from other sources usually applied. In contrast, the diesel consumption for an articulated truck on a hilly road in Spain from both the proposed method and generic databases coincided in 31 L/100 km. The vehicle speed, load, and road gradient also generated large variations up to 145% in the air pollutants' estimation. This study contributes to the need for more research about emission factors and tools that facilitate and reduce uncertainty in the environmental accounting in freight companies in different geographies.

Keyword: Life cycle assessment; Carbon footprint; Polluting emissions; Freight transport; Truck emissions; Road transport fuels