

EXHAUST EMISSIONS FROM ROAD VEHICLES v 3.0.0



Calculated using Emission Factors shown in the NPI EET Handbook for Combustion Engines (Version 3, June 2008)

This spreadsheet has been prepared by NPI+, a consultancy business specialising in assisting Australian companies prepare National Pollutant Inventory reports. To obtain the latest version of this spreadsheet, please contact NPI+ on telephone 0412 621480 or send e-mail to: peter@npiplus.com.au

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1. Calculation method

Exhaust emissions from vehicles are calculated using Emission Factors (EF) provided in the NPI EET Manual for Combustion Engines v 3.0 (June 2008). NPI Emission Estimation Techniques Manuals can be downloaded from the NPI website: www.npi.gov.au

Road-transport vehicles ('non-industrial vehicles') include cars, light and heavy goods vehicles, buses and motorcycles used on either sealed roads or on well-formed unsealed roads. Road transport vehicles are categorised into weight based classes (LGV: <3.5 t, MGV: 3.5 t to 12 t, HGV: 12 t to 25 t and VHGV: >25 t).

The Emission Factors are grouped according to vehicle type and fuel type.
For diesel powered vehicles, emissions are calculated by multiplying the EF and the fuel usage (m³).
For petrol powered vehicles, emissions are calculated by multiplying the EF and the distance travelled (km).

Table 2 of the EET Manual summarises the vehicle categories, vehicle fuels and EF substances. Emission Factors from tables 15, 16, 17, 20, 21, 22, 23 are relevant for diesel and petrol powered road transport vehicles.

Steps to calculate vehicle exhaust emissions from diesel powered vehicles

- Step 1: Determine fuel used for each diesel vehicle category (add annual fuel usage for all like vehicles to get this)
- Step 2: Convert fuel usage from litres to cubic metres by dividing by 1000 (1 cubic metre of diesel = 1,000 litres of diesel)
- Step 3: Calculate emissions for each diesel powered vehicle category

$$\begin{aligned} \text{Diesel vehicle emissions} &= \text{Emission Factor} \times \text{Fuel used} \\ \text{[kg of pollutant emitted from exhaust]} & \quad \text{[kg / m}^3\text{]} \quad \times \quad \text{[m}^3\text{]} \\ &= \text{Emission Factor} \times \text{Fuel used} \times 0.001 \\ & \quad \text{[kg / m}^3\text{]} \quad \text{[litres]} \quad \text{[m}^3\text{ / litre]} \end{aligned}$$

- Step 4: Add together emissions for each diesel vehicle category.
- Step 5: Populate the tables below with real data for each vehicle category

Steps to calculate vehicle exhaust emissions from unleaded petrol powered vehicles

- Step 6: Determine kilometres travelled for each petrol vehicle category (add annual distances travelled for all like vehicles to get this)
- Step 7: Calculate emissions for each petrol powered vehicle category

$$\begin{aligned} \text{Petrol vehicle emissions} &= \text{Emission Factor} \times \text{Distance travelled} \\ \text{[kg of pollutant emitted from exhaust]} & \quad \text{[kg / km]} \quad \times \quad \text{[km]} \end{aligned}$$

- Step 8: Add together emissions for each petrol vehicle category (in this case there is only one petrol category for the LGV category).
- Step 9: Populate the tables below with real data for the unleaded petrol vehicle category

Note: Enter data in yellow cells; emissions for each vehicle category shown in blue cells. Total emissions for all vehicle categories shown in green cells in Section 3.

2. Data

i. LGV (Light Goods Vehicles weighing 3.5 t or less)

Diesel vehicles

Vehicle category name and/or number	Distance travelled (km)	Fuel consumption rate [L/ 100 km]	Fuel used [litres]	Fuel used [m ³]
1			0	0.0
2			0	0.0
Total fuel usage	0		0	0.0

(if fuel usage is not available, enter the distance travelled and the average fuel consumption rate to calculate the litres of fuel used)

Emission rates	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds
kg of pollutant emitted / m ³ fuel used	0	0	19	0	8.9	2.3	2.4	0.00016	0.017	0.42

Emissions from diesel vehicles LGV category	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds
kg of pollutant emitted per year	0	0	0	0	0	0	0	0.000	0	0

Unleaded petrol vehicles

Vehicle category name/number	Distance travelled (km)	Fuel consumption rate [L/ 100 km]	Fuel used [litres]
3			
4			
Total fuel usage	0		0

(if fuel usage is not available, enter the distance travelled and the average fuel consumption rate to calculate the litres of fuel used)

Emission rates	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds
kg of pollutant emitted / km driven	0.000012	0.000008	0.012	0	0.0015	0.0000091	0.0000098	2.5E-09	0.000011	0.0012

Emissions from petrol vehicles LGV category	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds
kg of pollutant emitted per year	0	0	0	0	0	0	0	0.000	0	0

Total category emissions from diesel and petrol vehicles

Total emissions from LGV category	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds
kg of pollutant emitted per year	0	0	0	0	0	0	0	0.0000	0	0

ii. MGV (Medium Goods Vehicles weighing between 3.5 t and 12 t)

Diesel vehicles

Vehicle category number	Dist travelled (km)	Fuel cons'n [L/ 100 km]	Fuel used [litres]	Fuel used [m ³]
5			0	0.0
6			0	0.0

(if fuel usage is not available, enter the distance travelled and the average fuel consumption rate to calculate the litres of fuel used)

Total fuel usage	0		0	0.0							
Emission rates	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds	
kg of pollutant emitted / m ³ fuel used	0	0	12	0	17	2.2	2.3	0.00084	0.017	2.1	
Emissions from diesel vehicles in MGCV category	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds	
kg of pollutant emitted per year	0	0	0	0	0	0	0	0.000	0	0	

iii. HGV (Heavy Goods Vehicles weighing between 12 t and 25 t)

Diesel vehicles

Vehicle category number	Dist travelled (km)	Fuel cons'n [L/ 100 km]	Fuel used [litres]	Fuel used [m ³]							
8			0	0.0							
9			0	0.0							
Total fuel usage	0		0	0.0							
Emission rates	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds	
kg of pollutant emitted / m ³ fuel used	0	0	6.8	0	23	1.7	1.8	0.00071	0.017	1.8	
Emissions from diesel vehicles in HGV category	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds	
kg of pollutant emitted per year	0	0	0	0	0	0	0	0.000	0	0	

(if fuel usage is not available, enter the distance travelled and the average fuel consumption rate to calculate the litres of fuel used)

iv. VHGV (Very Heavy Goods Vehicles weighing above 25 t)

Diesel vehicles

Vehicle category number	Dist travelled (km)	Fuel cons'n [L/ 100 km]	Fuel used [litres]	Fuel used [m ³]							
10			0	0.0							
11			0	0.0							
Total fuel usage	0		0	0.0							
Emission rates	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds	
kg of pollutant emitted / m ³ fuel used	0	0	8.5	0	22	1.1	1.2	0.0004	0.017	1	
Emissions from diesel vehicles in HGV category	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds	
kg of pollutant emitted per year	0	0	0	0	0	0	0	0.000	0	0	

(if fuel usage is not available, enter the distance travelled and the average fuel consumption rate to calculate the litres of fuel used)

3. Total emissions

Total emissions from road transport vehicles	Benzene	1,3 Butadiene (vinyl ethylene)	Carbon monoxide	Fluoride compounds	Oxides of nitrogen	Particulate matter 2.5 µm	Particulate matter 10 µm	Polycyclic aromatic hydrocarbons	Sulfur dioxide	Total volatile organic compounds
kg of pollutant emitted per year	0	0	0	0	0	0	0	0.000	0	0

4. Data sources and assumptions

¹ The average diesel fuel consumption of large 4WD's is assumed to be 13.3 L/100km. This is based on adjusted fuel consumption for new large 4WD's given as being in the range 10-12 L/100 km on www.greenvehicleguide.gov.au, an average of around 11 L/100 km. This figure is then adjusted upwards by 10% because vehicles are not new and another 10% because they operate off-road and in other situations different from typical urban drive cycles on which new vehicle fuel consumption figures are based. This gives an overall fuel consumption rate of 13.3 L/100 km.