Vehicle CO_2 Emissions from Fuel Consumption

Tailpipe CO_2 per kilometre and per litre of fuel from fuel consumption, fuel density and carbon content, and the annual emission for a distance travelled.

Method: Carbon balance of fuel combustion

Input parameters

Unit system: SI

Parameter	Value	Unit
Fuel consumption (L/100 km)	6.5000	
Fuel density	745.00	kg/m³
Carbon mass fraction of fuel	86.600	%
Distance per year	15,000	km

Calculated results

Parameter	Value	Unit
CO_2 per kilometre (g/km)	153.66	
CO_2 per litre of fuel (kg/L)	2.3640	
Annual CO_2	2.3049	t

Notes for this case

• All carbon in the fuel leaves as CO_2 (CO and HC are a fraction of a percent): CO_2 per litre = ρ_f·w_C·44.01/12.01. Petrol (745 kg/m³, 86.6 % C) gives about 2.37 kg/L; diesel (835 kg/m³, 86.2 % C) about 2.64 kg/L. Biofuel blends lower the fossil share but not the tailpipe CO_2.

Formula and method

$$\frac{CO_2}{V} = \rho_f w_C \frac{44.01}{12.01}, \quad \frac{CO_2}{km} = \frac{FC}{100} \cdot \frac{CO_2}{V}$$

Variables

FC	Fuel consumption (L/100 km)	-
ρ_f	Fuel density	kg/m³
w_C	Carbon mass fraction of fuel	-
s	Distance per year	m
CO_2	CO_2 per kilometre (g/km)	-
CO_2/V	CO_2 per litre of fuel (kg/L)	-
m_{CO_2}	Annual CO_2	kg

Method and standards

CO_2 per km.

Assumptions and limits

- Complete combustion; all carbon to CO_2.

References

Carbon balance of fuel combustion

Report details

Report reference	FCC-F7MG-3K8Z (the same inputs always give the same reference)
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Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/automotive/vehicle-dynamics/vehicle-co2-per-km

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.