

HW 2: Energy Demand and CO₂ Emissions

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Creating a new category combining all buses, single-unit trucks, and combination trucks gives the following:

1.1

The average fuel economy is

Table 1: Average Fuel Economy of HDVs

Year	Fuel economy (mpg)
2020	21.2
2019	20.8

1.2

The CO₂ emissions per mile is given by $\frac{1}{\text{miles/gal}} \times \frac{\text{CO}_2}{\text{gal}} = \frac{\text{CO}_2}{\text{mile}}$. This gives

Table 2: HDV Fuel Consumption

Year	Fuel economy (mpg)	Fuel consumption (gpm)	Emissions (g CO ₂ /gal)	Emissions (g CO ₂ /mile)
2020	21.2	0.0471698	10180	480.1887
2019	20.8	0.0480769	10180	489.4231

1.3

The total CO₂ emissions for all LDVs and HDVs is

Table 3: Emissions of LDVs and HDVs

YEAR	category	Fuel consumed (thousand gallons)	Emissions (g CO ₂ /gal)	Emissions (g CO ₂)	Emissions (M tons CO ₂)
2020	ALL LDV	111930145	8887	9.947232e+14	994723199
2019		131455731	8887	1.168247e+15	1168247081
2020	ALL HDV	46853407	10180	4.769677e+14	476967683
2019		48094540	10180	4.896024e+14	489602417

Calculating the percentage of emissions from HDVs per year:

Table 4: HDV Emissions Proportion

Year	LDV Emissions	HDV Emissions	HDV Proportion
2020	994723199	476967683	0.3240950
2019	1168247081	489602417	0.2953238