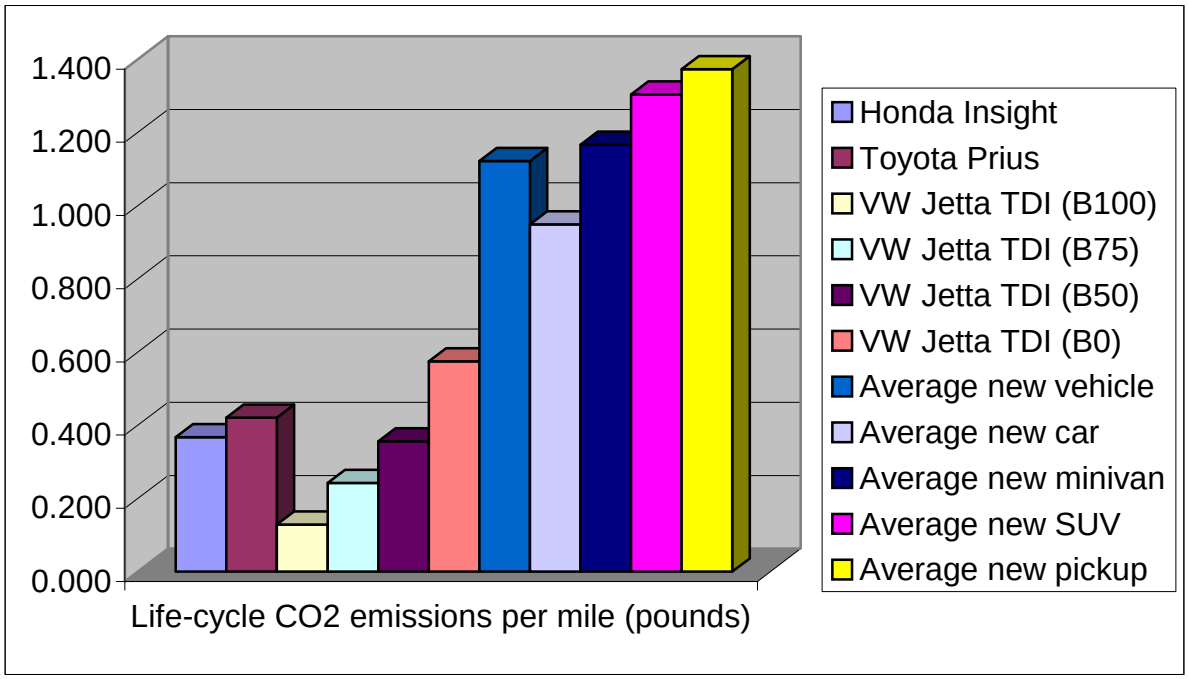
Life-Cycle CO_2 Emissions for Various New Vehicles

based on use of

- **gasoline with 10% ethanol blend for gasoline-powered vehicles**
- **biodiesel of varying blends (0 to 100%) for VW Jetta TDI (diesel)**



Life-cycle CO_2 emission factors (pounds per gallon)*:

Gasoline:	24.30	Diesel:	26.55
Ethanol:	14.60	Biodiesel:	5.84

*Combustion of gasoline yields 19.564 pounds of CO_2[1]. However, the life-cycle CO_2 emissions are greater because fossil fuel is used to extract, transport, and refine petroleum into gasoline. The "energy balance" (units of usable energy per unit of fossil fuel input) is estimated at 0.805[2]; thus the life-cycle CO_2 emissions per gallon of gasoline burned in a vehicle engine are 19.564 pounds/0.805 = 24.30 pounds. Similarly, diesel combustion yields 22.384 pounds of CO_2, and diesel has an energy balance of 0.843, so life-cycle CO_2 emissions per gallon of diesel burned in a vehicle engine are 22.384 pounds/0.843 = 26.55 pounds.

A detailed study by the U.S. Department of Energy and the U.S. Department of Agriculture[3] estimated a 78% reduction in life-cycle CO_2 emissions for biodiesel compared to regular diesel fuel taking into account all fossil fuels used in the production, transport, and processing of soybeans into biodiesel fuel. Life-cycle CO_2 emissions, per gallon, for biodiesel are thus estimated at 26.55 pounds*0.22 = 5.84 pounds.

Estimates of life-cycle CO_2 emissions for ethanol produced from corn vary, but a recent, reputable estimate[2] of the energy balance for corn-based ethanol is 1.34, and life-cycle CO_2 emissions, per gallon, for ethanol are thus estimated at 19.564 pounds/1.34 = 14.60 pounds.

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[1] Energy Information Administration, U.S. Dept. of Energy, "Fuel and Energy Source Codes and Emission Coefficients," http://www.eia.doe.gov/oiaf/1605/coefficients.html.

[2] U.S. Dept. of Agriculture, "The Energy Balance of Corn Ethanol: An Update," July 2002, http://www.usda.gov/oce/oepnu/aer-814.pdf.

[3] U.S. Dept. of Energy and U.S. Dept. of Agriculture, "Life Cycle Inventory of Biodiesel and Petroleum Diesel for Use in an Urban Bus," 1998, http://www.nrel.gov/docs/legosti/fy98/24089.pdf