The 'Carbon Footprint' of Daily Travel

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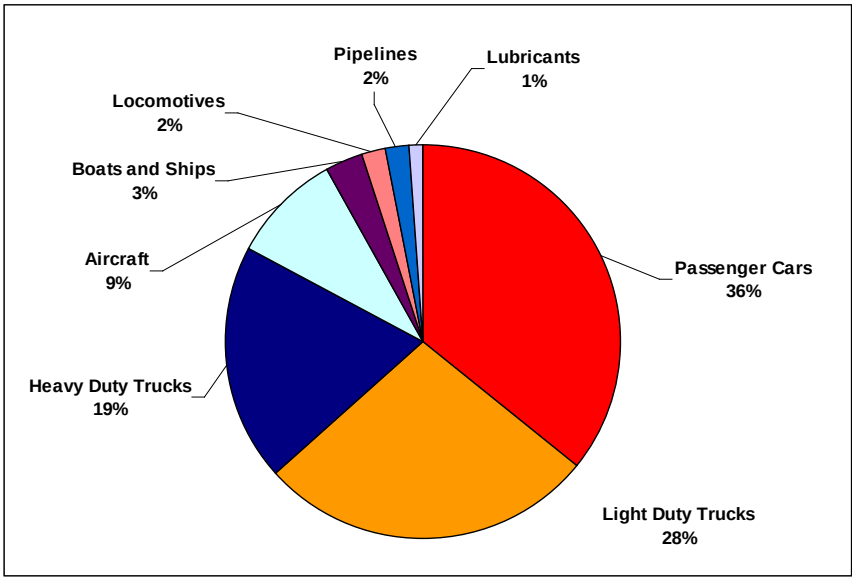
Any process that burns fossil fuel releases carbon dioxide (CO_2), a greenhouse gas, into the air. Carbon dioxide accounts for over 80 percent of total greenhouse gas emissions in the United States, and transportation sources account for nearly one-third of that total. Methods used to decrease toxic pollutants, such as requiring unleaded gasoline and catalytic converters, have no effect on the amount of CO_2 produced by vehicle travel.

Fuels used for transportation vary in the amount of carbon released, with jet fuel and diesel releasing more carbon per gallon burned than regular gasoline. Overall, 'on-road' sources of CO_2 from transportation (trucks, buses, passenger cars) account for over 80 percent of emissions, as shown in Figure 1.

Figure 1 – Percent of CO2 from Transportation Sources

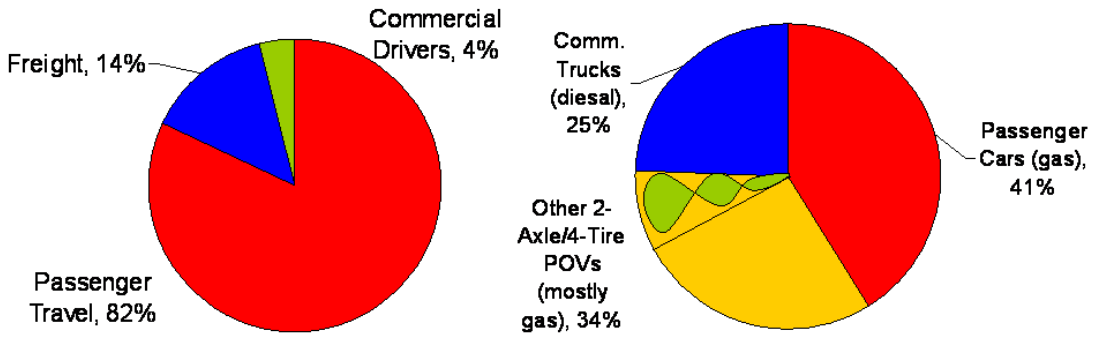


Source data: Green House Gas Emissions from the US Transportation Sector, 1990-2003 www.epa.gov, author's graphic

Travel generated by US households in private vehicles; commuting, shopping, visiting friends and recreational travel; accounts for over 80 percent of all vehicle miles on the nation's roadways, and about three quarters of the CO_2 emissions, as shown in Figure 2. These estimates are based on analysis of Highway Statistics VM-1 2008, and the National Household Travel Survey (NHTS). For this analysis, gasoline was estimated at 8.8 Kg CO_2 per gallon and diesel at 10.1 Kg CO_2 per gallon. It should be noted that some of the

vehicles counted as 'Other 2-axle/4-tire POVs' may burn diesel fuel, which would increase the amount of CO_2 from this vehicle class.

Figure 2 – Estimated Miles and CO_2 Emissions from Commercial and Private Travel



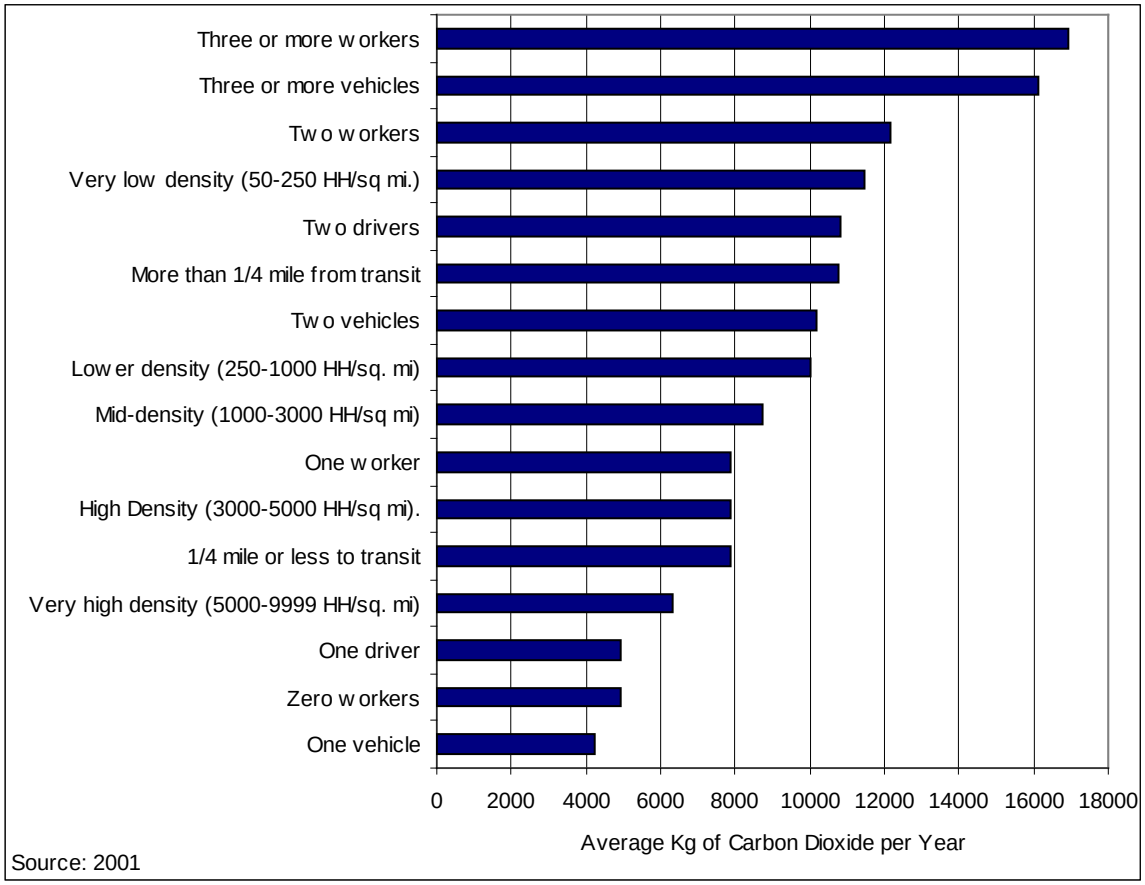
Passenger travel accounts for 82% of VMT and about 75% of CO_2

Source: Author's analysis of NHTS and Highway Statistics VM-1 2008

For any individual household, the 'carbon footprint' of daily travel is based the types of vehicles that household owns, how many miles each vehicle is driven, and each vehicle's fuel efficiency. For example, households in very low density development (rural families) own twice as many vehicles as households in high density areas – and these are likely to be less efficient vehicles like pick-up trucks. In fact, 37 percent of rural households own or lease a pick-up truck compared to 17 percent of households overall. Rural families also drive more miles than suburban and urban households with average annual vehicle miles traveled (VMT) of 28,238, well above the average of 21,187 for all households. The lower fuel efficiency of pick-ups combined with a greater VMT translates into a greater 'carbon footprint' for daily travel for rural families. As a result, households in very high density areas (urban areas of 5000-9999 households per square mile) produce about half the CO_2 than households in very low density areas (rural areas of 0-50 households per square mile).

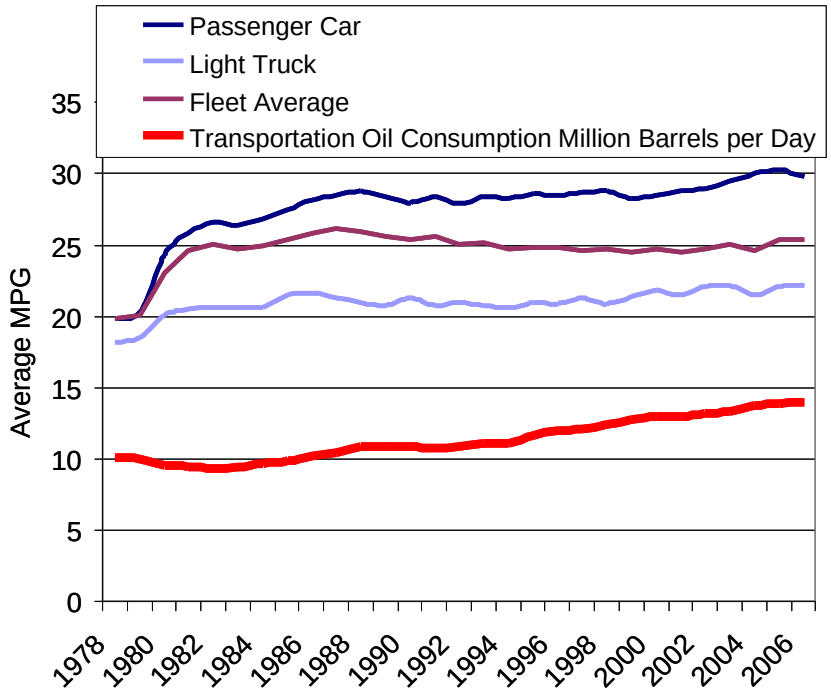
But many other factors, including socio-economic and land-use characteristics, affect the amount of CO_2 emissions by households. Figure 3 shows a ranking of households by some factors that effect the miles driven, or are correlated to the number and type of vehicles owned, and therefore significantly effect CO_2 emissions from travel. These categories are not exclusive, e.g. a single household can have "Three or more vehicles' and also have 'Two workers'. In general, households with more workers and more vehicles travel more miles, which emits more CO_2 than households with fewer vehicles and fewer workers. Importantly, Figure 3 also shows that distance to transit is related to carbon emissions--households very close to transit lines produce about one-quarter less CO_2 than households not near transit

Figure 3 –Ranking of Estimated Average CO_2 Emissions by Households per Year



One way to decrease green house gas emissions from daily travel is to increase the fuel efficiency of the passenger fleet. Fuel economy standards for passenger vehicles were first set in 1975, after oil embargoes initiated by OPEC created a gas shortage in the U.S. At that time Congress set a goal to double the fuel economy of passenger cars by 1985. As a result, passenger car fuel economy peaked in 1987 at 26.2 mpg.

Since 1987 however, fuel economy of the passenger fleet has slightly declined (see Figure 4)—largely as a result of the influx of 'light-duty trucks" (SUVs, pick-ups, and Vans) into the fleet. The average passenger vehicle increased in size from 3,220 pounds to 4,066 lb, and the percent of light trucks increased from 28% to 53% of the private vehicle fleet.



Source: Light-Duty Automotive Technology and Fuel Economy Trends:1995 through 2007, Compliance and Innovative Strategies Division and Transportation and Climate Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency.

Recently, concerns about energy independence and green house gas emissions are shaping policy again. Last year, a barrel of oil sold at a record high of $147 and a gallon of gas topped $4. The Energy Independence and Security Act of 2007 requires in part that automakers boost fleetwide gas mileage to 35 mpg by the year 2020. This requirement applies to all passenger automobiles, including "light trucks."

It is important to note that beginning with 2008 models, fuel economy estimates will be based on new test methods, which EPA finalized in December 2006. The new methods account for actual driving conditions that can lower fuel economy, such as high speed, aggressive driving, use of air conditioning, and cold temperature operation. Because of the new methods, the estimates for most 2008 models will be lower than their 2007 counterparts.

In addition, the recent economic downturn may encourage people to use or buy more fuel efficient vehicles, which will effect both energy use and carbon emissions. Importantly, the preliminary 2009 NHTS shows that passenger cars are a larger share of newer vehicles (0-2 years old), perhaps reversing a long-term trend toward the increasing number of larger and less fuel efficient vehicles. On the other end of the age spectrum, more SUVs, pick-up trucks, and Vans aged into the 10 years and older category.

Current policies focus on ‘cash for clunkers’ for a reason. The aging fleet has many consequences, for instance the longer lead time for introducing new technology and safety equipment, but also effects fuel use and green house gas emissions. Importantly,

according to the most recent data available, older vehicles (those 10 years and older) accounted for 39 percent of all vehicles and just 29 percent of all vehicle miles, but because of the generally lower fuel efficiency accounted for 42 percent of the gas consumption and CO2 emissions. Replacing those older vehicles with newer, more fuel efficient cars will help improve fleet fuel efficiency and reduce carbon emissions.

What Makes a Difference?

Sharing a ride. Each day American workers commute 166 million miles. If every worker in a two-worker family shared a ride to work, we would save 27.3 million kg of carbon emissions every day.

Walking or biking. Overall, American adults travel 25 million miles a day in trips of a half mile or less, of which nearly 60 percent are vehicle trips. If people walked instead of drove for these short trips, we would save 10.6 million kg of carbon emissions a day.

Linking trips together. Being efficient about planning travel can reduce the carbon footprint of travel too. Every time workers link a shopping or errand stop into their commute instead of coming home and going out again, they save 2.5 kg of carbon emissions. With 145 million workers in the US, this could add up to over 380 kg of carbon each workday.

Taking transit. Less than one out of ten workers who live and work near transit actually take transit to work. For those that do, the carbon savings are substantial. Workers who take transit reduce their driving-related carbon emissions by 10.6 kg of carbon each workday.

Choosing a fuel-efficient vehicle. The average American household has more than one vehicle. Drivers could halve their carbon impact by driving a car that gets 30 mpg versus a pick-up or SUV that averages 15 mpg. Switching to an efficient vehicle would save the average driver over 3500 kg of carbon emissions per year.

For more information on the data used in this article, visit:

http://ornl.nhts.gov
or
www.travelbehavior.us