Personal Transportation

In the U.S., the predominant mode of travel is by automobile and light truck, accounting for about 87% of passenger miles traveled in 2019.[1] The U.S. has less than 4% of the world's population, but has 12% of the world's cars, compared to 18.7% in China, 6.0% in Japan, 4.5% in Germany, and 4.8% in Russia.[2,3] The countries with the most growth in registered cars since 1990 are China, India, and Indonesia, with average change of 18%, 9.8%, and 9.8%, respectively.[3] The transportation consumption patterns that follow indicate that the current system is unsustainable.

Patterns of Use

Miles Traveled

- Total U.S. passenger miles traveled in 2019 were 5.6 trillion.[1]
- U.S. population increased 34% from 1990 to 2021. Vehicle miles traveled (VMT) increased 52% over the same time period.[1,2,4]
- 70% of the total annual vehicle miles traveled in the U.S. occur in urban areas.[1]

Vehicles and Occupancy

- In 1977, the U.S. average vehicle occupancy was 1.87 persons per vehicle.[5]
- In 2018, average car occupancy was 1.5 persons per vehicle.[3]
- In 2019, the U.S. had 276 million registered vehicles and 229 million licensed drivers.[1]
- In 2017, 24% of U.S. households had three or more vehicles.[6]

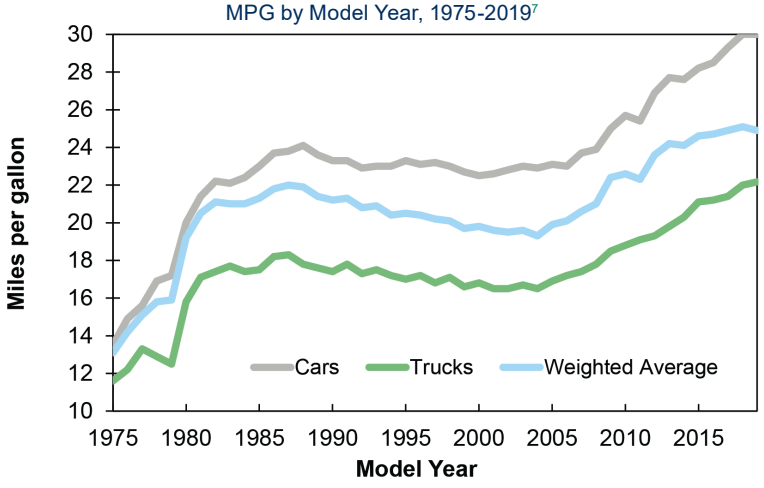
Average Fuel Economy

- The average vehicle fleet fuel economy peaked at 22.0 miles per gallon (mpg) in 1987, declined until the early 2000s, then increased again surpassing 22.0 mpg in 2009.[7]
- The average fuel economy for a 2019 model year vehicle was 24.9 mpg: 30.0 mpg for a new passenger car (sedan/wagon and car SUV) and 22.2 mpg for a new truck (truck SUV, minivan/van, and pickup).[7]
- Given the legislation in place, the U.S. has some of the lowest fuel economy standards of any industrialized nation, well below the European Union, China, and Japan.[8]

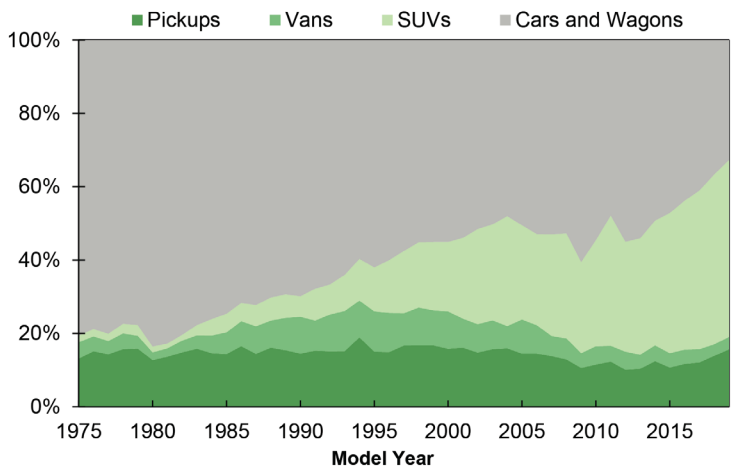
Vehicle Size

- From 1989 to 2019, average vehicle weight increased 24% (due to SUV market share growth), horsepower increased by 90%, and acceleration increased (i.e., 0-60 mph times dropped) by 37%.[7]
- During the same period, the average weight of a passenger car increased 13%, while the average weight of a pickup truck increased by 34%.[7]
- SUVs, vans, and pickups accounted for 56% of new vehicles sold in the U. S. in 2019.[7]
- A study from the University of Michigan recommends following green lightweighting principles to reduce vehicle mass and improve energy efficiency.[9]

MPG by Model Year, 1975-2019[7]



Market Share by Vehicle Type, 1975-2019[7]



Energy Use

- The transportation sector makes up 26% of total U.S. energy use. Since 1990, the energy use in the transportation sector grew by 8.5%, though the share of U.S. energy used for transportation increased by less than 1 percent.[3]
- In 2018, American cars and light trucks used 15.2 quadrillion Btus of energy, representing 15% of total U.S. energy consumption.[3]
- In 2020, 95% of total primary energy used for transportation came from fossil fuels; 91% of total primary energy was from petroleum.[10]
- The transportation sector accounted for 29% of U.S. greenhouse gas emissions in 2019—1,876 million metric tons CO_2e.[11]
- In 2019, passenger cars and light-duty trucks were responsible for 762 million metric tons CO_2e and 323 million metric tons CO_2e, respectively, together making up 58% of U.S. transportation emissions and 17% of total U.S. emissions.[11]

Life Cycle Impacts

A typical passenger car is responsible for various burdens during its lifetime (raw material extraction through end-of-life). Most of these impacts are due to fuel production and vehicle operations. Vehicle lifetime energy use for fuel production and vehicle operations is 1.22 and 4.54 MJ/mi, respectively, while energy use for material production, manufacturing, maintenance, and end-of-life combined is only 0.56 MJ/mi.[12]

Total Life Cycle Burdens, 2014 Mid-Size Sedan[12]

Environmental Flow	Per Mile (g)
CO_2	424
CO	2.89
SO_x	0.21
NO_x	0.30
VOC	0.56
Methane	0.54
GHG	445
Energy	6.32 MJ

Solutions and Sustainable Alternatives

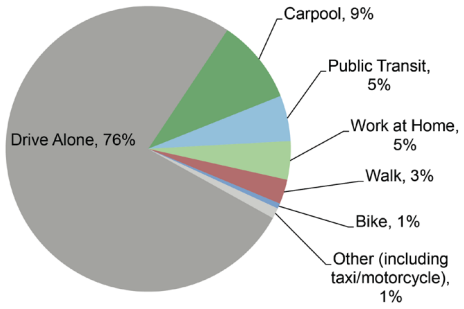
Reduce Vehicle Miles Traveled

- Live closer to work. Driving to/from work represents 30% of vehicle miles driven, and the average commute is 12 miles.[3] Consider telecommuting or working from home.
- In 2019, 76.3% of workers in the U.S. commuted by driving alone, and only 9% of workers carpooled (a drop from 19.7% in 1980).[3] Joining a carpool can help lower household fuel costs, prevent GHG emissions, and reduce traffic congestion.
- Roughly one-fifth of vehicle trips are shopping-related. Combine errands (trip chaining) to avoid unnecessary driving.[3]
- In 2019, traffic congestion caused Americans to spend an extra 8.7 billion hours on roads and buy an additional 3.5 billion gallons of gas. Using alternative modes of transportation, such as bikes, buses, or trains can reduce GHG emissions and decrease wasted time and money.[13]
- Micromobility (e.g., bikes, scooters, etc.) and shared transportation services (e.g., bike shares) have grown rapidly in recent years. In 2019, 136 million trips were taken by shared micromobility users.[3]

Promote Energy Efficiency

- Consider buying a vehicle that is best-in-class for fuel economy. Each year, the U.S. Environmental Protection Agency and Department of Energy jointly publish the Fuel Economy Guide, which ranks the most efficient vehicles in production.[14]
- Drive responsibly. Aggressive driving habits can lower fuel efficiency by 10% to 40%, and speeds over 50 mph significantly lower gas mileage.[15]
- Gallons per mile (gpm) is a better indicator of fuel efficiency than mpg. For example, upgrading from a 16 mpg to 20 mpg vehicle saves 125 gallons of fuel over 10,000 miles, whereas upgrading from a 34 to 50 mpg vehicle saves 94 gallons over 10,000 miles.[16]
- Improvements in information technology related to vehicles such as automation and platooning will likely reduce energy wasted from drivers stuck in traffic.[17]
- When driving electric vehicles, use best battery charging practices to maximize battery life and minimize GHG emissions.[18]

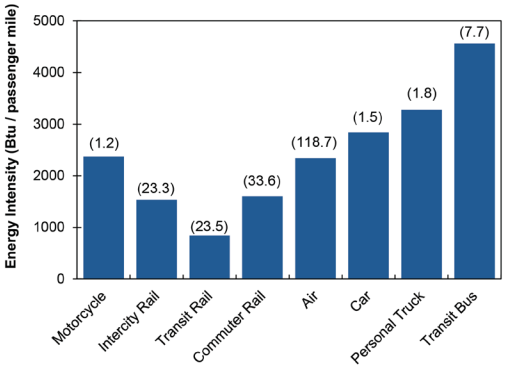
U.S. Modes of Transportation to Work[3]



Encourage Supportive Public Policy

- Dense, mixed-use communities encourage foot and bike travel while reducing time between residences, businesses, and office spaces.
- In 2010, the U.S. EPA and National Highway Traffic Safety Administration (NHTSA) set Corporate Average Fuel Economy (CAFE) standards that were set to raise fuel economy to 54.5 miles per gallon by 2025, saving billions of dollars in gas and avoiding millions of metric tons of CO_2 emissions.[19,20] In 2020, CAFE standards were replaced with lower targets in the Safer Affordable Fuel-Efficient (SAFE) rule. SAFE rules require vehicle manufacturers' new passenger car and light-duty truck fleets to increase efficiency by 1.5% annually, reaching 201 g/mi CO_2 and 40.5 mpg by 2030.[21] In 2021, NHTSA assessed the Safe I Rule and has proposed repealing the rule in favor of establishing regulations that align with the Energy Policy and Conservation Act (EPCA).[22]
- Some believe that fuel economy standards tied to vehicle size could incentivize a market shift toward larger vehicles, a trend we see currently. A University of Michigan study predicted vehicle footprint increases of 2-32%, which could undermine the progress made in fuel economy by 1-4 mpg.[23]

Energy Intensity of U.S. Passenger Travel, 2018[3]
(With average persons per vehicle in parentheses)



1. U.S. Department of Transportation (DOT), Federal Highway Administration (FHWA) (2021) Highway Statistics 2019.
2. U.S. Central Intelligence Agency (CIA) (2021) The World Factbook.
3. U.S. Department of Energy (DOE), Oak Ridge National Lab (2021) Transportation Energy Data Book Edition 39.
4. U.S. Census Bureau (2000) Intercensal Estimates of the United States Resident Population by Age and Sex: 1990-2000.
5. U.S. DOT (1981) Vehicle Occupancy: Report 6, 1977 National Personal Transportation Study.
6. U.S. DOT (2019) 2017 National Household Travel Survey.
7. U.S. Environmental Protection Agency (EPA) (2021) The 2020 EPA Automotive Trends Report.
8. International Council on Clean Transportation (2020) Passenger vehicle fuel economy.
9. Lewis, G., et al. (2019) Green Principles for Vehicle Lightweighting
10. U.S. Energy Information Administration (EIA) (2021) Monthly Energy Review August 2021.
11. U.S. Environmental Protection Agency (EPA) (2021) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019.
12. Argonne National Laboratory (2020) The Greenhouse gases, Regulated Emissions, and Energy use in Technologies Model (GREET) 2020.
13. Schrank, D., et al. (2021) 2021 Urban Mobility Report. Texas Transportation Institute.
14. U.S. DOE and U.S. EPA (2021) Fuel Economy Guide.
15. U.S. DOE, Energy Efficiency and Renewable Energy (2018) "Driving More Efficiently."
16. Larrick, R. and J. Soll (2008) "The MPG Illusion." Science, 320(5883): 1593-94.
17. Shoup, D. (2006) Cruising for parking. Transport Policy, 13(6): 479-486.
18. Woody, M., et al. (2021) Charging Strategies to Minimize Greenhouse Gas Emissions of Electrified Delivery Vehicles
19. U.S. National Highway Traffic Safety Administration (NHTSA) and U.S. EPA (2010) Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule. Federal Register, 75:88.
20. The White House Office of the Press Secretary (2012) "Obama Administration Finalizes Historic 54.5 MPG Fuel Efficiency Standards."
21. National Highway Traffic Safety Administration (NHTSA) and U.S. EPA (2020) The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks ; Final Rule. Federal Register, 85:84.
22. NHTSA (2021) "Corporate Average Fuel Economy (CAFE) Preemption." Federal Register, 86:90.
23. Whitefoot, K. S., & Skerlos, S. J. (2012) Design incentives to increase vehicle size created from the U.S. footprint-based fuel economy standards. Energy Policy, 41, 402–411.

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