# Carbon Footprint

A carbon footprint measures the total greenhouse gas (GHG) emissions—direct and indirect—associated with an individual, organization, product, or event[1] across all stages of its lifecycle: from material extraction and manufacturing to use and disposal. Common GHGs include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Because these gases differ in how strongly they trap heat, emissions are expressed in carbon dioxide equivalents (CO_2e), using each gas's global warming potential (GWP) as a conversion factor (See Greenhouse Gases Factsheet).[1] The U.S. per capita carbon footprint (17.6 t CO_2e/yr) in 2023 was more than twice the global average (6.6 t CO_2e/yr).[2]

Sources of Household Emissions

Household consumption indirectly accounts for over 70% of total U.S. emissions.[3,4] An average U.S. household has a carbon footprint of 48 t CO_2e/yr,[3] 30% of this is from transportation.[63] 16–20% of household emissions are from overseas production—household goods (China), fuel (Canada), and food (Mexico).[4]

Average U.S. Household Emissions per year[63]
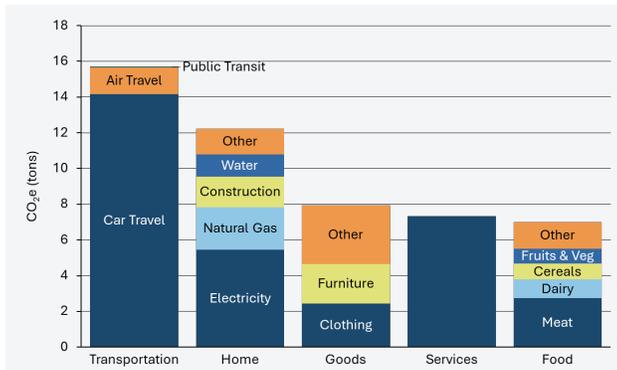
Transportation (Personal Transportation Factsheet)

- The average passenger car emits 0.67 lbs of CO_2e per mile driven.[6] Over its lifetime, a gasoline car emits about 66,000 lbs of CO_2e—84% comes from driving.[7] In 2022, cars and light trucks generated 16% of total U.S. emissions (1.03 Gt CO_2e).[8] See Electric Vehicle Factsheet for GHG emissions from ICEVs and EVs.

- In 2019, annual per capita miles driven reached 9,937.[9]

- Fuel economy rose 40% from 2005–2023, reaching an average of 28 mpg by 2024.[6] Driving at the speed limit boosts fuel economy by 7–14%, every 5 mph over 50 is equivalent to paying an additional $0.27–$0.54/gal.[10]

- Commercial aircraft emitted 130.8 Mt CO_2e in 2022; emissions vary by aircraft type, trip length, and load.[8] A domestic flight emits 0.41 lbs of CO_2e per passenger mile.[8,11]

- Domestic air travel fuel efficiency (passenger miles/gal) rose 112% since 1990 due to increased occupancy.[11]

- Rail transportation emitted 35.6 Mt CO_2e in 2022, 2% of U.S. transportation emissions.[8]

Household Energy (Residential Buildings Factsheet)

- Each kWh generated in the U.S. emits 0.8 lbs of CO_2e.[12] Coal emits 2.25 lbs/kWh, petroleum 1.43, and natural gas 0.86.[8]

- Nuclear, solar, wind, and hydro produce no CO_2 but have upstream emissions from material production and infrastructure (e.g. solar cells, nuclear fuels).[13]

- Residential electricity use generated 582.2 Mt CO_2e in 2022—9.2% of U.S. total.[8] Heating and cooling account for 41% of energy used in U.S. residential buildings in 2024.[14]

- Electricity used washing clothes emits 2.6 Mt CO_2e/yr.[15,16] Switching to cold water for just one load per week can cut household emissions by 70 lbs of CO_2e/yr.[17]

- Electronics in standby mode account for 5–10% of residential energy use—costing the average U.S. home $100/yr.[18]

Goods and Services

- The average American buys 53 clothes items a year,[19] producing emissions equivalent to driving almost 3000 miles.[20,21] The U.S. has the highest fashion carbon footprint at 132 Mt CO_2e/yr—90% of these emissions occur overseas.[22]

- A piece of furniture emits 9–270 kg CO_2e,[23] 50-80% is from materials. Buying refurbished cuts emissions by up to 85%.[24]

- Health care is the most carbon-intensive U.S. household service, emitting 1,692 kg CO_2e per capita in 2018—the highest among industrialized nations. 70% of emissions came from supply chains (pharmaceuticals, medical devices).[25]

- Using streaming services for 12 hours daily can account for over 50% of an individual's GHG emissions.[26]

Food (U.S. Food System Factsheet)

- Agriculture is responsible for 50% of CH_4, 66% of N_2O, and 3% of CO_2 emissions.[27] Food makes up 10–30% of a household's emissions, often more in low-income households.[3]

U.S. GHG Emissions, 2021[33]
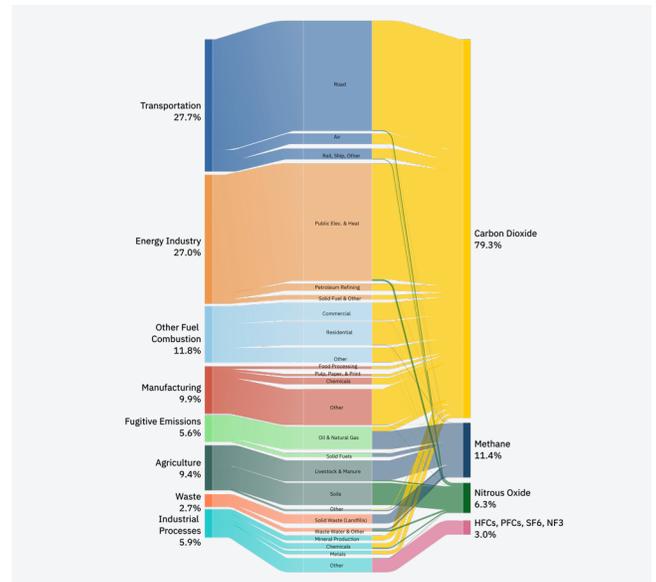
See Carbon Footprint Factsheet online for full-size image.

- Production accounts for 68% of food emissions; 27% comes from retail, restaurants, and wholesale. Transport accounts for just 5%—dietary choices have greater impact.[28,62]
- Meats like beef produce 36 times more GHG per g of protein than plant-based products;[29] most energy from feed is lost, and ruminants like cows emit CH_4 through manure.[30] Chicken produces 4.2 g CO_2e/kg, 7 times less than beef.[31]
- High-emission diets (top 20%) emit 8 times more GHGs than low-emission diets (bottom 20%), accounting for 46% of diet-related emissions.[5]
- Changes in U.S. eating habits cut diet-related GHG emissions by over 35% from 2003–2018.[32]
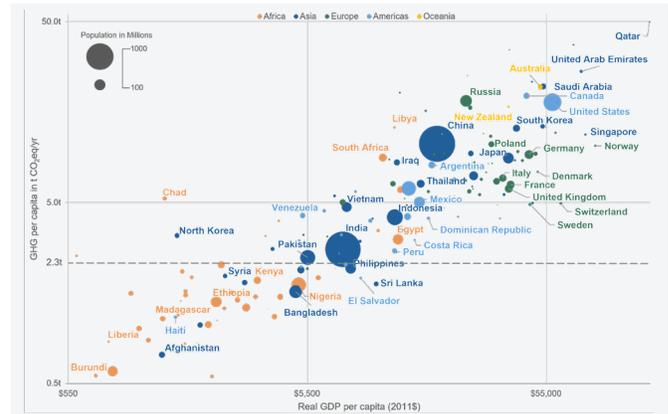
Sources of Institutional Emissions

Capital and Infrastructure

- Capital assets cause 75% of emissions for the richest 10%.[34]
- Embodied carbon from construction materials accounts for 11% of global carbon emissions.[35] Every $1B spent on infrastructure generates 1 Mt of embodied carbon.[36]
- U.S. commercial buildings emit 725 Mt CO_2/yr.[37] Data centers alone emit 105 Mt CO_2e/yr,[38] projected to double by 2030.[39] See Commercial Buildings Factsheet.
- Industrial machinery production accounts for 8% of global CO_2 emissions.[40]

Military

- Militaries contribute 5.5% of global GHG emissions,[41] mostly from supply chains and procurement, not operations.[42]
- NATO's military activities in 2023 resulted in 233 Mt CO_2e. The U.S. accounts for ⅔ of these emissions.[43]
- Rearmament efforts risk breaching the Paris Agreement—below 1.5 °C warming—by 2027. A 1% GDP increase in NATO military spending raises emissions by 200 Mt CO_2e/yr.[44]
- If NATO meets the 2% GDP military spending goal by 2028, its military's carbon footprint would be 2 Bt CO_2e/yr—surpassing emissions from all but the top 3 countries (China, India, U.S.)[43]

Global Emissions and Development

- To stay below 1.5 °C warming, world emissions must fall to 2.3 t CO_2 per capita by 2030.[45] This requires countries like the U.S., Canada, and Australia to cut emissions by 80%.[2]
- The U.S. and Canada emit twice as much per capita as other G7 countries. Countries with similar population to the U.S. (Brazil, Nigeria, Indonesia) emit 2 times less CO_2e/capita.[2]
- Fossil-exporting Gulf States like Qatar and UAE are outliers, exceeding 30 t CO_2e/capita.[2]
- The world's richest 10% emit 24 t CO_2e/capita. The richest 1% make up 15% of global emissions (74 t CO_2e/capita), while the poorest 50% account for 7% (just over 1 t CO_2e/capita).[45]

- By 2030, the world's richest 10% will emit 9 times the sustainable per capita level. The richest 1% will emit 30 times the target. The bottom 50% will emit about 1 t CO_2e/capita.[45]

GHG Emissions per capita by GDP per capita[2,46]

Solutions and Sustainable Actions

Ways to Reduce Your Carbon Footprint

- Walk, bike, carpool, use transit, or drive best-in-class vehicles.[47]
- Make your house more energy efficient. Through 2032, get tax credits covering 30%—up to $3,200/yr—for energy-efficient upgrades, plus another 30% for clean energy systems like solar, geothermal, and batteries.[48] Continued availability of these credits depends on congressional action.[49]
- Switching from incandescent to LED bulbs saves $200/yr.[50,51]
- Unplug devices or switch off power strips when not in use.[18]
- Purchase secondhand, reusable,[52] or low-emission products to reduce waste. See Municipal Solid Waste Factsheet. Many brands now disclose their products' carbon footprints.[53,54]
- Reduce meat consumption[28] and cut food waste: compost scraps, and donate excess.[55] See U.S. Food System Factsheet.
- Reducing snacks, ready-made food, and soft drinks can cut emissions as much as switching to a plant-based diet.[56]
- Cook at home—restaurant delivery can double emissions.[57] Meal kits may lower GHGs by 33% per meal compared to in-store shopping.[58]
- Solar-reflective roofs can cut home cooling demand by 27%.[59] Using reflective roofs on U.S. commercial buildings could offset 22 Mt CO_2e/yr,[60] equal to shutting 6 coal plants/yr.[61]

Carbon Footprint Calculators

Estimate your personal or household GHG emissions and explore the impact of different techniques to lower those emissions:

- U.S. Environmental Protection Agency
- The Nature Conservancy
- Global Footprint Network