



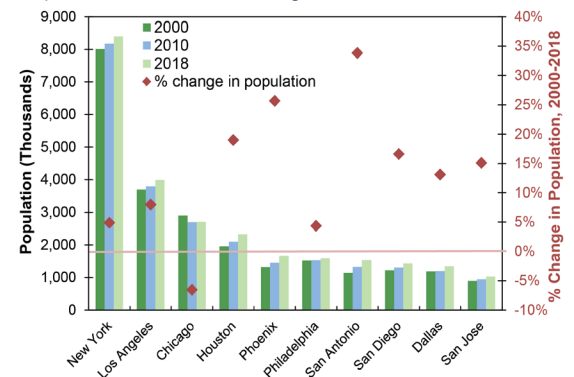
U.S. Cities

Large, densely populated, and bustling with activity, cities are cultural and economic centers, providing employment, leisure, and educational opportunities. Energy and resources flow in and out of cities to support their population and infrastructure. However, there is increasing attention on the environmental impacts of cities, and the significant opportunity for reducing the impact of the built environment and improving the livelihoods of urban residents.

Urban Land Use Patterns

- It is estimated that 83% of the U.S. population lives in urban areas, up from 64% in 1950. By 2050, 89% of the U.S. population and 68% of the world population is projected to live in urban areas.¹
- More than 300 urban areas in the U.S. have populations above 100,000; New York City, with 8.4 million inhabitants, is the largest.^{3,4}
- While the rate of urbanization, i.e., the changing of land from forest or agricultural uses to suburban and urban uses, is decreasing, an ever larger percentage of the world's population is living in urban centers.⁵ Between 2000 and 2010, urban land area in the U.S. increased by 15%. Urban land area is 106,386 square miles, or 3% of total land area in the U.S., and is projected to more than double by 2060.^{6,7}
- The average population density of the U.S. is 90 people per square mile.⁸ The average population density of metropolitan statistical areas (MSA) is 283 people per square mile; in New York City, the population density is 27,012 people per square mile. Guttenberg, New Jersey has the greatest density of housing units (24,195) per square mile of land area.⁶
- One study found that doubling population-weighted urban density reduces CO₂ emissions from household travel and residential energy use by 48% and 35%, respectively.⁹
- Sprawl, the spreading of a city and suburbs into surrounding rural land, increases traffic and energy use, and results in air and water pollution and flooding.¹⁰
- According to Smart Growth America's Sprawl Index (based on development density, land use mix, activity centering and street accessibility), the most sprawling metropolitan regions of the 221 surveyed are Hickory-Lenoir-Morganton, NC, Atlanta-Sandy Springs-Marietta, GA, Clarksville, TN-KY, and Prescott, AZ. The least sprawling metropolitan areas include New York/White Plains/Wayne, NY-NJ, San Francisco/San Mateo/Redwood City, CA, Atlantic City/Hammonton, NJ, and Santa Barbara/Santa Maria/Goleta, CA.¹¹

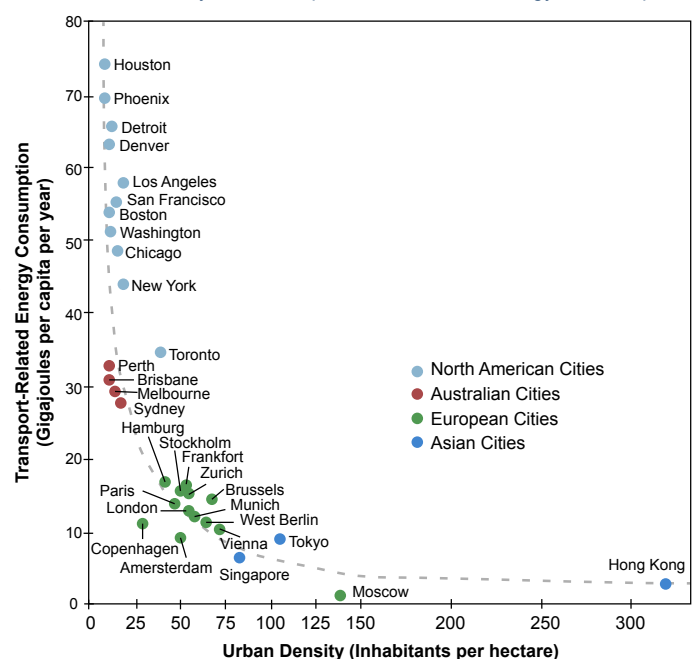
Population Trends of the Largest U.S. Cities, 2000-2018^{2,3}



Built and Natural Environment

- Residential (21.2 Quadrillion Btu; “quads”) and commercial (18.2 quads) sectors accounted for 39% of total energy consumption and 36% (1,907 million metric tons of CO₂) of energy-related emissions in 2018.¹³
- The “urban heat island effect,” in which average annual temperatures are 1.8-5.4°F higher in cities than surrounding suburban and rural areas, results in increased energy demand, air pollution, GHG emissions, and heat-related illness, as well as decreased water quality.¹⁴
- Urban tree canopies decrease the urban heat island effect. Target levels of canopy cover vary regionally and should be created for a specific city taking development densities, land use patterns, ordinances, and climate into account.¹⁵ Urban tree cover in the U.S. is 39.4% and has been declining, while impervious surfaces have expanded to 26.6% of urban areas.⁷
- The Air Quality Index is an important environmental metric monitored in cities. Since 2000, emissions from key pollutants has decreased and, with it, the number of unhealthy air days for urban residents.¹⁶
- Out of 315 contaminants detected in a national tap water quality study, 86 were sprawl- and urban-related pollutants resulting from road runoff, lawn pesticides, and human waste, of which 56 are unregulated.¹⁷
- Vegetation and topsoil loss and the constructed drainage networks associated with urbanization alter natural hydrology.¹⁸
- Stormwater runoff from the built environment is a principal contributor to water quality impairment of water bodies nationwide.¹⁸

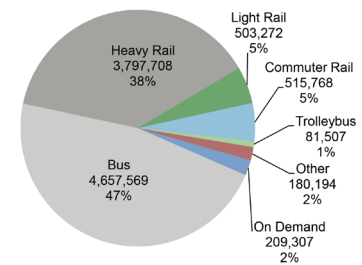
Urban Density and Transportation-Related Energy Consumption¹²



Transportation and Mobility

- In 2018, 55.79 billion passenger-miles (PM) were traveled on U.S. public transit and 3.2 trillion vehicle-miles were traveled (VMT) on U.S. public roads.^{19,20}
- There are 23 light rail systems in the U.S. If current trends continue, fixed-guideway modes of public transit, such as light-rail and commuter rail, will soon have a greater share of passenger trips than roadway modes, such as buses.¹⁹ Without public transportation, the annual impacts in the U.S. would include an additional 102.2 billion VMT, 5.3 billion gallons of gas, and 37 million metric tons of CO₂ emissions.²¹
- Congestion is a serious problem in urban areas, causing an additional 8.8 billion hours of travel time and an extra 3.3 billion gallons of fuel use by urban Americans in 2017.²²
- In 2016, transit buses used 91.6 trillion Btu and traveled 20.2 billion PM, while rail used 46.4 trillion Btu and traveled 39.1 billion PM. In comparison, passenger cars and trucks used 15,303 trillion Btu and traveled 4,406 billion PM.²³
- By number of riders, New York City has the most utilized heavy rail, commuter rail, and bus systems in the U.S., Los Angeles has the most utilized light rail system, and San Francisco has the most utilized trolley bus system.²⁴

Public Transportation Ridership, 2019²⁴
(number of passenger trips)



Socioeconomic Patterns

- U.S. metro economies account for 91.1% of GDP, 91.8% of wage income, and 88.1% of jobs. Only 9 countries (including the U.S.) have a higher GDP than the New York City area.²⁵
- The median household income inside MSAs is \$66,164; outside MSAs it is \$49,867.²⁶ The average unemployment rate of metropolitan areas in March 2020 (pre-COVID 19) was 4.5%, ranging from a low of 2.1% in Honolulu, HI to a high of 20.5% in El Centro, CA.²⁷
- Poverty rates are lower within metropolitan areas than outside: 11.3% compared to 14.7% in 2018.²⁶

Solutions and Sustainable Alternatives

A sustainable urban area is characterized by the preservation of a quality environment, efficient use of renewable energy resources, the maintenance of a healthy population with access to health services, and the presence of economic vitality, social equity, and engaged citizenry.²⁸ An integrated approach to environmental management, measures to counter sprawl, the establishment of linkages among community, ecology, and economy, and coordinated stakeholder interaction are necessary for achieving sustainability in cities.^{28,29}

- The San Francisco-Oakland-Hayward metro region in California placed first on a United Nations' Sustainability Development Goal (SDG) Index ranking based on 57 indicators across 15 of the 17 SDGs.³⁰
- As of May 2020, 1,066 mayors have signed on to the 2005 U.S. Mayors Climate Protection Agreement, committing to reduce carbon emissions below 1990 levels, in line with the Kyoto Protocol.³¹
- A Living Cities Report found that over 75% of the 40 largest U.S. cities surveyed have plans for reducing GHG emissions in the coming years.³² Many cities, including New York, Los Angeles, and Chicago, have created Climate Action Plans, demonstrating environmental leadership and commitment to reducing climate change.³³
- The EPA offers many clean energy programs, information, training opportunities, grants, resources, and tools to assist local governments.
- ICLEI (International Council for Local Environmental Initiatives), an international association of local governments and national and regional local government organizations, develops locally designed initiatives to achieve sustainability objectives.³⁴
- Smart Growth America is a coalition working to improve the planning and building of towns, cities, and metro areas.³⁵
- The U.S. EPA's Local Government Solar Project Portal provides guidance to local governments for community-wide deployment of solar power.³⁶

SDG Index Ranking, 2019³⁰

The Top 10 U.S. City Regions
San Francisco-Oakland-Hayward, CA
San Jose-Sunnyvale-Santa Clara, CA
Washington Metro, DC-VA-MD-WV
Seattle-Tacoma-Bellevue, WA
Madison, WI
Portland-Vancouver-Hillsboro, OR-WA
San Diego-Carlsbad, CA
Boston-Cambridge-Newton, MA-NH
Austin-Round Rock, TX
Raleigh, NC

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