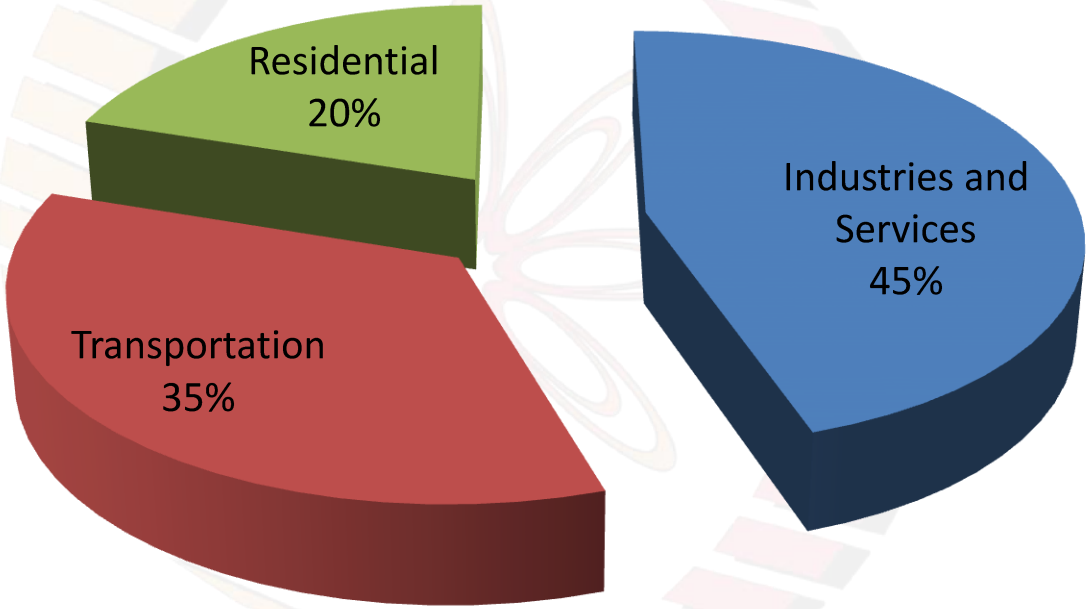
Energy Consumption

Learning objectives:

1)To become aware of the consumption pattern of energy across sectors
2)To become aware of energy usage across nations and their populations

Energy consumption by sector



Data Source: Key World Energy Statistics 2017; International Energy Agency (IEA)

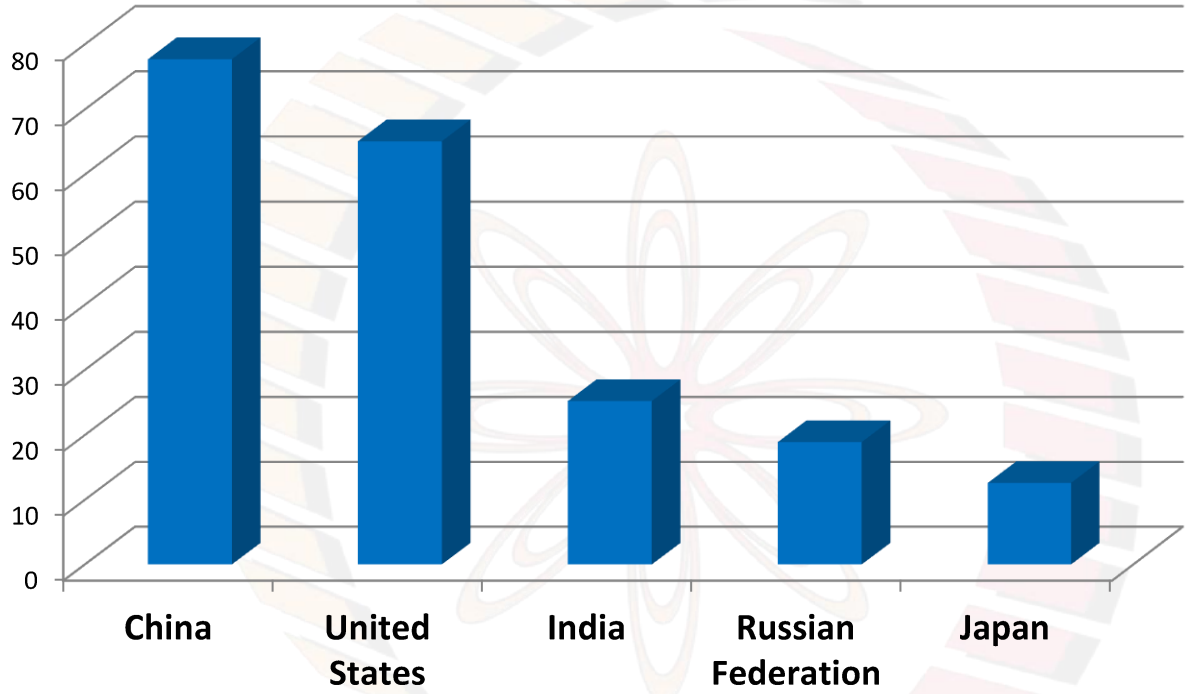
Energy Poverty

17% Lack access to electricity
38% lack access to clean cooking facilities

95% of these people live in Sub Saharan Africa, or Asia
80% of these are in Rural Areas

http://www.iea.org/topics/energypoverty/

Top 5 Nations based on Total Energy Consumption (Annual)

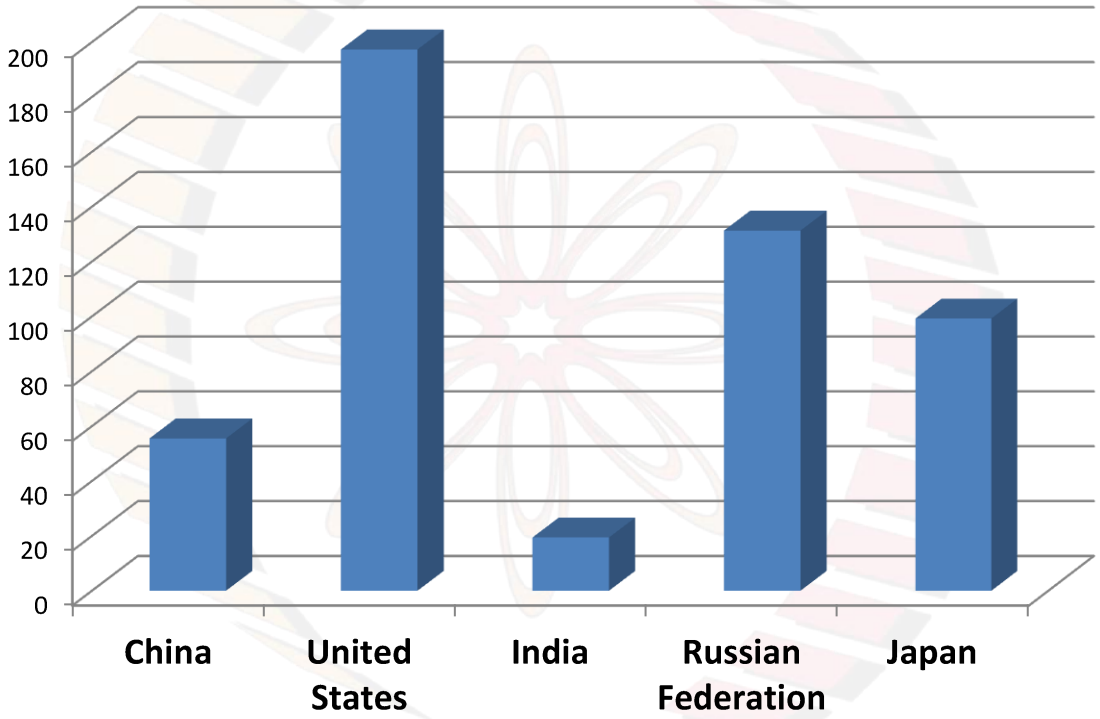


Humans use 500 Exa Joules of energy annually

1 Exa Joule = 10^{18} Joules

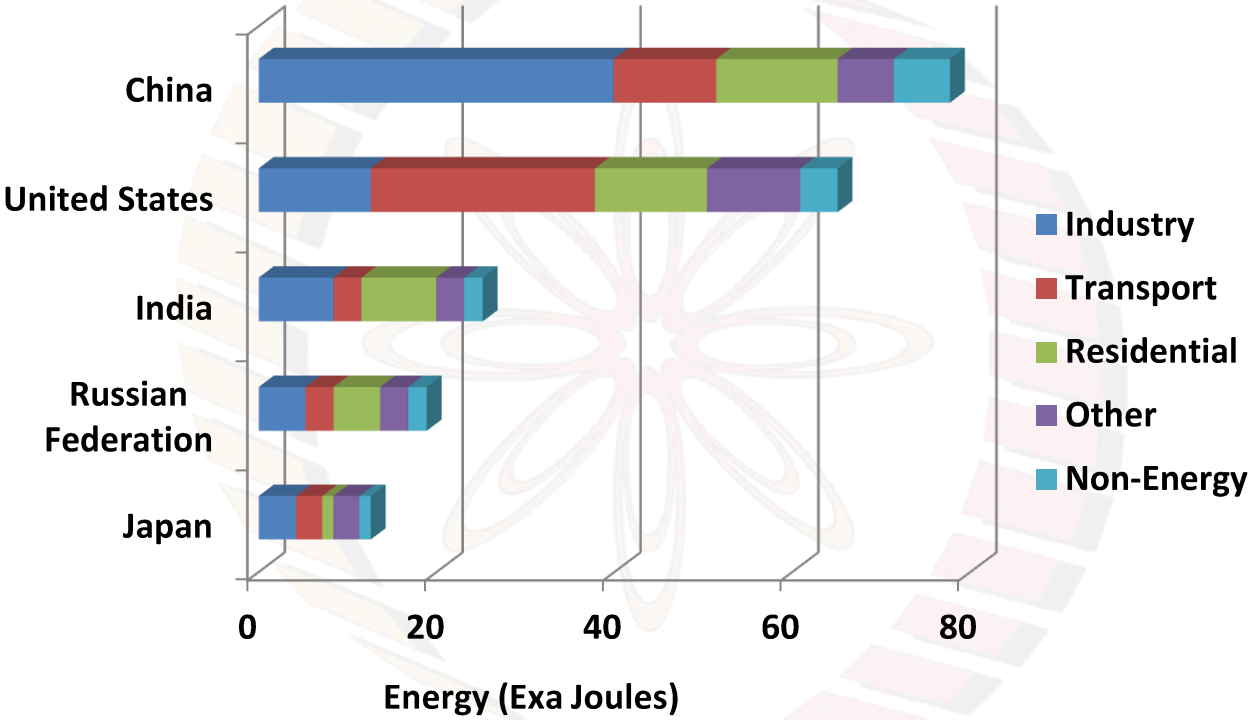
Data Source: Key World Energy Statistics 2017; International Energy Agency (IEA)

Per Capita Energy Consumption (Annual)



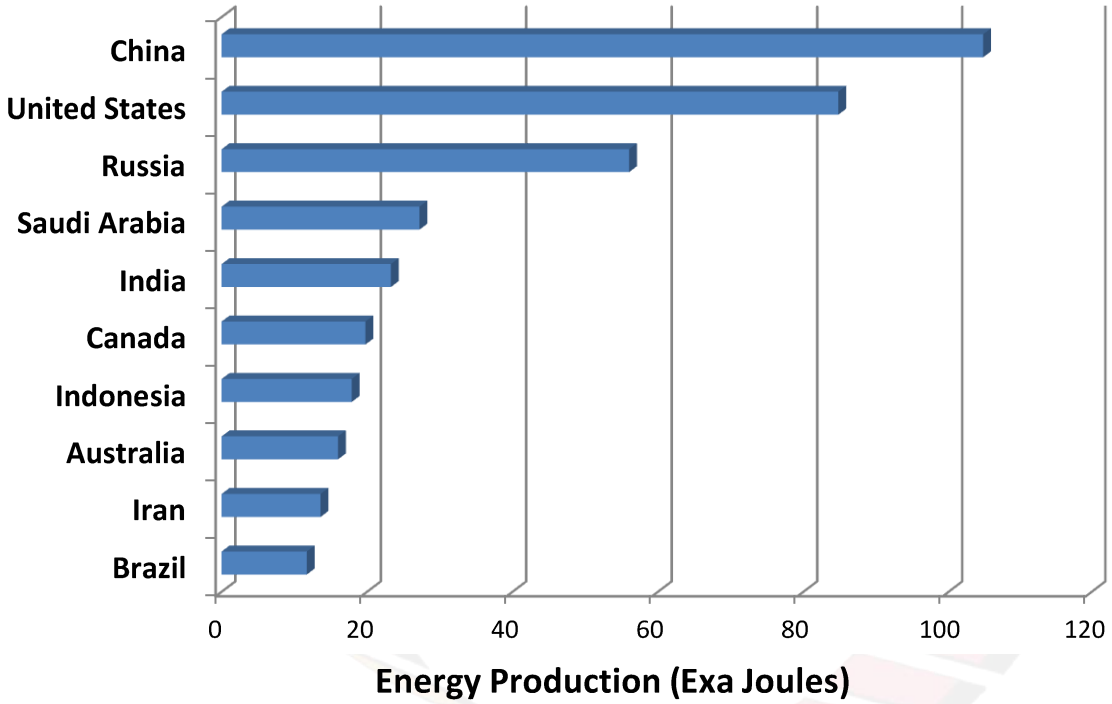
Data Source: Key World Energy Statistics 2017; International Energy Agency (IEA)

Top 5 Nations based on Total Energy Consumption (Annual)
Sector wise distribution



Data Source: Key World Energy Statistics 2017; International Energy Agency (IEA)

Top 10 Nations based on Total Energy Production (Annual)



https://www.iea.org/statistics/statisticssearch/
2015 data

10^{18}

World energy usage per year : 500 exa joules

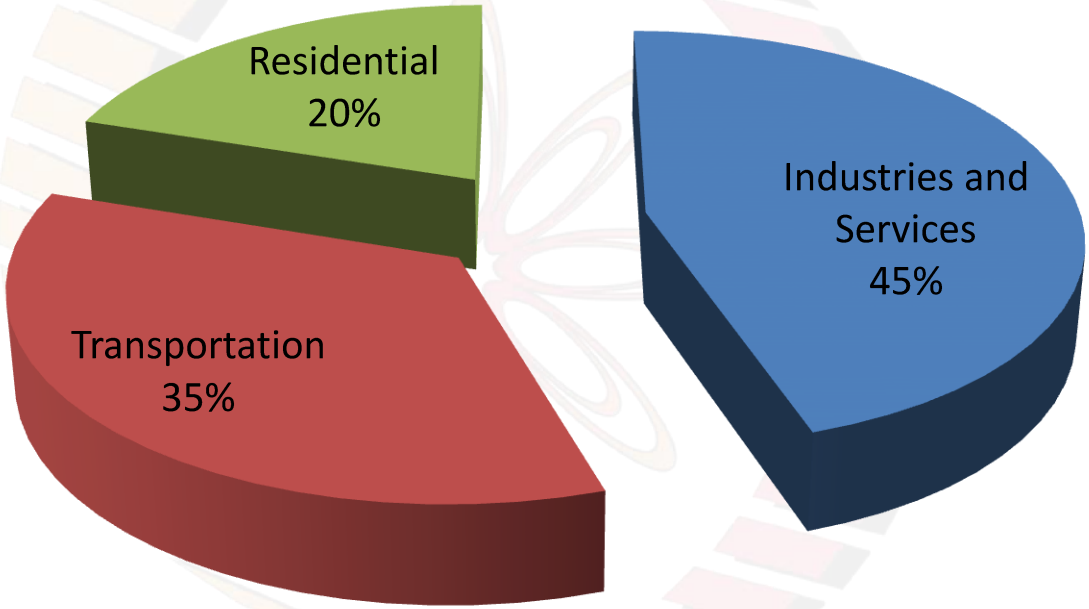
Image Credit NASA

Details of Energy usage in each sector

Learning objectives:

1)To become aware of the details of consumption within each sector
2)To become aware of sector wise scope for improved energy efficiency

Energy consumption by sector



Data Source: Key World Energy Statistics 2017; International Energy Agency (IEA)

Industrial sector:

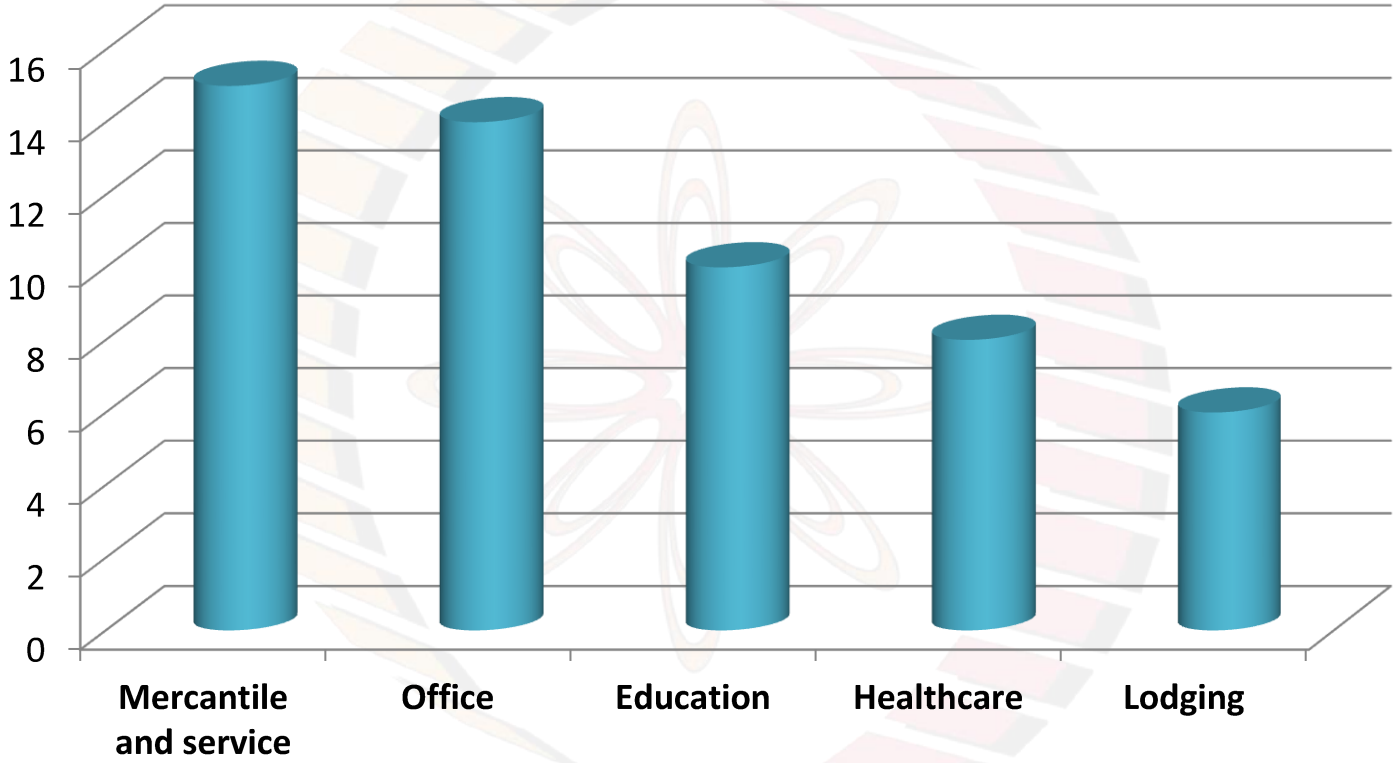
(Oil refining, Metallurgical processes, Glass manufacture)

1) **Process heating**: Raising temperature of components during manufacturing
2) **Refining Crude oil**: Separation of products
3) **Boiler heating**: To generate steam

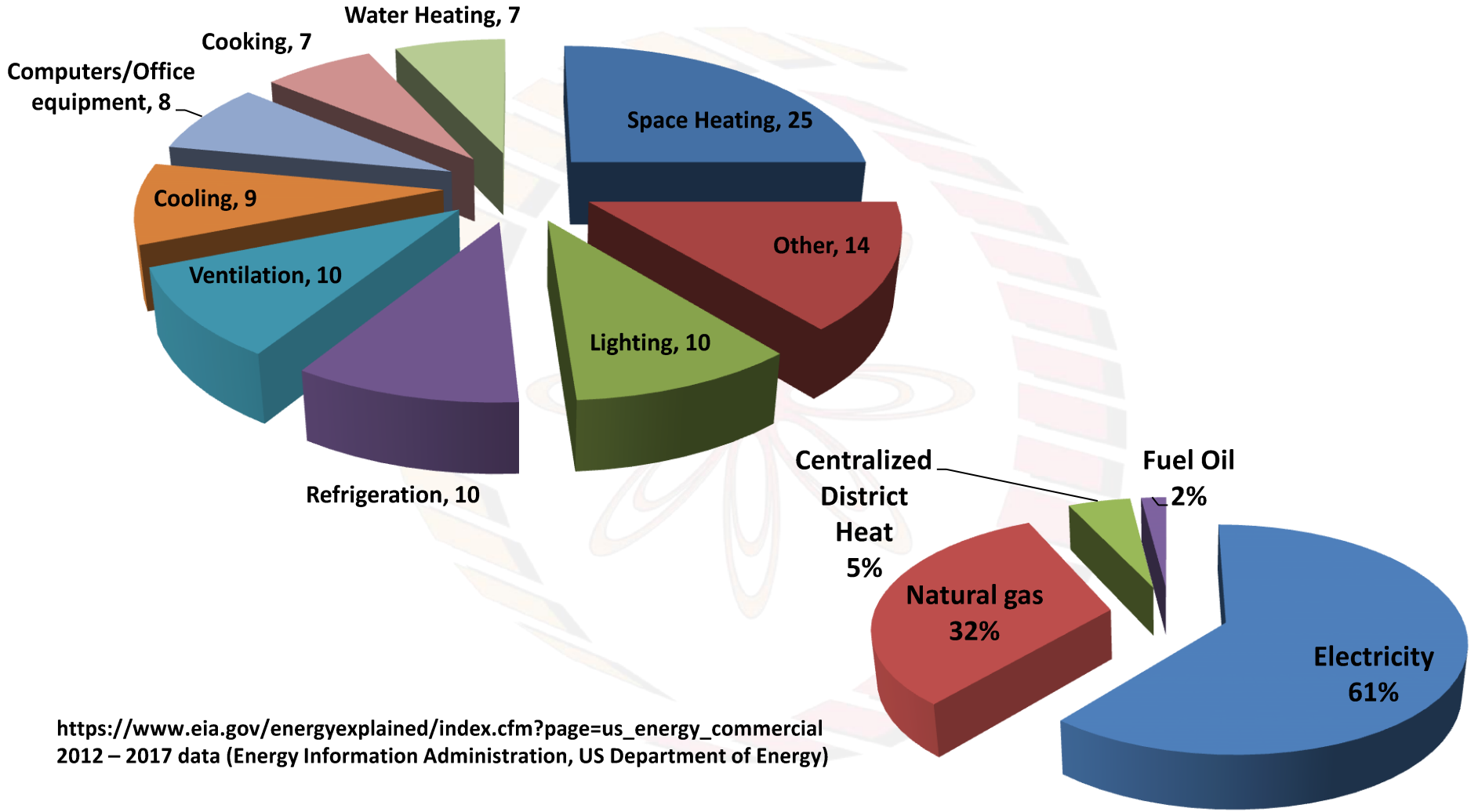
Primary: Natural gas and oil

Secondary: Electricity

Top 5 Energy Consuming Buildings

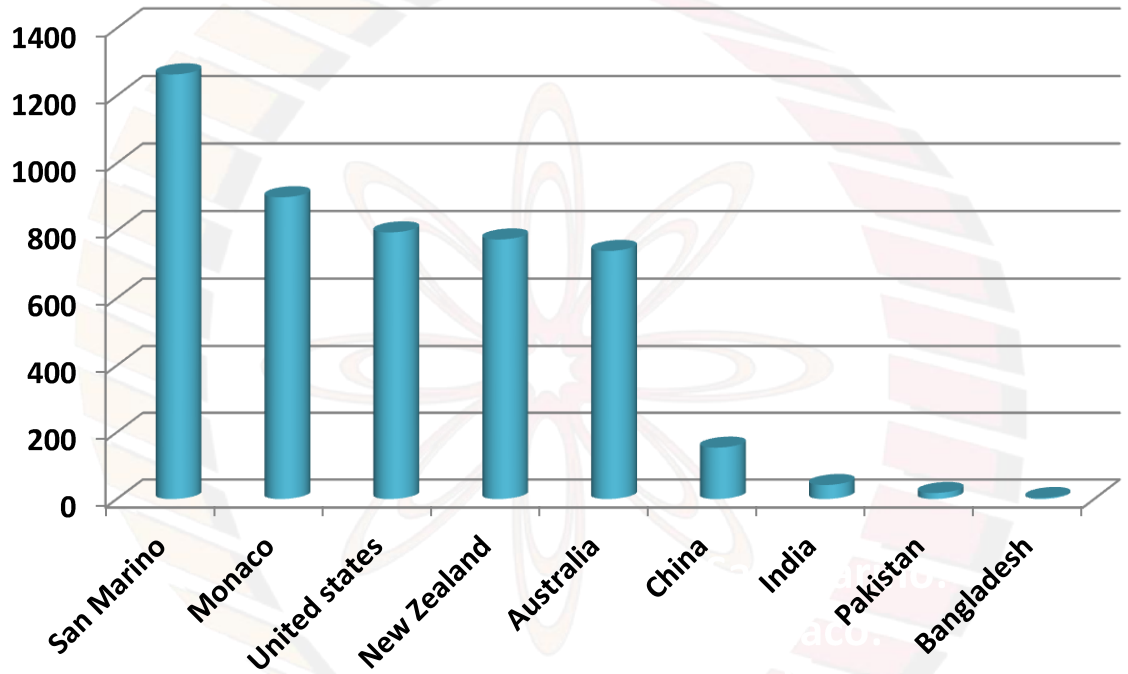


https://www.eia.gov/energyexplained/index.cfm?page=us_energy_commercial
2012 – 2017 data (Energy Information Administration, US Department of Energy)



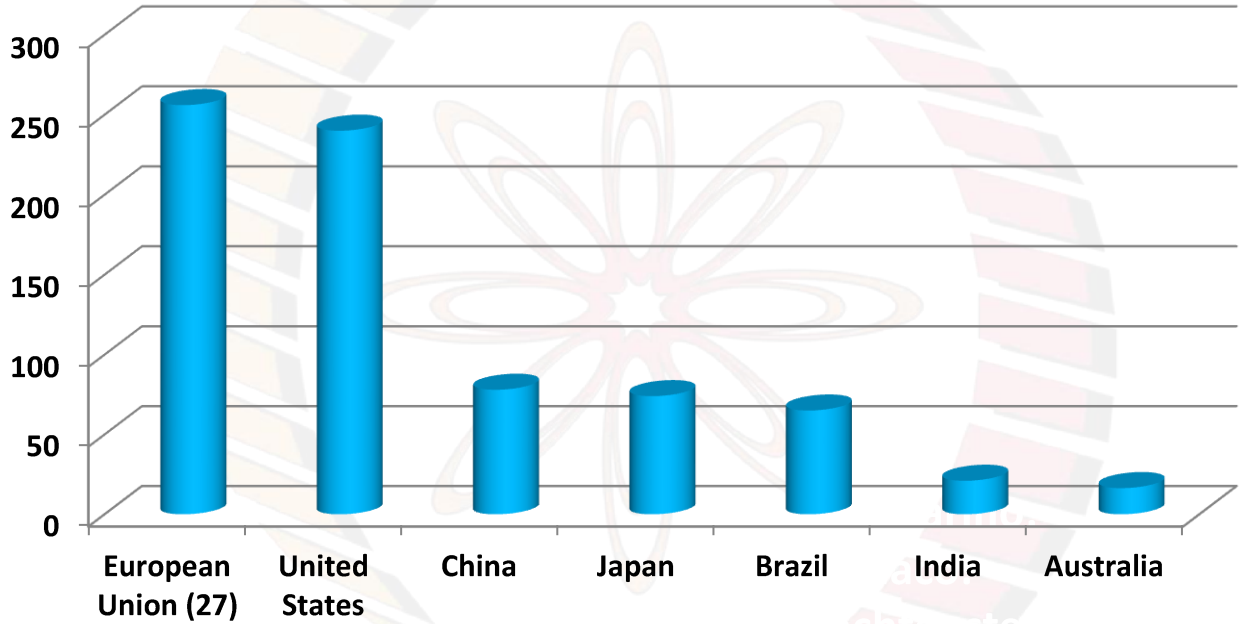
https://www.eia.gov/energyexplained/index.cfm?page=us_energy_commercial
2012 – 2017 data (Energy Information Administration, US Department of Energy)

Vehicles per 1000 people



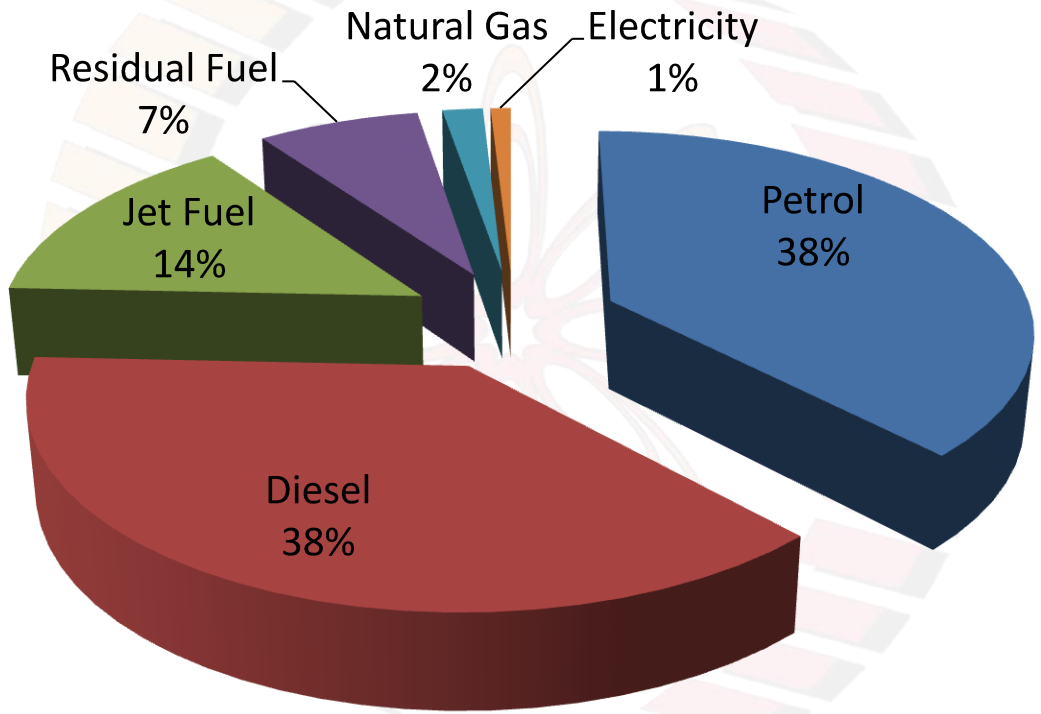
https://en.wikipedia.org/wiki/List_of_countries_by_vehicles_per_capita
2014 - 2016 data

Total Vehicle Population



https://en.wikipedia.org/wiki/Motor_vehicle
2010 - 2011 data

Sources of Fuel for Transportation Sector



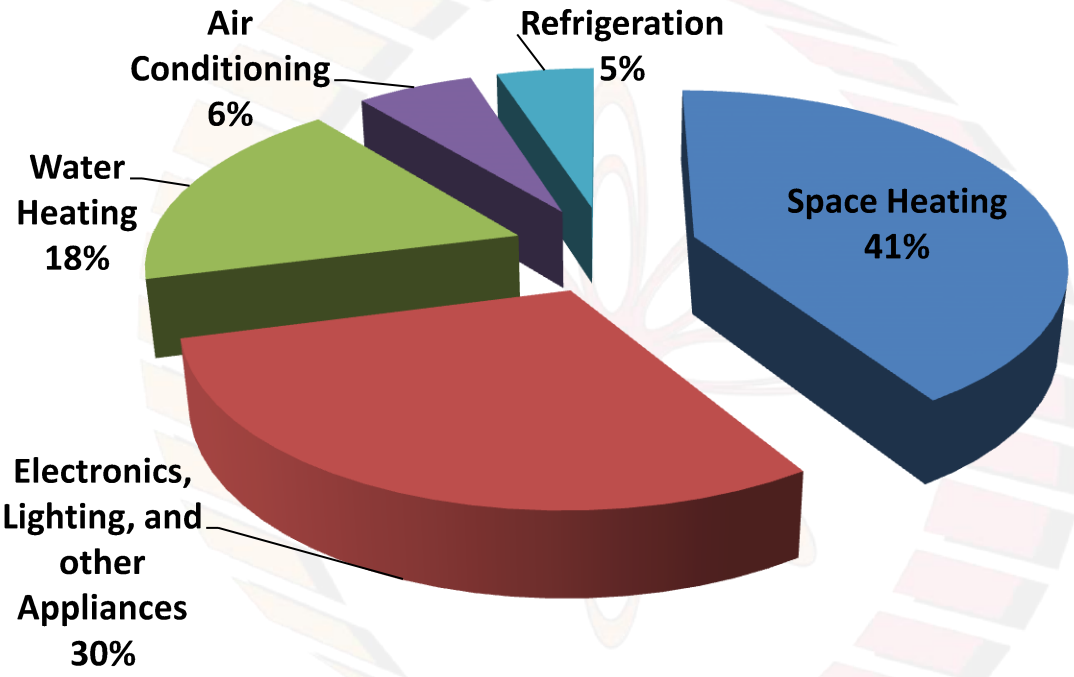
Source: https://www.eia.gov/analysis/studies/transportation/scenarios/pdf/globaltransportation.pdf
2015 Data

Traffic jam – wasted energy!
Wasted time

Carbon dioxide emissions (grams) per passenger mile

Old car Vs New car
1 person in a car Vs a carpool
Train/Bus Vs Carpool
Train/Bus Vs Flight

Use of Energy in a Home



https://www.eia.gov/energyexplained/index.cfm?page=us_energy_homes
2009 Data

Conclusions:

1) Considerable nuances in the energy supply and use scenario
2) Non conventional energy sources making only a limited intervention across sectors at this time