

An in depth look at greenhouse gas emissions of automobiles, effects, and remedial solutions



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ABSTRACT

This poster aims to educate the public on the extent of greenhouse gas emissions by cars and trucks, specifically in the United States. In 2017, transportation emissions overtook power generation as the number one contributor to greenhouse gases in the US. Despite this, the EPA has continued to roll back regulations surrounding emissions from automobiles. In order to illustrate the significance, this poster will use charts and graphs to compare and contrast emission levels with other countries and sectors of greenhouse gas emitting sources. There are numerous pollutants that are released by the burning of fossil fuels such as CO₂, NO₂, and SO₂. The extent and effects of these on the environment will be thoroughly explored in this project. As a conclusion, remedial solutions and practical steps to limit the extent of these emissions caused by transportation will also be looked at in detail.

INTRODUCTION

- Air quality is important for vegetation, crops, and primarily human health as well as aesthetic considerations (such as visibility) that affect appreciation of the natural beauty of national parks and other outdoor spaces.
- Transportation is the number one source for greenhouse gas emissions in the US.
- The extent of harmful pollutants that are released into the atmosphere as a result of combustion from vehicles is able to be reduced with the implementation of relatively progressive policies.

OBJECTIVES

- Give brief overview of extent of emissions from automobiles
- Provide insight on effects of varying pollutants found in automobile emissions
- Present remedial solutions and ways to improve already existing infrastructure

Total (2017)	Per Capita (2017)
<ul style="list-style-type: none"> • China: 9.8 Gt • USA: 5.3 Gt • EU28: 3.5 Gt • India: 2.5 Gt 	<ul style="list-style-type: none"> • USA: 16.2tonnes • China: 7.0tonnes • EU28: 7.0tonnes • India: 1.8tonnes • World: 4.8tonnes

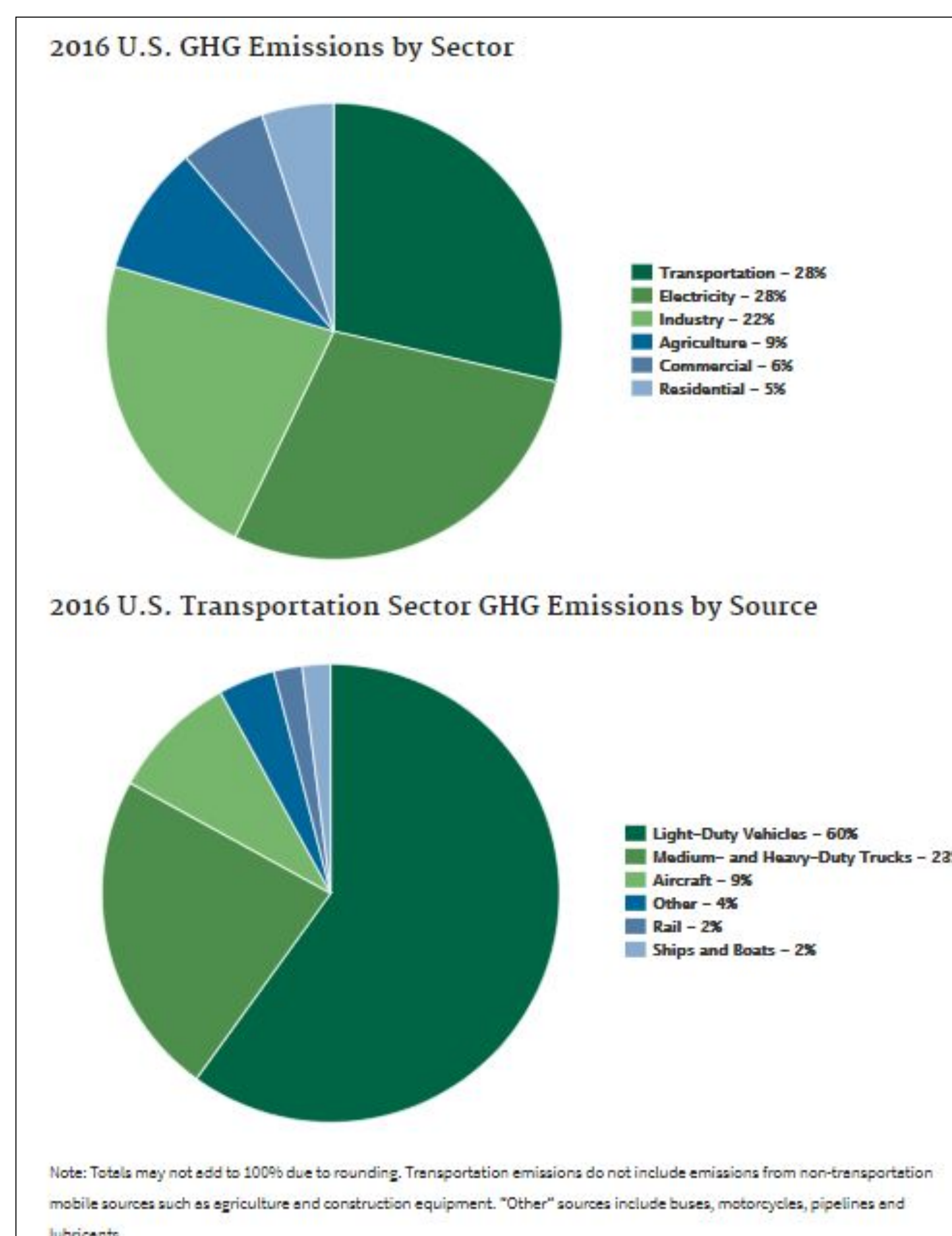


Figure 1. EPA 2016 Greenhouse gas emissions by source.

Pollutants released from burning of petroleum

- **Hydrocarbons (HC)**- These pollutants react with nitrogen oxides in the presence of sunlight to form ground level ozone, a primary ingredient in smog. Though beneficial in the upper atmosphere, at the ground level this gas irritates the respiratory system, causing coughing, choking, and reduced lung capacity.
- **Particulate matter (PM)**- These particles of soot and metals give smog its murky color. Fine particles pose the most serious threat to human health, as they penetrate deep into lungs. PM is a primary pollutant and a major contributor to PM is diesel exhaust.
- **Nitrogen oxides (NOx)**- These have the potential to cause lung irritation as well as weaken the body's defenses against respiratory infections. In addition, they assist in the formation of ground level ozone and particulate matter.
- **Carbon monoxide (CO)**- This odorless, colorless, and poisonous gas is formed by the combustion of fossil fuels such as gasoline and is emitted primarily from cars and trucks. When inhaled, CO blocks oxygen from the brain, heart, and other vital organs. Fetuses, newborn children, and people with chronic illnesses are especially susceptible to the effects of CO.
- **Hazardous air pollutants (toxins)**-These chemical compounds have been linked to birth defects, cancer, and other serious illnesses. The Environmental Protection Agency estimates that the air toxins emitted from cars and trucks — which include Benzene, acetaldehyde, and 1,3-butadiene — account for half of all cancers caused by air pollution.
- **Sulfur dioxide (SO₂)**- Found especially in diesel. Has the potential to react in the atmosphere to form fine particles and poses the largest health risk to young children and asthmatics.

CONCLUSIONS AND FUTURE WORK

- CO₂ concentrations in the atmosphere are the primary factor behind global climate change
- Per capita, the United States has the highest CO₂ emissions by far
- The primary contributor to this is the transportation sector
- The main goal for environmentalists is to significantly reduce these emissions in order to comply with 2016 Paris Agreement

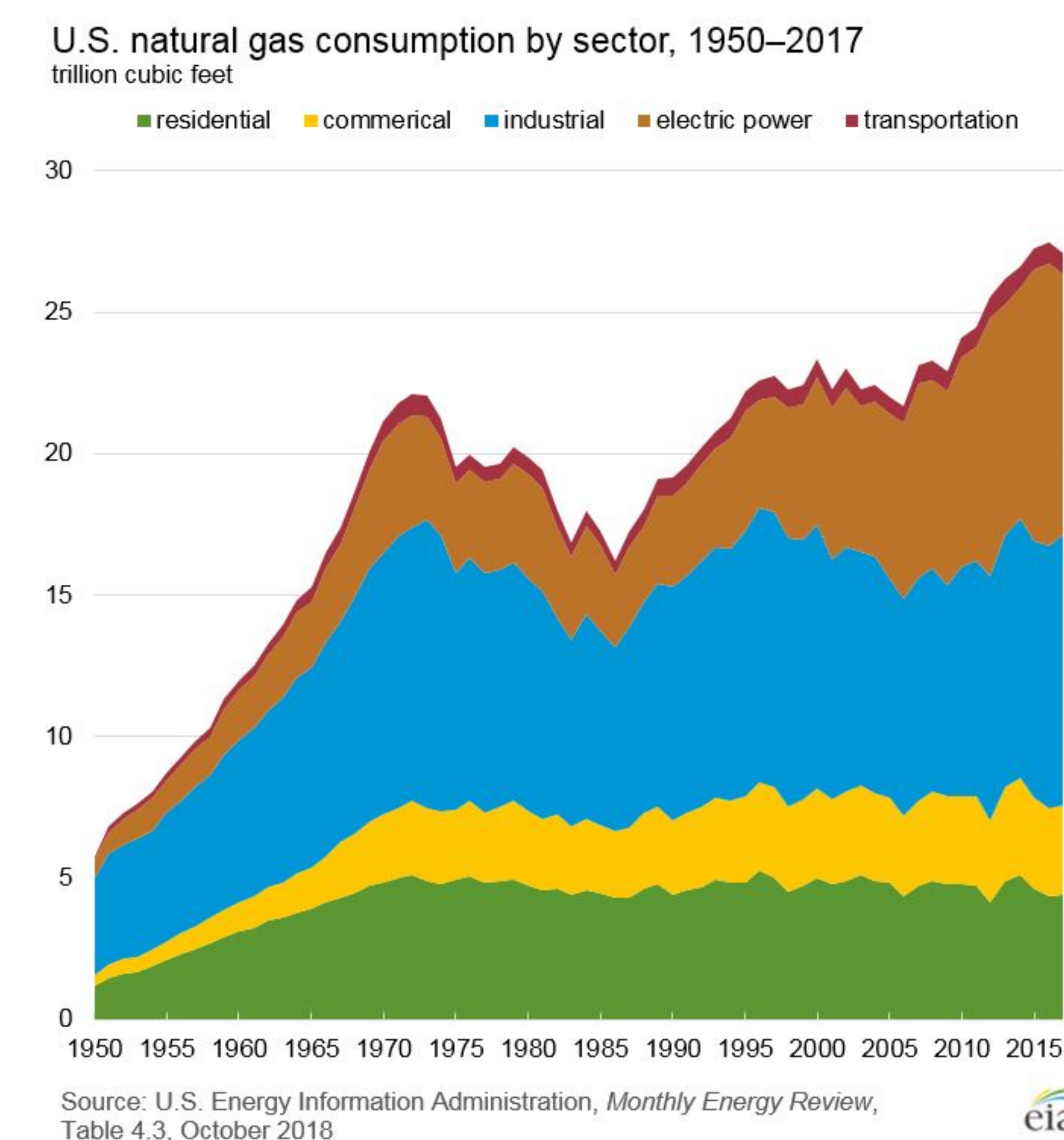


Figure 2. Natural Gas consumption by sector.

Solutions

- **Electric Vehicles**
 - Currently make up only 1 out of every 250 vehicles worldwide
 - 60% energy conversion rate when compared to roughly 20% for gasoline powered cars
 - Far more cost efficient than the price of gas
- **Natural Gas-**
 - Used primarily in generation of electricity as an alternative to coal
 - 3% of natural gas use is from transportation industry
 - More efficient than gasoline and can emit as much as 30% less CO₂, 85% less CO, and 95% less nitrogen oxide into the atmosphere when used in transportation
- **Carbon Taxes**
 - Currently none in place
 - Tax on amount of CO₂ released by type of fuel

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