

# Fossil Fuel Use and Carbon Dioxide Emissions

## Key Concepts:

- Carbon dioxide
- Energy sector
- Fossil fuel

## WHAT YOU WILL LEARN

1. You will learn which fossil fuel releases the most carbon dioxide when burned.
2. You will learn which energy sector contributes the most carbon dioxide to the atmosphere.
3. You will analyze carbon dioxide emission data for the different energy sectors and for different states.



## Explore and Explain

The amount of carbon in **fossil fuels** varies according to the type of fossil fuel. Coal contains the most carbon per unit of energy, followed by natural gas and petroleum. Natural gas has about 55% less carbon than coal per unit of energy, and petroleum has about 75% less carbon than coal. Therefore, the burning of coal releases more **carbon dioxide** into the atmosphere than the burning of natural gas or petroleum, but because the U.S. uses more petroleum than coal, petroleum contributes more carbon dioxide. Figure 1 shows the U.S. average carbon dioxide emissions from fossil fuels by **energy use sector** or social sector (e.g., residential, commercial, industrial, transportation, electric utilities).

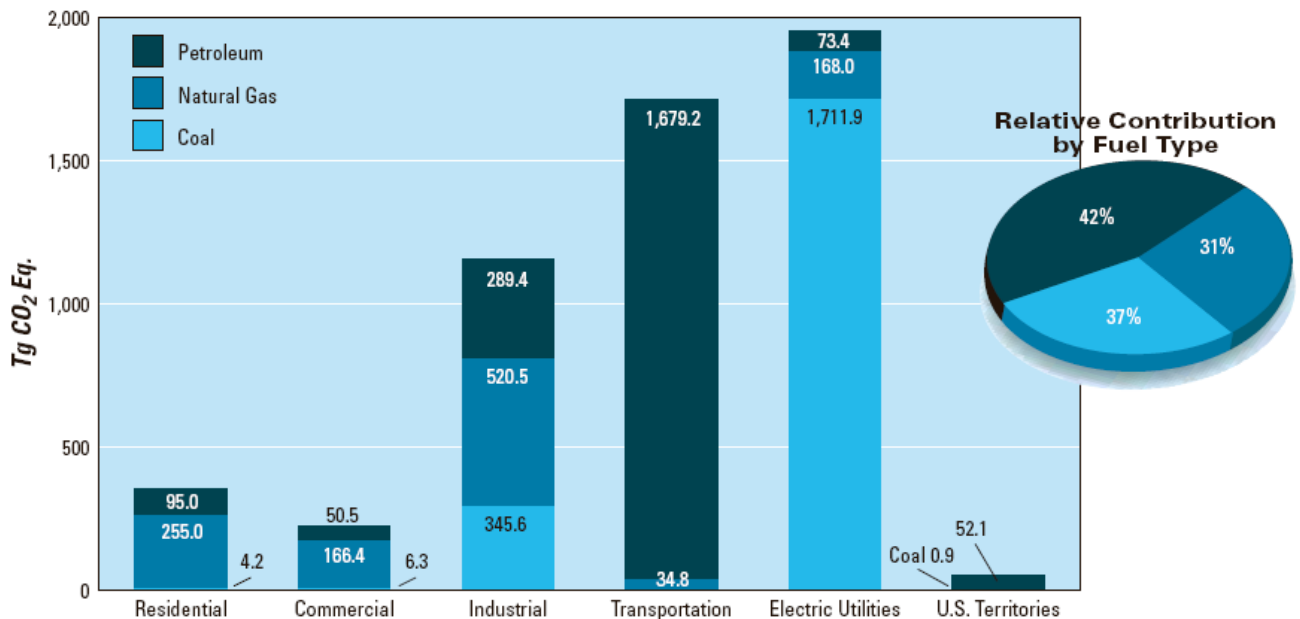


Figure 1. Carbon Dioxide Emissions by Fuel Type and Sector.

Source EPA

Units: Tg = million metric tons

Look carefully at the bar graph in Figure 1 and see which energy use or social sectors are emitting the most carbon dioxide, and which fossil fuels emit the most and the least amount of carbon dioxide.

- Which sector releases the most carbon dioxide?

5. Which sector releases the most carbon dioxide from coal?
  
6. Which sector releases the most carbon dioxide from petroleum?
  
7. Based on total energy use, which fossil fuel emits the most carbon dioxide to the atmosphere?
  
8. Explain how population growth, economic conditions, and energy price might influence fossil fuel use and carbon dioxide emissions?

### *Extend Your Thinking*

Table 1 shows the annual change in total carbon dioxide emissions, the emissions from electrical generation, and the emissions from the transportation sector over time in the U.S.

Table 1. Carbon dioxide emissions from energy use

Year	2008	2009	2010	2011	2012
Carbon dioxide emissions: total for the U.S.	5,936	5,506	5,722	5,592	5,383
Carbon dioxide emissions: electrical generation	2,360	2,146	2,259	2,271	2,072
Carbon dioxide emissions: transportation sector	1,817	1,748	1,765	1,748	1,740

Unit: Tg CO<sub>2</sub> Eq. (Tg = million metric tons) Source: EPA

9. On a separate sheet of paper, create a line graph based on the data in Table 1.
  
10. What percentage of the total carbon dioxide emissions for 2012 came from electrical generation? From the transportation sector?
  
11. What is the trend in the total amount of carbon dioxide emissions?
  
12. How would you explain this trend; that is, what do you think might be causing this trend?
  
13. Based on your line graph, predict what the total carbon dioxide emissions might be for the year 2020.

The 2010 state energy-related carbon dioxide emissions by sector for several Midwestern states are shown in Table 2.

Table 2. 2010 Carbon Dioxide Emissions by Energy Sector for Selected States

State	Business (Commercial)	Electric Power	Homes (Residential)	Industry	Transportation	Total
Illinois	12	94	24	34	67	231
Indiana	5	114	9	49	43	220
Michigan	9	70	19	17	50	165
Ohio	11	121	18	35	65	250
Wisconsin	5	43	9	13	30	100

In million metric tons, rounded. Source: EIA

14. For the states shown in Table 2, what is the average amount of carbon dioxide emissions for each sector (Commercial, Electric Power, Residential, Industry, and Transportation)?

15. Overall for these states what are the top two sectors that contribute the most carbon dioxide?

### *Apply What You Have Learned*

The burning of fossil fuels releases carbon dioxide into the atmosphere at a faster rate than the environment, the land, oceans and plants, can absorb it; consequently the concentration of atmospheric carbon dioxide is increasing. This increase is now thought to contribute to global warming and climate change.

The member nations of the United Nations at the conference on climate change proposed a framework for reducing carbon dioxide emissions. This framework includes emission reduction targets for each nation. It recommended that the U.S. reduce its carbon dioxide emission by 7 percent from 1990 emission levels. Explain how reducing carbon dioxide emissions might impact:

16. The different sectors that use fossil fuels.

17. The production and supply of fossil fuels.

