

EIA will delay its scheduled data releases November 8-10, 2023, to complete a planned systems upgrade. We will continue collecting energy data from survey respondents and will resume our regular publishing schedule on November 13. See our latest [press release](#) for more details.

COAL EXPLAINED

COAL AND THE ENVIRONMENT



BASICS

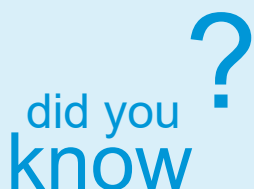
Coal is an abundant fuel source that is relatively inexpensive to produce and convert to useful energy. However, producing and using coal affects the environment.

Effects of coal mining

Surface mines (sometimes called *strip mines*) were the source of about 62% of the coal mined in the United States in 2021. These mining operations remove the soil and rock above coal deposits, or *seams*. The largest surface mines in the United States are in Wyoming's Powder River Basin, where coal deposits are close to the surface and are up to 70 feet thick.

Mountaintop removal and valley fill mining has affected large areas of the Appalachian Mountains in West Virginia and Kentucky. In this form of coal extraction, the tops of mountains are removed using explosives. This technique changes the landscape, and streams are sometimes covered with rock and dirt. The water draining from these filled valleys may contain pollutants that can harm aquatic wildlife downstream. Although mountaintop mining has existed since the 1970s, its use became more widespread and controversial beginning in the 1990s.

U.S. laws require that dust and water runoff from areas affected by coal mining operations must be controlled, and the area must be *reclaimed* close to its original condition.



Some electric power plants use *scrubbers* ([flue gas desulfurization equipment](#)) to reduce the amount of sulfur exiting their smokestacks. The power plants use [electrostatic precipitators or baghouses](#) to remove particulates and heavy metals from the smoke.

Underground mines generally affect the landscape less than surface mines. However, the ground above mine tunnels can collapse, and acidic water can drain from abandoned underground mines.

Methane gas that occurs in coal deposits can explode if it concentrates in underground mines. This *coalbed methane* must be vented out of mines to make mines safer places to work. In 2020, methane emissions from coal mining and abandoned coal

mines accounted for about 7% of total U.S. methane emissions and about 1% of total U.S. greenhouse gas emissions (based on global warming potential). Some mines capture and use or sell the coalbed methane extracted from mines.

Emissions from burning coal

Several principal emissions result from coal combustion:

- Sulfur dioxide (SO₂), which contributes to acid rain and respiratory illnesses
- Nitrogen oxides (NO_x), which contribute to smog and respiratory illnesses
- Particulates, which contribute to smog, haze, and respiratory illnesses and lung disease
- Carbon dioxide (CO₂), which is the primary greenhouse gas produced from burning fossil fuels (coal, oil, and natural gas)
- Mercury and other heavy metals, which have been linked to both neurological and developmental damage in humans and other animals
- Fly ash and bottom ash, which are residues created when power plants burn coal

The U.S. Energy Information Administration estimates (as of October 2022) that in 2021, CO₂ emissions from burning coal for energy accounted for about 20% of total U.S. energy-related CO₂ emissions and for nearly 60% of total CO₂ emissions from the [electric power sector](#).

In the past, fly ash was released into the air through the smokestack, but laws now require that most emissions of fly ash be captured by pollution control devices. In the United States, fly ash and bottom ash are generally stored near power plants or placed in landfills. Pollution leaching from coal ash storage and landfills into groundwater and several large impoundments of coal ash that ruptured are environmental concerns.

Reducing the environmental effects of coal use

The Clean Air Act and The Clean Water Act require industries to reduce pollutants released into the air and water.

The coal industry has found several ways to reduce sulfur and other impurities from coal. The industry has also found more effective ways of cleaning coal after it is mined, and some coal consumers use low sulfur coal.

Power plants use flue gas desulfurization equipment, also known as *scrubbers*, to clean sulfur from the smoke before it leaves their smokestacks. In addition, the coal industry and the U.S. government have cooperated to develop technologies that can remove impurities from coal or that can make coal more energy efficient, which reduces the amount of coal that is burned per unit of useful energy produced.

Equipment intended mainly to reduce SO₂, NO_x, and particulate matter can also be used to reduce mercury emissions from some types of coal. Scientists are also working on new ways to reduce mercury emissions from coal-burning power plants.

Research is underway to address emissions of CO₂ from coal combustion. One method is *carbon capture*, which separates CO₂ from emissions sources and recovers it in a concentrated stream. The CO₂ can then be injected underground for permanent storage, or *sequestration*.

Reuse and recycling can also reduce the environmental effects of coal production and use. Land that was previously used for coal mining can be reclaimed and used for airports, landfills, and golf courses. Waste products captured by scrubbers can be used to produce products such as cement and synthetic gypsum for wallboard.

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