



# CBO's Benchmark Projection of Greenhouse Gas Emissions

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Greenhouse gases (GHGs) accumulate in the atmosphere when fossil fuels are burned to produce energy; they also accumulate as a result of industrial processes and activities such as deforestation and agriculture. GHGs, which include carbon dioxide, methane, nitrous oxide, and other (mainly fluorinated) gases, vary in their contributions to atmospheric warming: They remain in the atmosphere for different lengths of time and cause different amounts of warming while they are present. So that GHGs can be compared on a common basis, emissions are often measured in carbon dioxide equivalent units (CO<sub>2</sub>e), or the amount of CO<sub>2</sub> that would cause the same amount of warming over a given period (typically a century).

The Congressional Budget Office maintains a 10-year benchmark projection of annual GHG emissions to estimate the effects that certain GHG emissions policies, such as setting a price on those emissions, would have on the federal budget. This report presents CBO's most recent projection of GHG emissions. According to that projection, GHG emissions in the United States, measured in CO<sub>2</sub>e, decline by about 8 percent from 2025 to 2034. That decline is driven by a projected decrease of 15 percent in energy-related emissions of CO<sub>2</sub>, partially offset by an increase of 9 percent in other, non-energy-related emissions.

## How CBO Constructs Its Benchmark Projection of Greenhouse Gas Emissions

CBO uses information from the Environmental Protection Agency (EPA) and the Energy Information Administration (EIA) to construct its benchmark projection of GHG emissions. The projection is updated annually, following the release of EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks* and EIA's *Annual*

*Energy Outlook*.<sup>1</sup> EPA's inventory is a detailed accounting of annual emissions, including subtotals by economic sector and type of greenhouse gas. Because of the time required to gather data and produce estimates, EPA's most recent inventory, released in 2024, reports historical GHG emissions through 2022. EIA's outlook provides long-term projections of U.S. energy markets, including energy-related emissions of CO<sub>2</sub> by economic sector, most recently through 2050.

CBO constructs its GHG emissions benchmark as follows: For CO<sub>2</sub> emissions from energy use, CBO applies EIA's projected emissions growth rates, which are sector specific, to the corresponding emissions totals for the latest year in EPA's inventory. Because EIA does not provide its projections of non-energy-related GHGs in its outlook, CBO uses its own growth rates, which it developed from EIA's projection model.<sup>2</sup> CBO also maintains a 30-year projection by extrapolating from EIA's projections beyond 2050.

If future laws or administrative actions that would notably affect emissions were adopted after CBO's annual update, the agency would revise its benchmark to reflect the expected effects of those changes.

1. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2022*, EPA 430-R-24-004 (April 2024), <https://tinyurl.com/3ftkt32a>; and Energy Information Administration, *Annual Energy Outlook 2023* (March 2023), [www.eia.gov/outlooks/aeo](http://www.eia.gov/outlooks/aeo). EIA did not publish an outlook in 2024; it plans to resume annual publication in 2025.
2. EIA uses its publicly available National Energy Modeling System model, which it revises each year, to make projections in support of its *Annual Energy Outlook*. See Energy Information Administration, *The National Energy Modeling System: An Overview* (May 2023), <https://tinyurl.com/567yvatp>.

Table 1.

**CBO's Benchmark Projection of Greenhouse Gas Emissions**

Millions of metric tons of carbon dioxide equivalent units

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<b>Total greenhouse gas emissions</b>	<b>6,182</b>	<b>6,063</b>	<b>5,935</b>	<b>5,841</b>	<b>5,766</b>	<b>5,711</b>	<b>5,687</b>	<b>5,673</b>	<b>5,679</b>	<b>5,681</b>
<b>Energy-related carbon dioxide</b>	<b>4,401</b>	<b>4,266</b>	<b>4,123</b>	<b>4,012</b>	<b>3,919</b>	<b>3,845</b>	<b>3,802</b>	<b>3,775</b>	<b>3,763</b>	<b>3,745</b>
Transportation	1,703	1,688	1,673	1,664	1,645	1,625	1,606	1,590	1,577	1,566
Electricity	1,316	1,181	1,044	932	852	795	768	751	749	737
Composite <sup>a</sup>	1,381	1,397	1,406	1,416	1,421	1,426	1,428	1,434	1,437	1,442
<b>Non-energy carbon dioxide<sup>b</sup></b>	<b>363</b>	<b>365</b>	<b>368</b>	<b>371</b>	<b>375</b>	<b>380</b>	<b>384</b>	<b>384</b>	<b>386</b>	<b>392</b>
<b>Methane</b>	<b>777</b>	<b>780</b>	<b>783</b>	<b>785</b>	<b>788</b>	<b>791</b>	<b>794</b>	<b>797</b>	<b>800</b>	<b>803</b>
Agriculture <sup>c</sup>	280	281	282	283	284	285	286	287	288	289
Oil and natural gas production <sup>d</sup>	224	225	226	227	227	228	229	230	231	232
Landfills	120	120	120	120	120	120	120	120	120	120
Other <sup>e</sup>	153	154	155	156	157	158	159	160	161	162
<b>Nitrous oxide</b>	<b>412</b>	<b>417</b>	<b>421</b>	<b>426</b>	<b>430</b>	<b>435</b>	<b>440</b>	<b>444</b>	<b>449</b>	<b>454</b>
Agriculture <sup>f</sup>	323	327	331	335	339	344	348	352	357	361
Other <sup>g</sup>	90	90	90	91	91	91	92	92	92	93
<b>Fluorinated gases<sup>h</sup></b>	<b>230</b>	<b>235</b>	<b>241</b>	<b>247</b>	<b>253</b>	<b>260</b>	<b>266</b>	<b>273</b>	<b>280</b>	<b>287</b>

Data source: Congressional Budget Office. See [www.cbo.gov/publication/60862#data](http://www.cbo.gov/publication/60862#data).

- A composite of the industrial, commercial, and residential sectors.
- Mainly consists of carbon dioxide (CO<sub>2</sub>) released as a by-product of industrial processes and unrelated to energy production, such as chemical reactions that create CO<sub>2</sub> during cement or petrochemical production.
- Includes enteric fermentation, manure management, rice cultivation, and field burning of agricultural residues.
- Consists of unintentional releases of methane that occur when oil and natural gas are produced and transported.
- Includes methane from coal mines, stationary and mobile sources, and other sources.
- Includes soil management (fertilization and tilling), manure management, and field burning of agricultural residues.
- Includes stationary and mobile sources, adipic and nitric acid production, and other sources.
- Includes hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride.

**CBO's Current Benchmark Projection of GHG Emissions**

In CBO's most recent GHG emissions projection, emissions fall from 6,182 million metric tons (MMT) of CO<sub>2</sub>e in 2025 to 5,681 MMT of CO<sub>2</sub>e in 2034, an 8 percent decline (see Table 1). Energy-related CO<sub>2</sub> emissions account for 71 percent of total GHG emissions in the first year of CBO's projection, and the decline in total GHG emissions over the projection period is entirely due to decreases in those energy-related CO<sub>2</sub> emissions. By 2034, energy-related CO<sub>2</sub> emissions are 66 percent of the total.

Emissions of CO<sub>2</sub> from the transportation sector, the largest single source of energy-related CO<sub>2</sub>, decline by 8 percent from 2025 to 2034 in CBO's projection, as vehicle fuel economy—aided by increasing sales of electric vehicles—continues to rise. Because a growing share of electricity is being generated from renewable energy sources such as solar and wind power, CO<sub>2</sub> emissions

from the electric power sector are projected to fall by 44 percent over the projection period. By contrast, other energy-related CO<sub>2</sub> emissions—from a composite of the industrial, commercial, and residential sectors—increase by 4 percent in CBO's projection.

CBO also expects emissions of other greenhouse gases, and emissions of CO<sub>2</sub> from non-energy uses, to increase over the projection period. Methane emissions—primarily from agriculture and the production of oil and natural gas—increase by 3 percent and constitute 14 percent of total GHG emissions in 2034. In the agency's projection, emissions of non-energy CO<sub>2</sub>, nitrous oxide, and fluorinated gases all increase as well—by 8 percent, 10 percent, and 25 percent, respectively—through 2034 and together account for the remaining 20 percent of GHG emissions that CBO projects for that year. As energy-related CO<sub>2</sub> emissions decline, the relative contributions of non-energy CO<sub>2</sub> and other GHG emissions all increase by several percentage points over the next decade in CBO's projection.

This report, which is part of the Congressional Budget Office's continuing efforts to make its work transparent, provides information about the agency's projections of greenhouse gas emissions. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

David Austin and Ron Gecan prepared the report with guidance from Nicholas Chase and Joseph Kile. Ann E. Futrell, Tamara Hayford, John McClelland, Robert Reese, and Molly Sherlock provided comments. Jeffrey Kling reviewed the report. Rebecca Lanning edited it, and Jorge Salazar created the table and prepared the text for publication. The report is available at [www.cbo.gov/publication/60862](http://www.cbo.gov/publication/60862).

CBO seeks feedback to make its work as useful as possible. Please send comments to [communications@cbo.gov](mailto:communications@cbo.gov).



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