Global Carbon Budget 2022


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www.globalcarbonatlas.org
Anthropogenic perturbation of the global carbon cycle

Global annual average for the decade 2012–2021 (GtCO₂/yr)

The budget imbalance is the difference between the estimated emissions and sinks.

Source: NOAA-ESRL; Friedlingstein et al 2022; Canadell et al 2021 (IPCC AR6 WG1 Chapter 5); Global Carbon Project 2022
Global Fossil CO$_2$ Emissions
Emissions are set to grow 1% [0.1 to 1.9%] in 2022. The rate of increase has slowed from 3% per year in the 2000s to about 0.5% per year in the past decade.

The 2022 projection is based on preliminary monthly data and modelling. When including cement carbonation, projected 2022 fossil emissions reach 36.6 GtCO$_2$. Source: Friedlingstein et al 2022; Global Carbon Project 2022
Global fossil CO₂ emissions from coal are expected to rise & may lead to a new global peak. Emissions from oil expected to grow mainly from international aviation, but still remain below 2019 levels. Emissions from gas are set for an small decline in 2022.

The 2022 projections are based on preliminary monthly data and modelling.

Source: Friedlingstein et al 2022; Global Carbon Project 2022
Fossil CO₂ Emissions by country

In 2022 the largest increases are in India, Rest of World (primarily aviation), and the USA. Emissions are projected to decline in China and the EU27.

Fossil CO₂ emissions decreased in 24 countries during the past decade.

The 2022 projections are based on preliminary monthly data and modelling.

Source: Friedlingstein et al 2022; Global Carbon Project 2022
Globally: Decarbonisation (decrease in CO₂/energy) and declines in energy per GDP are largely responsible for the reduced growth rate in emissions over the last decade.

Source: Friedlingstein et al 2022; Global Carbon Project 2022
Land-use Change Emissions
Land-use change emissions are projected to be 3.9 GtCO₂ in 2022, ten times less than fossil emissions. There is a small but uncertain decline in the past two decades.

Estimates from three bookkeeping models
Source: Friedlingstein et al 2022; Global Carbon Project 2022
Deforestation, the main driver of land-use emissions, remains high in the last decade. Removals through re/afforestation counterbalance approximately half the deforestation emissions.

Estimates from three bookkeeping models
Source: Friedlingstein et al 2022; Global Carbon Project 2022
Indonesia, Brazil, the Democratic Republic of the Congo combined contribute 58% of the global total land-use change CO₂ emissions.

The peak in Indonesia in 1997 was the Indonesian peat fires

Estimates from three bookkeeping models

Source: Friedlingstein et al 2022; Global Carbon Project 2022
Total global CO$_2$ emissions of **40.6** are projected for 2022. Emissions remain high but approximately flat since 2015, but this trend is uncertain.

![Graph showing annual CO$_2$ emissions from 1960 to projected 2022. The graph indicates a trend of increasing emissions with a slight flattening since 2015.](image)

Source: Friedlingstein et al 2022; Global Carbon Project 2022
Closing the Global Carbon Budget
The global CO₂ concentration increased from ~277 ppm in 1750 to 417.2 ppm in 2022 (up 51%).

Globally averaged surface atmospheric CO₂ concentration. Data from: NOAA-ESRL after 1980; the Scripps Institution of Oceanography before 1980.

Source: NOAA-ESRL; Scripps Institution of Oceanography; Friedlingstein et al 2022; Global Carbon Project 2022.
Changes in the partitioning of the emissions over time

The ocean and land sinks have continued to grow with increasing atmospheric CO$_2$ and to take up around half of the emissions. Climate change is already reducing these growths by about 4% (ocean sink) and 17% (land sink).

Source: Friedlingstein et al 2022; Global Carbon Project 2022
Tracking progress towards mitigation targets
The remaining carbon budget for a 50% likelihood to limit global warming to 1.5°C, 1.7°C and 2°C has reduced to an equivalent of 9, 18 and 30 years from 2023 (at 2022 emissions levels). 2495 GtCO₂ have been emitted since 1850.

The remaining carbon budgets are updated from IPCC AR6 WG1 by removing additional historical emissions since 1 January 2020. Quantities are subject to additional uncertainties e.g., future mitigation choices of non-CO₂ emissions.

Source: IPCC AR6 WG1; Friedlingstein et al 2022; Global Carbon Budget 2022
Global CO₂ emissions must reach net zero to limit global warming. Reaching net zero CO₂ emissions by 2050 would require a decrease of about 1.4 GtCO₂ each year, comparable to the COVID-related 2020 fall.

Source: Friedlingstein et al 2022; Global Carbon Project 2022
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