Global Carbon Project

Briefing on key messages Global Carbon Budget 2024

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Important notice: this document is intended as background briefing for the co-authors and journalists covering the release of the Global Carbon Budget 2024. **Do not cite or quote until the embargo is lifted.**

The Global Carbon Project is an international research project within the Future Earth research initiative on global sustainability, and a research partner of the World Climate Research Programme. It aims to develop a complete picture of the global carbon cycle, including both its biophysical and human dimensions, together with the interactions and feedbacks between them. The Global Carbon Budget 2024 is the 19th edition of the annual update that started in 2006, and the 13th edition made available as a living data collection in the journal *Earth System Science Data*.

Data and methods are detailed in the publication, with a link provided at the end of this document.

A. Headline: No clear signs of peak in global fossil CO_2 emissions yet

- **Global CO_2 emissions from fossil use are projected to rise 0.8% in 2024 (range -0.3% to 1.9%), reaching 37.4 billion tonnes of CO_2 ($GtCO_2$)[1].** Despite progress in clean energy, growth in natural gas and oil use drives global fossil emissions up. Coal emissions are also projected to increase, but more marginally. The projected growth in 2024 fossil emissions comes on top of a 1.4% growth in 2023 emissions, and further delays the anticipated and necessary peak in global emissions.

- **Global CO_2 emissions from land-use change remain high at a projected 4.2 $GtCO_2$ in 2024, but they have decreased every decade since the 1990s, and in particular in the past decade (-20%).** Decreasing emissions from deforestation and increasing removals from reforestation and afforestation both contributed to the decrease in land-use change emissions, although removals stagnated in the past decade.

- **Total CO_2 emissions – the sum of fossil and land-use change emissions – have plateaued in the past decade, and are projected to be 41.6 $GtCO_2$ in 2024.** The plateau during 2014-2023 follows a decade of strong growth in total emissions of 2% per year on average during 2004-2013, indicating progress in tackling climate change, but insufficient to put global emissions on a downward trajectory.

- **The concentration of CO_2 in the atmosphere is set to reach 422.5 parts per million in 2024, 2.8 parts per million above 2023, and 52% above pre-industrial levels.** Total CO_2 emissions are responsible for the rise in atmospheric CO_2 concentration (on average +2.5 parts per million over the past decade), with the response of the CO_2 sinks to climate conditions modulating the exact value each year, especially on land.

[1] Global fossil CO_2 emissions include the cement carbonation sink.

B. CO_2 emissions

Preliminary data for 2024 show global fossil CO_2 emissions are set to increase +0.8% (range -0.3% to 1.9%) relative to 2023 level.

- **The projected 2024 growth brings global fossil CO_2 emissions to 37.4 $GtCO_2$**[2]. Final data for 2023 show global fossil emissions increased 1.4% above 2022 levels. Growth in global fossil CO_2 emissions remains persistent since the post-pandemic rebound in 2021.

- **The projected 2024 growth is driven by growth in gas and oil emissions, while coal emissions could also increase but more marginally.**

    - Coal emissions (41% of global emissions) are projected to increase by 0.2% (range -1% to 1.4%), with increases in India, China, and the Rest of the World in aggregate[3], and decreases in the European Union and the USA.

    - Oil emissions (32% of global emissions) are projected to increase by 0.9% (range 0.0 to 1.8%), pushed up by a rise in emissions from international aviation and shipping, India and the Rest of the World, and a more marginal increase in the European Union. Oil emissions are projected to decrease in the USA and China.

    - Natural gas emissions (21% of global emissions) are projected to increase 2.4% (range 1.1 to 3.8%), with increases in China, the USA, India, and the Rest of the World, and decreases in the European Union.

    - Cement emissions (4% of global emissions) are projected to decrease 2.8% (range -4.7% to -0.9%), with decreases in China, USA, the European Union, and increases in India and the Rest of the World.

- **Projected 2024 emissions decrease in the European Union and the USA, but increase in India, marginally in China, and in the Rest of the World in aggregate**. Trends by fuel types show evidence of growing penetration of low carbon technologies.

    - In China (32% of global emissions), emissions in 2024 are projected to increase by 0.2% (range -1.6% to +2%) over 2023. Increases are projected for emissions from coal (+0.3%) and natural gas (+8%), and decreases for emissions from oil (-0.8%) and cement (-8.1%). Electricity demand continues to grow strongly from both industry and households, sustaining a small growth in coal consumption. Emissions from oil have probably peaked as electric vehicles steadily gain market share.

[2] Global fossil CO_2 emissions include the cement carbonation sink (0.8 $GtCO_2$), without the cement carbonation sink, global fossil CO_2 emissions projection for 2024 is 38.2 $GtCO_2$.

[3] Emissions are described here for the largest emitting countries (China, USA, India), the European Union (EU27) in aggregate, International shipping and aviation (IAS), and the Rest of the World in aggregate. See also Table 1.

- In the United States (13% of global emissions), emissions in 2024 are projected to decrease by 0.6% (range -2.9% to +1.7%) over 2023. Decreases are projected for emissions from coal (-3.5%), oil (-0.7%), and cement (-5.8%), alongside a rise in emissions from natural gas (+1.0%). Natural gas and renewables continue to out-compete coal in the power sector, and coal-fired power stations steadily decline in number.

- In India (8% of global emissions), emissions in 2024 are projected to increase by 4.6% (range 3.0% to 6.1%) over 2023, with projected rises in emissions from coal (+4.5%), oil (+3.6%), natural gas (+11.8%, but from a low base), and cement (+4.0%). The Indian economy continues to grow strongly, with significant infrastructure development and increases in power demand that outstrip the solid growth in new renewables.

- In the European Union (EU27, 7% of global emissions), emissions in 2024 are projected to decrease by 3.8% (range -6.2% to -1.4%) over 2023, with projected decreases in emissions from coal (-15.8%), natural gas (-1.3%), and cement (-3.5%), and a projected rise in emissions from oil (+0.2%). Strong growth in renewables is driving emissions down, in the presence of weak economic growth and high energy prices.

- International aviation and shipping (3% of global emissions) are projected to increase by 7.8% in 2024 over 2023, but remain below their 2019 pre-pandemic level by 3.5%. International aviation is projected to rise by 13.5% over 2023 (4.8% below 2019 levels), while international shipping is projected to rise by 2.7% (2.9% below 2019 levels).

- In the Rest of the World in aggregate (38% of global emissions), emissions in 2024 are projected to increase by 1.1% (range -1.0% to +3.3%) over 2023, with projected rises in emissions from coal (+0.5%), oil (+0.5%), natural gas (+2.2%), and cement (+2.0%).

- **Many countries have succeeded in reducing their fossil CO_2 emissions or slowing down their growth, with continued decarbonisation trends (i.e., declining CO_2 emissions per unit energy) in most countries as well as globally, but not sufficient to put global emissions on a downward trajectory towards net zero.**

  - Fossil CO_2 emissions decreased in 22 countries representing 23% of global fossil CO_2 emissions during the past decade (2014-2023) while their economies grew[4], up from 18 countries during the previous decade (2004-2013)**.**

  - Decreases in fossil CO_2 emissions were more pronounced in the group of OECD countries in the past decade (-1.4% per year on average) compared to the previous decade (-0.9%).

[4]Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Jordan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, South Korea, Romania, Slovenia, Somalia, Spain, Sweden, Switzerland, United Kingdom, USA. New countries compared to the previous decade include New Zealand, Norway and South Korea, while Austria exited the list in the past decade.

- Increases in fossil CO_2 emissions slowed down in the group of non-OECD countries in the past decade (1.8% per year on average) compared to the previous decade (4.9%). This is also observed separately for China.

- Global fossil CO_2 emissions grew more slowly in the past decade (+0.6% per year on average) compared to the previous decade (2.4%), even though emissions continue to rise.

- These trends can be largely explained by the continued decarbonisation of energy systems (e.g., coal to gas and fossil fuels to renewables) and a slightly weaker economic growth during the past decade. The continued decarbonisation of the energy sector has not accelerated sufficiently to reverse the growth in global fossil CO_2 emissions.

Net CO_2 emissions from land-use change[5] remain high, but they have decreased since their peak in the late-1990s, in particular in the past decade.

- **Global net CO_2 emissions from land-use change[2] averaged 4.1 $GtCO_2$ for the past decade (2014-2023), with a projection for 2024 of 4.2 $GtCO_2$.**

  - Brazil, Indonesia, and the Democratic Republic of the Congo together contribute 60% of the global net land-use change CO_2 emissions.

  - Annual emissions from permanent deforestation considerably decreased over the past decade (2014-2023) but still remain high at around 3.7 $GtCO_2$, highlighting the strong potential of halting deforestation for emissions reductions.

  - Other emissions from land management, including wood harvest and other forest management (1.0 $GtCO_2$ per year), peat drainage and peat fires (0.9 $GtCO_2$ per year), and other transitions (0.4 $GtCO_2$ per year) add to these annual fluxes.

  - Permanent removals through reforestation and afforestation (1.9 $GtCO_2$ per year), offset around half of the permanent deforestation emissions. Harvested wood products add notably to the amounts of Carbon Dioxide Removal based on vegetation, while biochar and Bioenergy with Carbon Capture and Storage (BECCS) provide negligible amounts.

  - Over the past decade, emissions from deforestation in shifting cultivation cycles (2.6 $GtCO_2$ per year) are almost compensated by removals from forest regrowth after abandoning agricultural areas in shifting cultivation cycles (2.5 $GtCO_2$ per year).

  - The projected rise in land-use change emissions in 2024 (0.5 $GtCO_2$ over the 2023 level)

[5] Net CO_2 emissions from land-use change refer to emissions, but also removals, from land-use, land-use change and forestry, such as deforestation, reforestation and afforestation, and forest management. They exclude CO_2 fluxes from vegetation in response to changing CO_2 concentration and climate conditions.

is driven by fire emissions linked to deforestation and forest degradation in South America. Drought conditions associated with temporary El Niño conditions exacerbated forest fires.

    - The estimate of net CO_2 emissions from land-use change published here can be translated to the definition used by national greenhouse gas inventories, which also include the natural land sink in managed forests. When common definitions are used, a net sink of 2.6 $GtCO_2$ over managed forest is estimated based on our analysis (2014-2023), closely matching the sink of 2.8 $GtCO_2$ based on national inventories.

- **Annual net land-use change CO_2 emissions have declined each decade since the late-1990s, when they were at their highest level since the 1950s.** This trend is found to be statistically significant for the first time thanks to improved data and methods.

    - The decline of 28% between the late-1990s (1995-2004) and the most recent decade (2013-2023) is caused by both decreasing emissions from deforestation and increasing removals from reforestation and afforestation.

    - The decline is further enhanced in the most recent decade (-20%), in the context of further decrease in deforestation. However, removals from reforestation and afforestation have stagnated in the past decade.

    - Key improvements in methodology were updates in the estimates of changes in cropland and pasture areas in major countries (Brazil, Indonesia, China) using regionally-specific data products.

Besides removals through land-use change, current deliberate Carbon Dioxide Removal (CDR) not based on vegetation offsets a negligible fraction of fossil CO_2 emissions in 2023.

- The annual flux of carbon resulting from deliberate carbon dioxide removal activity not based on vegetation is a million times smaller than current fossil CO_2 emissions at 0.04 million tonnes of CO_2, with 0.03 million tonnes of enhanced weathering projects and 0.004 million tonnes of Direct Air Capture with Capture Storage (DACCS).

Total CO_2 emissions from fossil use and land-use change combined have plateaued in the past decade, but not declined. The growth in fossil CO_2 emissions is compensated by the decline in land-use change CO_2 emissions. There is still no sign of the rapid and deep decrease in total CO_2 emissions that is needed to tackle climate change.

- **Total CO_2 emissions have now plateaued in the past decade (2014-2023), compared to the strong growth of 2% per year over the previous decade (2004-2013), but they are not on a downward trajectory towards net zero.**

- Despite the plateau in total emissions over the past decade, 2024 emissions are projected to reach 41.6 $GtCO_2$ in 2024, 2% above their 2023 level of 40.6 $GtCO_2$. This is driven by an increase in land-use change emissions due to large emissions from emissions from deforestation and forest degradation and forest degradation fires in South America exacerbated during El Niño. Hence land-use change CO_2 emissions are not compensating the rise in fossil CO_2 emissions this year.

- The mean annual growth in fossil CO_2 emissions over the past decade (equivalent to 0.2 $GtCO_2$) was compensated by the mean annual decline in land-use change CO_2 emissions (also 0.2 $GtCO_2$) over the past decade (2014-2023).

- Despite progress in individual countries, there is no sign of the decrease in global total CO_2 emissions that is needed to tackle climate change.

- Continued CO_2 emissions lead to further increase of CO_2 in the atmosphere and, therefore, continued global warming. Total anthropogenic CO_2 emissions need to rapidly decrease and reach net zero in order to stop further warming.

- **If the plateau in total CO_2 emissions continues, the remaining carbon budget for a 50% chance to limit warming to 1.5°C could be exceeded in 6 years.**

    - From January 2025, the remaining carbon budget for a 50% likelihood to limit global warming to 1.5°C, 1.7°C and 2°C has respectively been reduced to 235 $GtCO_2$ (6 years at 2024 emissions levels), 585 $GtCO_2$ (14 years) and 1110 $GtCO_2$ (27 years). The remaining carbon budget is subject to large uncertainties, particularly when so close to the global warming limit of 1.5°C.

    - Reaching net zero CO_2 emissions by 2050[6] entails cutting total CO_2 emissions by 1.6 $GtCO_2$, or 3.9% of 2024 emissions, each year on average. This would result in additional cumulative emissions of 530 $GtCO_2$ between 2025 and 2050, close to the 50% likelihood of limiting warming to nearly 1.7°C.

    - Reducing global temperatures after net zero CO_2 emissions is reached would require net negative emissions (i.e., more removals than emissions). In addition to minimal fossil CO_2 emissions, this would require an unprecedented scale up of land and other removals.

C. Atmospheric CO_2 accumulation and the natural carbon sinks

The land and ocean CO_2 sinks combined continued to take up around half of the anthropogenic CO_2 emitted to the atmosphere, despite being negatively impacted by climate change.

[6] Note that most countries have net zero objectives that cover all greenhouse gasses, and not just CO_2.

- The ocean CO_2 sink absorbed 10.5 $GtCO_2$ on average each year in the past decade (2014-2023), or 26% of total CO_2 emissions. Climate conditions reduced the ocean sink by an estimated 5.9% in the past decade, likely dominated by altered winds that perturb the ocean circulation with a smaller contribution from the reduced solubility of CO_2 in warming waters.

- The land CO_2 sink absorbed 11.7 $GtCO_2$ on average each year in the past decade (2014-2023), or 29% of total CO_2 emissions. Climate conditions reduced the land sink by an estimated 27% in the past decade due to warming and reduced rainfall. The negative effects of climate change can be seen across the globe, and are particularly strong in most of South America, Central Europe, and Southeast Asia.

- The effects of El Niño have led to a reduction in the land CO_2 sink in 2023, which is projected to recover as El Niño ended by the second quarter of 2024. The land and ocean CO_2 sinks fluctuate annually in response to natural climate variability.

    - The effects of El Niño that developed in late 2023 and early 2024 reduced the land CO_2 sink to 8.4 $GtCO_2$ in 2023, 41% below 2022 and 28% below its decadal mean.

    - The preliminary estimate for the 2024 land CO_2 sink suggests a recovery to around 11.9 $GtCO_2$ following the end of El Niño by the second quarter of 2024. The timing and the extent of the recovery will need to be confirmed with consolidated data in 2025.

    - Net CO_2 fluxes on land – the sum of land-use change emissions and the land CO_2 sink was reduced to around 3.6 $GtCO_2$ in 2023, the lowest level since the 2015-2016 El Niño.

    - The preliminary estimate for the 2024 ocean CO_2 sink is around 10.8 $GtCO_2$. The ocean sink has been stagnant since 2016 after rapid growth during 2002-2016. The stagnation is largely in response to climate variability associated with prolonged La Niña periods.

Global CO_2 emissions from fires in 2024 have been above the average since the beginning of the satellite record in 2003, particularly due to the persistence of the extreme 2023 wildfire season in Canada and to intense drought promoting fires in Brazil.

- Global fire CO_2 emissions are presented alongside the global carbon budget analysis to give an indication of their scale. Direct comparison cannot be made between the reported fire CO_2 emissions and other components of the budget (such as the land sink and land-use change emissions) because these emissions cannot be allocated to specific types of fires at this stage[7].

- The global CO_2 emissions from fires amounted to 7.0 (6.0-8.0) $GtCO_2$ for January-September 2024, 11-32% above the 2014-2023 average. This is due to synchronous large emissions in North and South America, particularly Canada and Brazil.

[7] A portion of the reported fire CO_2 emissions is natural, a portion is already included in the land use change emissions or the land sink components, and post-fire recovery fluxes are not included in the above fire emissions estimate.

- In Canada, the extreme wildfire season of 2023 persisted in 2024. Emissions for January-September 2024 were 0.8-1.2 $GtCO_2$, down from 1.7-2.8 $GtCO_2$ in 2023 but still more than twice the 2014-2023 average.
- In Brazil, fire emissions for January-September 2024 were 0.8-1.2 $GtCO_2$, approximately double their 2014-2023 average due to intense drought.

The concentration of CO_2 continued to increase in the atmosphere because of continued CO_2 emissions. The increase was further enhanced in 2023 and 2024 due to El Niño conditions.

- **Atmospheric CO_2 concentration increased 2.79 parts per million in 2023 and is projected to increase by a further 2.76 parts per million (21.5 $GtCO_2$) in 2024**, above the mean annual increase of 2.46 parts per million (19.2 $GtCO_2$) over the past decade (2014-2023).
    - Total CO_2 emissions are responsible for the rise in atmospheric CO_2 concentration (on average 2.5 parts per million in the past decade), with the response of the land CO_2 sink (and to a lesser extent the ocean CO_2 sink) to climate conditions modulating the exact increase each year.
    - The 2023-2024 El Niño and the emissions from wildfires in North and South America combined to leave additional CO_2 in the atmosphere in 2023 and part of 2024.
    - The 2023 rise in atmospheric CO_2 concentration was the 4th largest over the 1959-2023 atmospheric observational record, closely following 2015, 2016 and 1998, all strong El Niño years[8].
- **Atmospheric CO_2 concentration is set to reach 422.5 parts per million averaged over the year in 2024 (see latest trends here)[9], 52% above its pre-industrial level.**

[8] Here we use the global average rise in atmospheric CO_2 concentration. The 2023 rise in atmospheric CO_2 concentration at the Mauna Loa Observatory in the Northern Hemisphere was a record high.
[9] https://www.esrl.noaa.gov/gmd/ccgg/trends/gl_data.html

Table 1. Projected change in fossil CO_2 emissions by fuel type in million tonnes CO_2 (percent in for 2024 compared to 2023). IAS stands for International aviation and shipping. RoW stands for World in aggregate (excluding IAS).
World values include cement carbonation and IAS.

Country	Total	Coal	Oil	Natural gas	Cement
World	+399 (+0.8%)	+66 (+0.2%)	+143 (+0.9%)	+214 (+2.4%)	-40 (-2.8%)
China	+55 (+0.2%)	+51 (+0.3%)	-8 (-0.8%)	68 (+8%)	-56 (-8.1%)
USA	-16 (-0.6%)	-25 (-3.5%)	-10 (-0.7%)	+22 (+1%)	-2 (-5.8%)
India	+149 (+4.6%)	+98 (+4.5%)	+27 (+3.6%)	+16 (+11.8%)	+8 (+4%)
EU27	-89 (-3.8%)	-85 (-15.8%)	5 (0.2%)	-7 (-1.3%)	-2 (-3.5%)
RoW	+197 (+1.1%)	+28 (+0.5%)	+38 (+0.5%)	+115 (2.2%)	+13 (+2%)
IAS	+90 (+7.8%)		+90 (+7.8%)		

Table 2. 2023 fossil CO_2 emissions from top 20 countries including the European Union (EU27; together and separately) in billion tonnes CO_2/yr, and, when available, projection of growth for 2024.
World values include cement carbonation and IAS.

Country	2023 emissions (billion tonnes CO_2/yr)	2023 % of total	2023 emissions per capita (tonnes CO_2/pers/yr)	2023 growth (percent)	2024 projected growth (percent)
China	11.9	32.2%	8.3	4.9%	+0.2% (-1.6% to +2.0%)
USA	4.9	13.3%	14.4	-3.3%	-0.6% (-2.9% to +1.7%)
India	3.1	8.3%	2.1	8.2%	+4.6% (+3% to +6.1%)
EU27	2.5	6.8%	5.6	-8.4%	-3.8% (-6.2% to -1.4%)
Russia	1.8	4.9%	12.6	0.8%	
Japan	1.0	2.7%	8.0	-4.3%	
Iran	0.8	2.2%	9.2	2.1%	
Saudi Arabia	0.7	2.0%	19.9	1.8%	
Indonesia	0.7	2.0%	2.6	-0.5%	
Germany	0.6	1.6%	7.2	-11.2%	
South Korea	0.6	1.6%	11.2	-4.1%	
Canada	0.5	1.5%	14.2	-0.2%	
Brazil	0.5	1.3%	2.2	0.5%	
Mexico	0.5	1.3%	3.8	3.7%	
Turkey	0.4	1.2%	5.0	-1.2%	
South Africa	0.4	1.1%	6.7	-0.8%	
Australia	0.4	1.0%	14.5	-0.4%	
Viet Nam	0.3	0.9%	3.4	12.5%	
Italy	0.3	0.8%	5.3	-8.0%	
United Kingdom	0.3	0.8%	4.5	-2.8%	

Poland	0.3	0.8%	7.1	-8.2%	
International Aviation	0.5	1.4%	n.a.	23.2%	13.5%
International Shipping	0.6	1.6%	n.a.	-0.3%	2.7%
World	37.0	100%	4.7	1.3%	+0.8% (-0.3% to +1.9%)

Table 3. Decadal growth in fossil CO_2 emissions (percent per year)

	World	China	USA	EU27	India	OECD	Non-OECD	IAS	ROW
2004-2013	2.4%	7.5%	-1.4%	-1.8%	6.4%	-0.9%	4.9%	2.6%	1.9%
2014-2023	0.6%	1.9%	-1.2%	-2.1%	3.6%	-1.4%	1.8%	-1.6%	0.4%

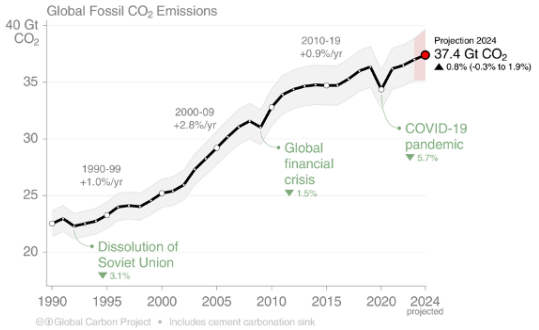
Table 4. Land-use changes CO_2 emissions from key countries, in billion tonnes CO_2/yr. Average over the 2014-2023 period.

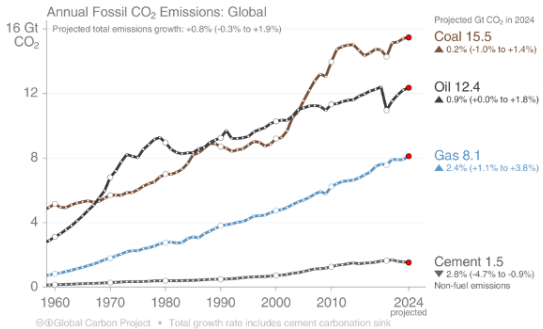
Top 10 countries, E_{LUC} CO_2 emission

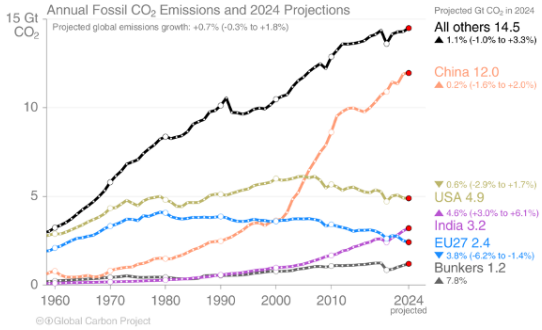
	Net Emissions (billion tonnes CO_2/yr)	% of global
Brazil	1.12	27.1
Indonesia	0.83	20.1
Democratic Republic of the Congo	0.53	12.8
Russia	0.22	5.3
Tanzania	0.11	2.8
Canada	0.10	2.5
Malaysia	0.10	2.5
Viet Nam	0.10	2.4
Myanmar	0.10	2.4
Angola	0.09	2.3

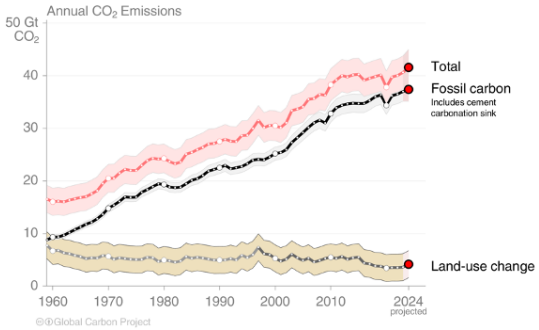
World	**4.14**	**100%**

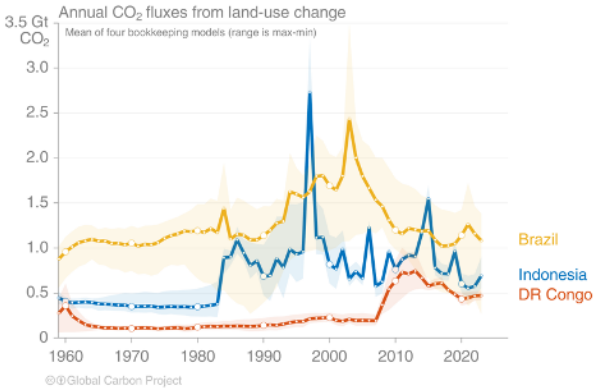
Key figures:

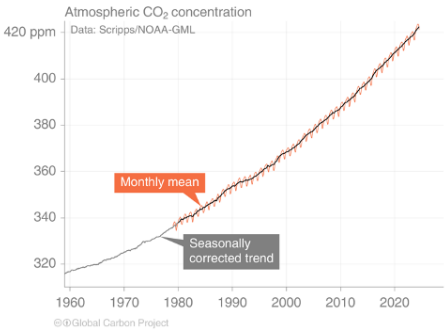

Global Fossil CO2 Emissions
40 Gt CO2
35
30
25
20
1990-99
+1.0%/yr
2000-09
+2.8%/yr
2010-19
+0.9%/yr
Projection 2024
37.4 Gt CO2
▲ 0.8% (-0.3% to 1.9%)
Dissolution of Soviet Union
▼ 3.1%
Global financial crisis
▼ 1.5%
COVID-19 pandemic
▼ 5.7%
1990
1995
2000
2005
2010
2015
2020
2024
projected
Global Carbon Project • Includes cement carbonation sink

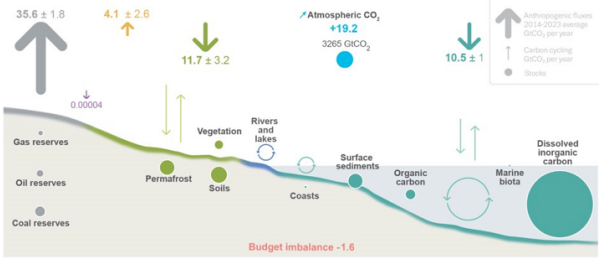

Annual Fossil CO2 Emissions: Global
Projected total emissions growth: +0.8% (-0.3% to +1.9%)
16 Gt CO2
12
8
4
0
Projected Gt CO2 in 2024
Coal 15.5
▲ 0.2% (-1.0% to +1.4%)
Oil 12.4
▲ 0.9% (+0.0% to +1.8%)
Gas 8.1
▲ 2.4% (+1.1% to +3.8%)
Cement 1.5
▼ 2.8% (-4.7% to -0.9%)
Non-fuel emissions
1960
1970
1980
1990
2000
2010
2024
projected
Global Carbon Project • Total growth rate includes cement carbonation sink


Annual Fossil CO2 Emissions and 2024 Projections
Projected global emissions growth: +0.7% (-0.3% to +1.8%)
15 Gt CO2
10
5
0
Projected Gt CO2 in 2024
All others 14.5
▲ 1.1% (-1.0% to +3.3%)
China 12.0
▲ 0.2% (-1.6% to +2.0%)
▼ 0.8% (-2.9% to +1.7%)
USA 4.9
▲ 4.6% (+3.0% to +6.1%)
India 3.2
EU27 2.4
▼ 3.8% (-6.2% to -1.4%)
Bunkers 1.2
▲ 7.8%
1960
1970
1980
1990
2000
2010
2024
projected
Global Carbon Project


Annual CO2 Emissions
50 Gt CO2
40
30
20
10
0
Total
Fossil carbon
Includes cement carbonation sink
Land-use change
1960
1970
1980
1990
2000
2010
2024
projected
Global Carbon Project


Annual CO2 fluxes from land-use change
Mean of four bookkeeping models (range is max-min)
3.5 Gt CO2
3.0
2.5
2.0
1.5
1.0
0.5
0
Brazil
Indonesia
DR Congo
1960
1970
1980
1990
2000
2010
2020
Global Carbon Project


Atmospheric CO2 concentration
Data: Scripps/NOAA-GML
420 ppm
400
380
360
340
320
Monthly mean
Seasonally corrected trend
1960
1970
1980
1990
2000
2010
2020
Global Carbon Project


35.6 ± 1.8
4.1 ± 2.6
11.7 ± 3.2
Atmospheric CO2
+19.2
3265 GtCO2
10.5 ± 1
0.00004
Gas reserves
Oil reserves
Coal reserves
Permafrost
Vegetation
Soils
Rivers and lakes
Coasts
Surface sediments
Organic carbon
Marine biota
Dissolved inorganic carbon
Budget imbalance -1.6

This media release is part of the Global Carbon Budget 2024, the annual update by the Global Carbon Project. The Global Carbon Budget annual update builds on established methodologies in a fully transparent manner. The 2024 edition is undergoing peer-review in the journal *Earth System Science Data*.

Friedlingstein et al. (2024) Global Carbon Budget 2024. *Earth System Science Data*. [DOI TO BE ADDED HERE] (on 13 November, see below for access prior to the embargo)

DATA AVAILABILITY:

All material, publications, data, figures (including by country), are available under embargo on the following link: https://drive.google.com/drive/folders/1yJ0hW9nQFih_3mmjAOKtRaMDi2mql1vo

https://drive.google.com/drive/folders/1yJ0hW9nQFih_3mmjAOKtRaMDi2mql1vo

Global Carbon Atlas (on 13 November): http://globalcarbonatlas.org

PRESS BRIEFINGS:

Science Media Centre online news briefings will be held as follows:

- UK: Friday 8 November, 10:30 GMT. Contact: smc@sciencemediacentre.org

EVENTS AT COP 29:

- **UN Press Conference & launch of Global Carbon Budget 2024**. Location: Press conference 2 (Natavan), Area C. Blue Zone COP 29, 13th November. 10.30-11.00
- **UNFCCC side event**. Action with impact: Critical enablers for fulfilling national commitments. Location: SIDE EVENT 5, blue Zone, COP 29, 14th November. 15.00-16.30
- **Coalition of Rainforest Nations Pavilion.** Climate Science: The 2024 Global Carbon Budget and The Global South. Location: Coalition of Rainforest Nations Pavilion, Blue Zone, COP29, 15th November. 16.00-16.45
- **IPCC Pavilion event.** Reconciling anthropogenic land-use emissions. Location: Science for Climate Action Pavilion, Blue Zone COP 29, 11:00 – 12:15, Saturday 16th November

Contact: pressoffice@exeter.ac.uk

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