CarbonMajors

2023 Data Update

MARCH 2025

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Executive Summary

■ Carbon Majors traces 33.9 $GtCO_2e$ of emissions to the 169 active entities in the database in 2023, a 0.7% increase from 2022. The CO_2 emissions in the database accounted for 78.4% of global fossil fuel and cement CO_2 emissions in 2023, with just 36 companies linked to over half of these global emissions.

Figure 1: Carbon Majors & Global CO_2 Emissions (1854–2023)
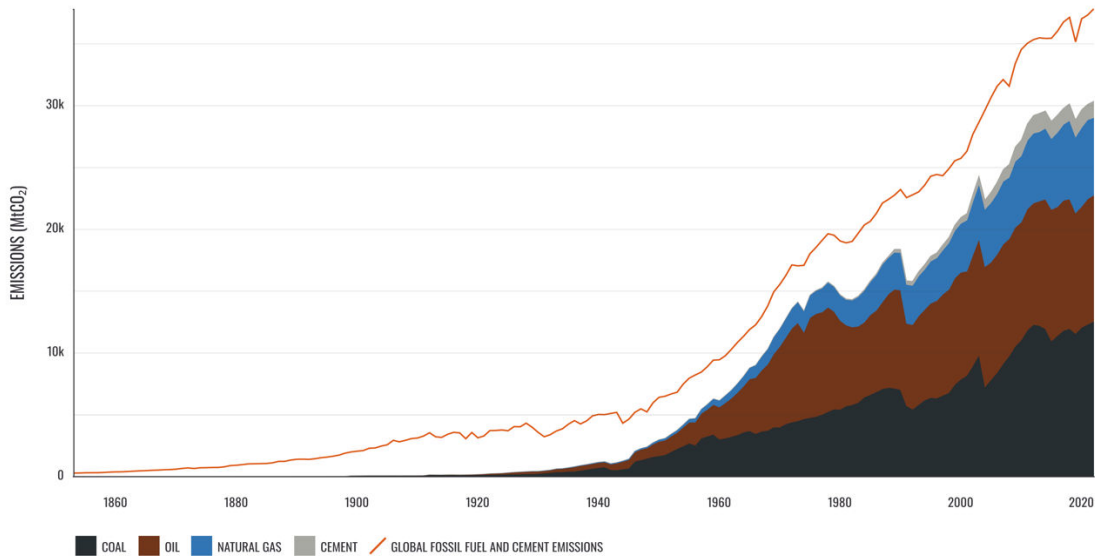
■ Carbon Majors is a database of historical production data from 180 of the world's largest oil, gas, coal, and cement producers representing 169 active and 11 inactive entities. This data is used to quantify the direct production-linked operational emissions and emissions from the combustion of marketed products that can be attributed to these entities. The database is updated annually and is available at *carbonmajors.org*. This briefing presents the updated data for the 2023 reporting year. Carbon Majors has played a pivotal role in holding fossil fuel producers to account for their climate-related impacts in academic, regulatory, and legal contexts. Climate litigation examples include the Commission on Human Rights of the Philippines' *inquiry* into corporate responsibility for climate-related human rights violations as well as multiple lawsuits in the U.S. against major emitters (e.g., in *Baltimore, Oregon*, and *San Francisco and Oakland*).

■ Since the release of the *Carbon Majors Database: Launch Report* in April 2024, there have been several key developments in the utilization of the underlying data and the concept of climate attribution based on historical emissions. Most notably, the database has been used to inform the development of accountability mechanisms like *New York* and *Vermont's* Climate Superfund laws, which require major emitters to fund climate damage repairs. Researchers have also used it to quantify the role of fossil fuel companies in *intensifying extreme heatwaves*, while legal advocacy groups have cited it to support potential *criminal charges* against fossil fuel executives for reckless endangerment. Additionally, the

database has been referenced in regulatory actions, such as ClientEarth's *complaint* against BlackRock for misleading investors.

■ The Carbon Majors database traces 1,388 $GtCO_2e$ of cumulative historical emissions from 1854 through the end of 2023 to 180 industrial producers, the CO_2 portion of which is equivalent to 67.5% of global fossil fuel and cement CO_2 emissions since 1750. Over one third of these global CO_2 emissions historically can be traced to just 26 companies.

■ The 2023 Carbon Majors update includes the disaggregation of coal emissions from China, the Russian Federation, the Czech Republic, Poland, Ukraine, and Kazakhstan, which were previously aggregated at the national level. The new update attributes emissions to individual companies in these countries, the largest of which are state-owned. This has contributed to state-owned entities becoming the largest entity type in the database in 2023, with 22.5 $GtCO_2e$ attributed to 68 state-owned companies, equivalent to 52% of global fossil fuel and cement CO_2 emissions in 2023. In comparison, 99 investor-owned companies accounted for 10.2 $GtCO_2e$ (23%) and 2 nation states were linked to 1.1 $GtCO_2e$ (3%).

■ The top 20 highest carbon-producing entities collectively accounted for 17.5 $GtCO_2e$ in emissions in 2023, with their CO_2 emissions representing 40.8% of global fossil fuel and cement CO_2 emissions. The list is dominated by state-owned entities, which make up 16 of the top 20, and includes a significant presence of Chinese entities, eight of which accounted for 17.3% of global fossil fuel and cement CO_2 emissions in 2023. Coal companies also feature prominently with seven in the top 20, including six from China and one from India, highlighting Asia's continued reliance on coal.

■ The top 5 state-owned entities in 2023 were Saudi Aramco, Coal India, CHN Energy, National Iranian Oil Co., and Jinneng Group, and they were linked to 7.4 $GtCO_2e$ (the CO_2 portion of which is equivalent to 17.4% of global fossil CO_2 emissions).The top 5 investor-owned companies in 2023 were ExxonMobil, Chevron, Shell, TotalEnergies, and BP, and they accounted for a combined 2.2 $GtCO_2e$ (the CO_2 portion of which is equivalent to 4.9% of global fossil CO_2 emissions).

■ The analysis also found that most entities are linked to increased emissions in 2023 compared to 2022. Overall, 93 entities increased their emissions, while 73 reduced emissions and 3 maintained the same level of emissions.

■ In 2023, coal remained the largest source of emissions, contributing 41.1% of emissions in the database, continuing a steady increase since 2016. While coal emissions grew by 1.9% (258 $MtCO_2e$) since 2022, cement experienced the largest relative rise at 6.5% (82 $MtCO_2e$), reflecting expanding production. In contrast, natural gas emissions declined by 3.7% (164 $MtCO_2e$), and oil remained stable with a minimal 0.3% increase (73 $MtCO_2e$).

Introduction

Background

In its 2023 *AR6 Synthesis Report*, the International Panel on Climate Change (IPCC) stated that global surface temperatures have already reached 1.1°C above pre-industrial levels (1850–1900) from 2011–2020, underscoring the urgency of immediate and deep emissions reductions. Meanwhile, the *UN Emissions Gap Report 2024* reveals that despite existing climate agreements, global greenhouse gas emissions reached a record high of 57.1 $GtCO_2e$ in 2023, a 1.3% increase from 2022. This growth exceeds the average annual increase observed between 2010–2019 of 0.8%. Unless emissions in 2030 fall below levels inferred by current policies and Nationally Determined Contributions (NDCs), the chance of achieving the 1.5°C target will vanish, and the difficulty of limiting warming to 2°C (>66% chance) will increase dramatically. The International Energy Agency's (IEA) *Net Zero by 2050* report emphasizes the need for a dramatic and immediate decline in coal, oil, and gas consumption, yet the fossil fuel industry continues to expand. In 2023, global CO_2 emissions from fossil fuels reached a record high of 37.8 $GtCO_2$, up 1.3% from 2022.[1]

Carbon Majors

Carbon Majors was first released in 2013[2] by Richard Heede of the Climate Accountability Institute (CAI) to trace emissions from fossil fuel and cement production back to the companies responsible. In 2024, InfluenceMap, in collaboration with CAI, updated and launched the database on a new website, *carbonmajors.org*. This platform ensures regular updates and increased accessibility for users.

Carbon Majors was developed to focus on the accountability of hydrocarbon producers, specifically corporations that consistently generate substantial profits from the extraction and manufacturing of products known to be the major contributors to climate change. Unlike national-level emissions databases, it is the first and only global database that aggregates emissions data by company, providing a crucial link between corporate actions and climate change-related harms. This approach has been essential for identifying and establishing the responsibility of a small group of companies whose emissions have significantly contributed to global warming.

Since 2013, Carbon Majors has been widely utilized in climate litigation and legislation, serving as a critical tool for emissions attribution. Additionally, it has found applications in academic research, as well as in regulatory and financial contexts. Since the release of the *Carbon Majors Database: Launch Report* in April 2024, notable use cases include:

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[1] *Global Carbon Budget. Friedlingstein et al. Earth System Science Data, 2024.*

[2] *Heede, R.* Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854–2010. *Climatic Change* **122**, 229–241 (2014).

- *New York* and *Vermont* have passed Climate Superfund laws requiring fossil fuel companies responsible for significant emissions to pay into state funds for climate damage repair and adaptation. The database is a proposed tool to quantify these companies' emissions.

- *Quilcaille et al. found* climate change significantly increased heatwave intensity and likelihood, with 33% of historical heatwaves being virtually impossible without anthropogenic influence. The study also quantifies the role of the Carbon Majors entities in intensifying these heatwaves, showing that emissions from these producers made up to 62 heatwaves reported between 2000 and 2022 up to 10,000 times more likely.

- A 2024 *memo* by Public Citizen and Fair and Just Prosecution outlines how fossil fuel companies and their CEOs could face criminal charges under New York's reckless endangerment laws for knowingly contributing to climate disasters while misleading the public about the risks. The database serves as a key resource to support evidence of reckless conduct by major fossil fuel producers.

- ClientEarth filed a *complaint* against BlackRock with the French financial regulator, for misleading investors about 'sustainable' funds while investing in fossil fuel companies, including ExxonMobil, Shell, and BP. The database is cited to highlight these companies' significant contribution to global emissions.

Methodology

Carbon Majors traces greenhouse gas emissions from fossil fuels and cement produced by companies from as early as 1854 to the present. This section provides a brief overview of the database's methodology. For a more detailed explanation, see the Methodology in Appendix 1 or refer to Rick Heede's 2014 paper, *Carbon Majors: Methods & Results Report*[3].

Carbon Majors selects the largest oil, gas, coal, and cement producers based on their production. These entities are categorized as either investor-owned, state-owned, or nation-state producers. Nation-state producers are used primarily in the coal sector and are included only when investor-owned or state-owned companies haven't been established or played a minor role in the relevant country.

Production data is obtained for each entity and is primarily based on self-reported figures, with third-party sources used when necessary. This data is standardized to common commodity types, each with a standard unit: Oil & Natural Gas Liquids (million barrels), Natural Gas (billion cubic feet), and Coal (million tonnes). To improve data accuracy, coal production is further categorized by rank, such as bituminous or anthracite, or by utilization, such as thermal or metallurgical.

Emission factors for each fuel type are used to estimate the carbon content released when these fossil fuels are combusted. Applying this factor to the standardized production results in the emissions from the combustion of marketed products, comprising nearly 90% of total emissions tracked by the database. These are Scope 3 Category 11 emissions, corresponding to "use of sold products". Four direct, operational Scope 1 emissions are then estimated: the flaring and venting of CO_2 at oil and gas facilities, fugitive methane from coal, oil, and gas operations, and CO_2 from a producer's own fuel use (mainly gas production). Both Scope 1 and Scope 3 emissions are then aggregated to determine the total emissions for a company in a given year and historically.

Estimation of CO_2 emissions for cement production differs from that for fossil fuel production. Cement emissions are calculated based on process emissions from limestone calcining and exclude fuel and electricity inputs already accounted for by fossil fuel producers.

This research compares the emissions tracked by the Carbon Majors database to total fossil fuel and cement emissions since the beginning of the Industrial Revolution. Data from the Carbon Dioxide Information Analysis Center (CDIAC), and more recently the *Global Carbon Project*, provides this total, amounting to 1,812 $GtCO_2$ from 1750 to 2023. The CO_2 emissions figures obtained from the above

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[3] *The data storage and processing methods as well as the output formats have changed. The new data structure Is accessible and is explained on the* website.

calculations (excluding fugitive methane CO_2 equivalent emissions) are compared to this total to calculate entities' relative contributions to total fossil fuel and cement emissions.

Findings

This section presents analysis of the Carbon Majors database, beginning with a historical overview of the data and then examining emissions in 2023. The 2023 analysis highlights the top 20 entities by emissions, and examines emissions by entity type, fuel type, and region. In previous versions of the database, coal emissions in China, the Russian Federation, the Czech Republic, Poland, Ukraine, and Kazakhstan were aggregated at the national level. The 2023 update disaggregates these emissions, attributing them to individual companies instead of nations. The last section explores this newly added data.

The following figure shows the annual CO_2 emissions traced to the carbon fuels and cement produced by the Carbon Majors entities from the beginning of the data records in 1854 to 2023 and compares these to global fossil fuel and cement CO_2 emissions.

Figure 2: Carbon Majors & Global CO$_2$ Emissions (1854–2023)
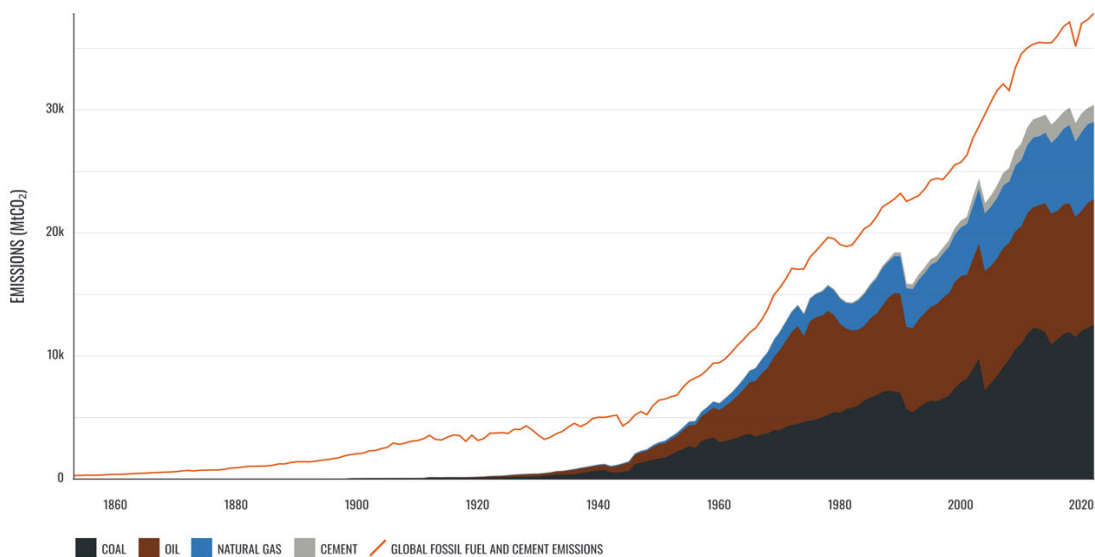
Historical Emissions

Carbon Majors traces 1,388 GtCO$_2$e of cumulative historical emissions from 1854 through 2023 to 180 industrial producers, the CO_2 portion of which is equivalent to 67.5% of global fossil fuel and cement CO_2 emissions since 1750. Over a third (33.7%) of these global CO_2 emissions historically can be attributed to just 26 companies.

The table below shows the top 20 highest carbon producing entities in the database, which collectively account for 845 GtCO$_2$e, representing 41.0% of global historical fossil fuel and cement CO_2 emissions since 1824. In the 2023 update, China dropped to second place, Poland to thirteenth place and the Russian Federation was removed due to the disaggregation of their coal production data (see the Nation State Coal

Disaggregation section for more information). These emissions are now attributed to individual companies. Changes to the top 20 include:

- The Russian Federation's coal production dropped out of the rankings, while China's fell to second place and Poland's to thirteenth. This shift occurred because post-2004 and post-2001 production data for China and Poland, respectively, as well as Russia's coal production since the fall of the Soviet Union, were disaggregated and attributed to individual companies.

- CHN Energy, one of the Chinese coal companies that emerged from this disaggregation, entered the rankings at number fourteen.

- The former Soviet Union moved up one place to first. Abu Dhabi National Oil Company (ADNOC) and China's cement production each climbed two spots, while Pemex rose one place in the rankings.

- TotalEnergies and Peabody Energy each dropped one place in the rankings.

Table 1: Top 20 Carbon Majors entities by emissions (1854–2023)

Entity	Total emissions (MtCO$_2$e)	CO$_2$ emissions (MtCO$_2$)	Percentage of global CO$_2$ emissions
Former Soviet Union (1900–1991)	135,113	118,604	6.54%
China (Coal, 1945–2004)	104,888	94,242	5.20%
Saudi Aramco	70,670	64,432	3.56%
Chevron	58,598	51,705	2.85%
ExxonMobil	55,667	48,214	2.66%
Gazprom	51,823	38,840	2.14%
National Iranian Oil Company	44,439	39,086	2.16%
BP	42,877	37,843	2.09%
Shell	41,092	35,534	1.96%
Coal India	30,939	27,799	1.53%
Pemex	25,861	22,989	1.27%
China (Cement)	24,211	24,211	1.34%
Poland (Coal, 1913–2001)	22,695	20,392	1.13%
CHN Energy	21,796	19,584	1.08%
ConocoPhillips	20,495	17,394	0.96%
British Coal Corporation (1947–1994)	19,745	17,741	0.98%
CNPC	19,684	17,215	0.95%
Abu Dhabi National Oil Company (ADNOC)	18,089	16,052	0.89%
Peabody Energy	18,019	16,190	0.89%
TotalEnergies	17,943	15,690	0.87%

Note: The total emissions values in the table above includes fugitive methane emissions in MtCO$_2$ equivalent units, however only total CO$_2$ figures are factored into the calculation of an entity's percentage of total fossil fuel and cement emissions.

The top 20 includes 16 companies and 4 nation-states: the coal production of the Former Soviet Union, China, and Poland, as well as China's cement production. Among the companies, 9 are state-owned and 7 are investor-owned, with the United States (4 companies), the United Kingdom (3 companies), and China (2 companies) having the largest representation.

Emissions in 2023

In 2023, Carbon Majors traced emissions totalling 33.9 GtCO$_2$e to the 169 active entities within the database, an increase of 0.7% compared to 2022 (0.2 GtCO$_2$e). The CO$_2$ emissions tracked by the database in 2023 are equivalent to 78.4% of global fossil fuel and cement CO$_2$ emissions in that year. One half (50.0%) of fossil fuel and cement CO$_2$ emissions in 2023 can be traced to just 36 state- and investor-owned companies.

The table below highlights the top 20 highest carbon producing entities in the database in 2023. Collectively, these entities were linked to 17.5 GtCO$_2$e in emissions, with their CO$_2$ emissions accounting for 40.8% of all global fossil fuel and cement CO$_2$ emissions in 2023. The list is predominantly composed of state-owned entities, which make up 80% of the top 20. Notably, Chinese entities represent 40% of the list, and the CO$_2$ emissions from these 8 companies constitute 17.3% of the total fossil fuel and cement CO$_2$ emissions for the year. Coal companies feature prominently, with seven on the list, six from China and one from India, highlighting the continued reliance on coal in Asia.

Table 2: Top 20 Carbon Majors entities by emissions (2023)

Entity	Total emissions (MtCO$_2$e)	CO$_2$ emissions (MtCO$_2$)	Percentage of global CO$_2$ emissions
Saudi Aramco	1,839	1,656	4.38%
Coal India	1,548	1,391	3.68%
CHN Energy	1,533	1,378	3.65%
National Iranian Oil Company	1,262	1,040	2.75%
Jinneng Group	1,228	1,103	2.92%
Gazprom	1,136	875	2.31%
China (Cement)	1,050	1,050	2.78%
Rosneft	805	702	1.86%
CNPC	733	612	1.62%
Shandong Energy	728	654	1.73%
China National Coal Group	719	646	1.71%
Abu Dhabi National Oil Co (ADNOC)	705	618	1.64%
Shaanxi Coal and Chemical Industry Group	681	612	1.62%
Sonatrach	576	460	1.22%
ExxonMobil	562	483	1.28%
Shanxi Coking Coal Group	548	493	1.30%
Iraq National Oil Company	540	498	1.32%

Entity	Total emissions (MtCO$_2$e)	CO$_2$ emissions (MtCO$_2$)	Percentage of global CO$_2$ emissions
Chevron	487	412	1.09%
Shell	418	350	0.92%
Kuwait Petroleum Corp.	417	380	1.01%

Note: The total emissions values in the table above includes fugitive methane emissions in MtCO$_2$ equivalent units, however only total CO$_2$ figures are factored into the calculation of an entity's percentage of total fossil fuel and cement emissions.

Emissions by Entity Type in 2023

Emissions from the assessed entities are traced to three entity types: investor-owned companies, state-owned companies, and nation-state producers. Nation-state producers are used primarily in the coal sector and are included only when investor-owned or state-owned companies are either not established, play a minor role in the country, or lack available historical production data.

Prior to the 2023 Carbon Majors data update, emissions data for coal production in China, the Russian Federation, the Czech Republic, Poland, Ukraine, and Kazakhstan were aggregated at the national level in the database. However, the 2023 update disaggregates these emissions, attributing them to individual companies, the largest of which are state-owned. This has contributed to state-owned entities becoming the largest entity type in the database in 2023, with 22.5 GtCO$_2$e attributed to 68 companies, equivalent to 52% of global fossil fuel and cement CO$_2$ emissions in 2023. In comparison, 99 investor-owned companies accounted for 10.2 GtCO$_2$e (23% of global fossil fuel and cement CO$_2$ emissions) and 2 nation states were linked to 1.1 GtCO$_2$e (3% of global fossil fuel and cement CO$_2$ emissions).

The top 5 investor-owned companies, ExxonMobil, Chevron, Shell, TotalEnergies, and BP are responsible for a significant portion of global emissions, with a total of 2.2 GtCO$_2$e (4.9% of global fossil CO$_2$ emissions). However, this is still considerably lower than the 7.4 GtCO$_2$e (17.4% of global fossil CO$_2$ emissions) linked to the 5 largest state-owned entities in 2023: Saudi Aramco, Coal India, CHN Energy, National Iranian Oil Co., and Jinneng Group. The new additions of CHN Energy and Jinneng Group, along with Coal India, highlights the influence of state-owned coal companies, particularly in Asia.

The analysis also found that most entities are linked to increased emissions in 2023 compared to 2022. Overall, 93 entities increased their emissions, while 73 reduced them and 3 maintained the same level of emissions. State-owned entities expanded the most, with 42 of the 68 (62%) companies in the database increasing emissions, resulting in an additional 391 MtCO$_2$e being produced in 2023 compared to 2022. Just over half of investor-owned companies increased emissions, with 50 of the 99 (51%) companies linked to increased emissions. However, despite this, investor-owned companies as a group produced 139 MtCO$_2$e less in 2023 than in 2022.

Emissions by Fuel Type in 2023

Carbon Majors tracks emissions from the production of four different commodity types: oil & natural gas liquids (oil & NGL), natural gas, coal, and cement.

As the table below shows, coal, the largest contributor to overall emissions in the database in 2023, grew by 1.9% (258 MtCO$_2$e), reinforcing its dominant role in total emissions. Cement experienced the largest relative increase in emissions at 6.5% (an 82 MtCO$_2$e rise), reflecting expanding production. In contrast, natural gas saw a decline of 2.0% (164 MtCO$_2$e), while oil remained relatively stable, with a slight increase of 0.7% (73 MtCO$_2$e).

Table 3: Commodity Emissions in 2023

Commodity type	2023 Emissions (MtCO$_2$e)	Change from 2022
Oil & Natural Gas Liquids	10,752	+0.7%
Natural Gas	7,864	-2.0%
Coal	13,923	+1.9%
Cement	1,343	+6.5%

As shown in the graph below, coal has held the largest share of emissions since 2008. Prior to that, from the mid-1980s until 2008, coal and oil have alternated as the dominant source. The mid-1960s and 1970s were dominated by oil, before which coal consistently held the largest share. Natural gas has been steadily increasing its share in total emissions since the 1940s, while cement's share has been growing since the 1980s.

Figure 3: Commodity Percentage Share of Emissions (1950–2023)
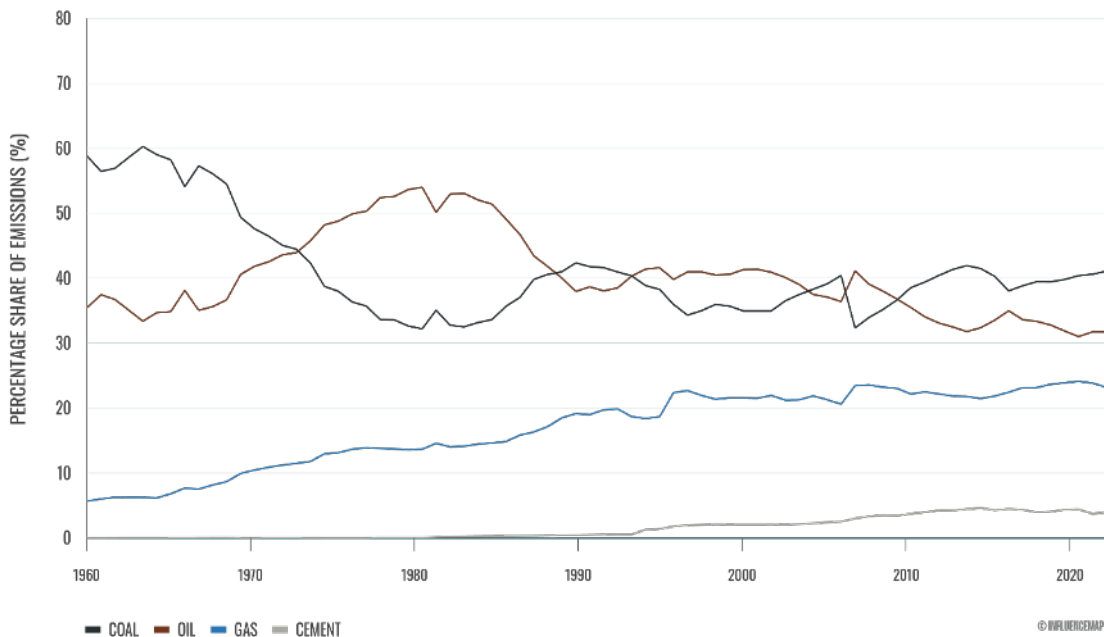
Since 2005, coal's percentage share of emissions has been steadily rising, reaching 41% in 2023, its highest level since 2013, when it peaked at 42%. In contrast, the share of oil and NGLs has been on a slow decline since the mid 2000s, dropping from 41% in 2005 to 32% in 2023. Cement and natural gas have remained relatively consistent in the last 20 years, with cement's share staying below 5% and natural gas fluctuating between 21% and 24%.

Company Emissions by Region in 2023

This section analyzes the emissions of both investor-owned and state-owned companies by region, categorizing these entities based on the location of their headquarters: Africa, Asia, Australia, Europe, the Middle East, North America, and South America.

Between 2022 and 2023, emissions from coal and natural gas companies in Africa decreased, while emissions from oil companies increased. In Australia, emissions across all commodity types decreased. Similarly, in Europe, company emissions reduced from all produced commodities other than cement. In contrast, emissions rose across all produced commodities from companies in Asia, reflecting continued growth in production. In North America, emissions from coal companies dropped, while emissions from cement companies as well as oil and natural gas companies continued to rise, suggesting a shift in fossil fuel usage patterns. In the Middle East, emissions from natural gas companies rose, while those from oil companies.

Table 4: Regional Emissions in 2023

Region	Companies with increased emissions	Emissions change from 2022
Africa	3 of 8 (38%)	+0.1%
Australia	2 of 4 (50%)	+11.3%
Europe	19 of 49 (39%)	-4.0%
Asia	36 of 48 (75%)	+5.5%
Middle East	4 of 9 (44%)	+0.9%
North America	26 of 41 (63%)	+3.4%
South America	4 of 5 (80%)	+3.1%

Nation State Coal Disaggregation

Carbon Majors includes nation-state producers primarily in the coal sector when investor-owned or state-owned companies are either not established, play a minor role in the country, or lack available historical production data. Until the 2022 update, coal production data in Carbon Majors from China, the Russian Federation, the Czech Republic, Poland, Ukraine, and Kazakhstan was aggregated at the national level. However, the 2023 update disaggregates coal production from these nations, attributing emissions to

individual companies. This section analyses the emissions associated with this newly detailed production data, with a focus on China and Russia, two of the most significant coal-producing countries.

Chinese coal

The inclusion of Chinese coal companies in Carbon Majors represents a significant development compared to previous iterations of the database. Previously, emissions from these companies were aggregated at the national level, limiting insight into company-specific contributions. This was due to the unavailability of historical production data and challenges in verifying the ownership structures of these entities. However, thanks to work analysing and translating Chinese coal industry reports, this data gap has been addressed. The database now includes data on 28 companies, spanning production from 2005 to 2023, providing a source for emissions from Chinese coal production at the company level.

This addition is particularly important given China's dominant role in global coal production. In 2023, China produced 4.36 billion tonnes of coal, accounting for approximately 50% of global coal output[4]. The companies included in the database represent over 77% of China's coal production in 2023, offering a comprehensive view of the largest Chinese coal companies' emissions. Moreover, these companies constitute 71% of total Chinese coal emissions over the 2005–2023 period, underscoring their importance in historical emissions.

Twenty-four of the Chinese coal companies in the database are state-owned, compared to four investor-owned..

Table 5: Top 20 Chinese coal producers by emissions (2023)

Entity	Total emissions (MtCO$_2$e)	Carbon Majors 2023 Rank	Percentage of 2023 global CO$_2$ emissions
CHN Energy	1,533	3	4.06%
Jinneng Group	1,228	5	3.25%
Shandong Energy	728	10	1.93%
China National Coal Group	719	11	1.90%
Shaanxi Coal and Chemical Industry Group	681	13	1.80%
Shanxi Coking Coal Group	548	16	1.45%
China Huaneng Group	292	29	0.77%
Lu'an Chemical Group	292	30	0.77%
State Power Investment Group	219	40	0.58%
Henan Energy and Chemical Industry Group	215	41	0.57%
Huaihe Energy Holding Group	205	42	0.54%
Liaoning Energy Industry Holding Group	198	44	0.52%
Huadian Coal Industry Group	170	51	0.45%
Jizhong Energy Resources	157	53	0.42%

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[4] *U.S. Energy Information Administration.* Coal and Coke Production: International Energy Statistics. *U.S. Department of Energy, n.d.,* https://www.eia.gov/international/data/world/coal-and-coke/coal-and-coke-production. *Accessed 23 January 2025.*

Entity	Total emissions (MtCO$_2$e)	Carbon Majors 2023 Rank	Percentage of 2023 global CO$_2$ emissions
Inner Mongolia Yitai Group	141	60	0.37%
Inner Mongolia Huineng Coal and Electricity Group	136	63	0.36%
Xinjiang Tianshan Energy	136	63	0.36%
Inner Mongolia Dian Tou Energy	126	65	0.33%
Huayang New Material Technology Group	124	67	0.33%
Longmay Mining Group	116	73	0.31%

Note: The total emissions values in the table above includes fugitive methane emissions in MtCO$_2$ equivalent units, however only total CO$_2$ figures are factored into the calculation of an entity's percentage of total fossil fuel and cement emissions.

Russian coal

Similarly to China, emissions from Russian coal companies were aggregated at the national level, starting with the foundation of the Russian Federation in 1992. Like China, this was due to challenges in obtaining reliable production data during the initial post-Soviet period, as state-owned assets were privatized and reorganized. Again, this data gap has been addressed through the discovery and analysis of Russian coal data from various industry and company reports. In the 2023 update, 14 Russian coal companies have been added to the database, with the earliest company-specific data from three companies dating back to 1998.

Russia is the fifth-largest national coal producer in the world, producing 480 million tonnes of coal in 2023, accounting for approximately 6% of global coal production[5]. In 2023, the companies included in the database represent over 64% of Russia's total coal production, and since the establishment of the Russian Federation in 1992, these companies have accounted for over 57% of the nation's total coal production.

Table 6: Russian coal producers by emissions (2023)

Entity	Total emissions (MtCO$_2$e)	Carbon Majors 2023 Rank	Percentage of 2023 global CO$_2$ emissions
SUEK	250	37	0.66%
Kuzbassrazrezugol	101	85	0.27%
Elgaugol	62	110	0.16%
EVRAZ	56	120	0.15%
ELSI	53	125	0.14%
Stroyservis	44	130	0.12%
En+ Group	40	135	0.11%
SDS Coal	31	142	0.08%
Mechel	29	142	0.08%
Kuzbasskaya Toplivnaya	26	146	0.07%
Russian Coal	26	147	0.07%
Novaya Gornaya	24	148	0.06%

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[5] *Ibid*

Entity	Total emissions (MtCO$_2$e)	Carbon Majors 2023 Rank	Percentage of 2023 global CO$_2$ emissions
TALTEK	22	150	0.06%
Severstal	21	152	0.06%

Note: The total emissions values in the table above includes fugitive methane emissions in MtCO$_2$ equivalent units, however only total CO$_2$ figures are factored into the calculation of an entity's percentage of total fossil fuel and cement emissions.

Coal Disaggregation in Other Nations

In addition to China and Russia, the 2023 Carbon Majors data update disaggregates coal production data for the Czech Republic, Poland, Ukraine, and Kazakhstan. While these nations contribute less to global coal production than China and Russia, their inclusion provides valuable insights into regional company emissions. In Poland, five companies included in the database represent 75% of the nation's coal production since 2002. In the Czech Republic, the four new companies in the database account for 45% of its coal production, while in Ukraine and Kazakhstan, the three new companies in each country represent 72% and 66% of their respective coal production, covering the period since the dissolution of the Soviet Union.

Table 7: Newly added coal producers by emissions (2023)

Entity	Total emissions (MtCO$_2$e)	Percentage of 2023 global CO$_2$ emissions
Czech Republic		
Severoceske doly	21	0.06%
Sev.en Group	17	0.04%
OKD	6	0.01%
Sokolovska uhelna	5	0.01%
Kazakhstan		
Samruk-Energy	117	0.31%
Eurasian Resources Group[6]	80	0.21%
Kazakhmys Holding Group	20	0.05%
Poland		
Polska Grupa Gornicza (PGG)	58	0.15%
PGE Group	51	0.14%
JSW	39	0.10%
LW Bogdanka	19	0.05%
Poludniowy Koncern Weglowy	15	0.04%
Ukraine		
DTEK	50	0.13%
Metinvest	16	0.04%

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[6]*The company is headquartered in Luxembourg, but it is minority-owned by the government of Kazakhstan and the majority of its coal production is from Kazakhstan.*

Note: The total emissions values in the table above includes fugitive methane emissions in MtCO₂ equivalent units, however only total CO₂ figures are factored into the calculation of an entity's percentage of total fossil fuel and cement emissions.

Policy Engagement

Many of the companies tracked by Carbon Majors are among the most oppositional companies to climate regulation globally, as shown by InfluenceMap's *LobbyMap* database. The LobbyMap database scores and ranks over 500 companies and 250 industry associations on their activities influencing climate change policy using an A+ to F scale.

Investor-owned Companies

As shown in the table below, LobbyMap assesses 9 of the 10 highest-emission investor-owned Carbon Majors companies. Of these 9 companies, 5 score a D or below, indicating unsupportive positions on climate policy. The remaining 4 score only slightly higher at C-. All 9 assessed companies have an engagement intensity score above 18%, indicating active engagement with climate policy. Additionally, 8 out of 9 have intensity scores above 31%, indicating highly active or strategic engagement. For example, *Chevron* scores an D- with an engagement intensity of 44%, and *ExxonMobil* scores a D with an engagement intensity of 50%, indicating that both companies are highly engaged with and hold unsupportive or oppositional positions on climate-related policy.

Table 8: Top 10 investor-owned companies: LobbyMap policy engagement scores

Investor-owned company	Performance band	Engagement intensity
Chevron	D-	44%
ExxonMobil	D	50%
BP	C-	62%
Shell	C-	63%
ConocoPhillips	D-	35%
Peabody Energy	F	18%
TotalEnergies	C-	53%
Occidental Petroleum	D	31%
BHP	C-	49%
CONSOL Energy	-	-

State-owned Companies

State-owned companies are even more oppositional to climate regulation globally according to *LobbyMap research*. LobbyMap assesses 7 of the 10 highest emissions state-owned Carbon Majors companies. Similarly to investor-owned companies, none scores higher than a C-, while 5 receive scores lower or equal to a D, where D to F indicates increasingly obstructive climate policy engagement.

State-owned companies are also not as transparently engaged as investor-owned companies. The 6 assessed state-owned companies average a 15% engagement intensity compared to 45% for investor-owned companies. *Saudi Aramco*'s D- score with an engagement intensity of 13% is representative of these companies, indicating oppositional positions on climate policy with active engagement.

Table 9: Top 10 state-owned companies: LobbyMap policy engagement scores

State-owned company	Performance band	Engagement intensity
Saudi Aramco	D-	13%
Gazprom	E	19%
National Iranian Oil Company	-	-
Coal India	D	10%
Pemex	D-	14%
State-owned company	Performance band	Engagement intensity
CHN Energy (Shenhua Energy)	C-	14%
British Coal Corporation	-	-
CNPC (PetroChina)	C-	26%
Abu Dhabi National Oil Company (ADNOC)	D	11%
Petroleos de Venezuela	-	-

Conclusion

This analysis of emissions linked to the world's largest carbon-producing entities provides important insights into the responsibility for industrial CO_2 emissions. The historical overview, spanning from 1750 to 2023, reveals that 67% of global fossil fuel and cement emissions can be traced to 181 entities, with over one-third of these emissions attributed to just 26 producers.

In 2023, the database traced 33.7 $GtCO_2e$ of emissions to the 169 active entities, marking a 0.1% increase from 2022. Notably, just 37 companies were linked to over half of global fossil fuel and cement CO_2 emissions that year. The top 20 highest carbon-producing entities in 2023 are dominated by state-owned enterprises, with 16 of the 20 being state-owned. This list also underscores the significant role of Chinese entities, with the eight entities on the list responsible for 17.3% of global emissions in 2023. Coal companies also feature prominently, with seven on the list, six from China and one from India, highlighting Asia's continued reliance on coal.

A significant update in this year's analysis is the disaggregation of coal emissions previously aggregated at the national level for China, the Russian Federation, the Czech Republic, Poland, Ukraine, and Kazakhstan. Attributing these emissions to individual companies, many of which are state-owned, further emphasizes the dominant role of state-owned enterprises. In fact, state-owned entities have emerged as the largest emitters by type in 2023, with 67 state-owned entities linked to 22.3 $GtCO_2e$, more than double the 10.2 $GtCO_2e$ attributed to 99 investor-owned entities.

Coal remained the largest contributor to emissions in 2023, with its share of total emissions increasing, while cement emissions saw the largest relative rise. In contrast, natural gas emissions declined slightly, and oil emissions remained stable. Regionally, Africa and Europe made some progress in emissions reductions, with most companies in these regions decreasing emissions and overall emissions dropping across all fuels. All other regions saw total emissions increase from 2022, with the majority of companies in those regions, except the Middle East, linked to higher emissions.

In summary, Carbon Majors provides a comprehensive view of the historical and ongoing role of major producers in global emissions. It provides strong evidence for attributing responsibility for climate impacts to a small group of entities, who are often actively engaged with climate policy while simultaneously holding unsupportive or oppositional positions on those policies. By doing so, Carbon Majors underscores the urgent need for targeted accountability and systemic changes in industrial production and policy to align with global climate goals.

Appendix 1: Methodology

Carbon Majors aims to trace greenhouse gas emissions from fossil fuels and cement produced by companies, historically from as early as 1854 to the present. This section gives an overview of the methodology that the database uses to achieve this. For a more detailed description of this methodology, including discussion around the accounting protocol, calculation of emissions factors, historical attribution, uncertainties, etc., please refer to Rick Heede's 2014 paper, *Carbon Majors: Methods & Results Report*[7].

Entity Selection

Greenhouse gas emissions data has historically primarily been collected at the country level. Carbon Majors was created to instead link these emissions to fossil fuel production companies, or "carbon majors". Carbon Majors originally selected extant companies from a variety of sources that met an 8 MtC per year emissions threshold. Some entities in the database do not meet this threshold, for example, companies that met the threshold when the Carbon Majors project was started but have since shrunk, or smaller companies acquired by larger ones. However, this guideline still applies to ensure a manageable number of entities. The number of entities assessed may vary over time due to mergers and acquisitions, as well as additions to the database.

The assessed entities are divided into three entity types: investor-owned companies, state-owned companies, and nation-state producers. Investor-owned companies include both publicly listed and privately held producers. Nation-state producers are used primarily in the coal sector and are included only when investor-owned or state-owned companies haven't been established or played a minor role in the relevant country. Examples include North Korea and former Soviet states (the former Soviet Union, Kazakhstan, Ukraine, etc.). While current and recent production is available for some Chinese coal entities, historical production data is unavailable before 2005 and so before this date, China's coal production has been aggregated and reported as a nation state. State-owned companies are often partially owned by institutional or individual shareholders. These are considered state owned if more than fifty percent of shares are controlled by the state.

The database also tracks mergers and acquisitions. In such cases, the acquired companies' emissions are attributed to the surviving company. Divestitures are inherently accounted for, as the production from divested assets will not be included in subsequent company disclosures (see Production Data below for further explanation). Assets that have been nationalized or expropriated are also monitored to the extent that equity-owned production is reported accurately by the relevant entities. Breakups of companies are also accounted for. For example, the multiple smaller companies into which the Standard Oil Trust was broken up have evolved to become some of the most recognizable companies in the database today.

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[7] *The data storage and processing methods as well as the output formats have changed. The new data structure Is accessible and is explained at on the* website.

Some are direct descendants of Standard Oil, like ExxonMobil, with both Exxon and Mobil as descendants separately, and Chevron. Others have resulted from mergers with descendants of Standard Oil, such as BP and ConocoPhillips.

Production Data

Carbon Majors obtains production data for each entity for each year. Due to the importance of transparency in the Carbon Majors approach, self-reported production data by the producing entity is always preferred to and used instead of any other sources. This includes annual reports, company histories, SEC filings, operation reviews, online datasets on production, etc. However, in some cases, reputable third-party sources are used when self-reported data is unavailable, particularly for national companies that irregularly, inaccurately, or do not publish production data. Alternative, third-party sources include the U.S. Energy Information Administration (EIA), the Keystone Coal Industry Manual, the Oil & Gas Journal (especially the annual OGJ100/150 issues), and others.

For historical data, complete production records are sought and used where applicable. However, for some entities, production data is unavailable from the establishment of the entity, resulting in minor cases of underreporting, as early production is often overshadowed by later company expansions. In such cases, the entity's missing early production data are left empty. This is especially true before the U.S. Securities Act of 1933, which required companies to provide full and accurate financial and operational information. Other data gaps sometimes occur, often due to missing annual reports. In the absence of alternative available data, such gaps are filled through interpolation of surrounding data.

Net production data is preferred to gross, as gross production often includes output from joint ventures, production-sharing partnerships, or a state resource owner. While reporting gross production was common in the 1960s and early 1970s, it tends to overestimate emissions. In such cases, net production is estimated by applying a net-to-gross ratio. State-owned oil and gas companies typically report total production rather than their equity share. This practice can lead to a potential issue of double counting, where production is recorded both as overseas equity production by multinational oil and gas companies and as production by state-owned entities. To address this, collating data from third-party sources is utilized to adjust self-attributed production. This involves reducing total national production by a percentage corresponding to the portion of production owned by the state.

Due to variations in how companies report production, the reported production data is standardized to a common commodity type, each with a standard unit: Oil & Natural Gas Liquids (million barrels), Natural Gas (billion cubic feet), and Coal (million tonnes).

To improve data accuracy, coal production is further categorized by rank, such as bituminous or anthracite, or by utilization, such as thermal or metallurgical. Preferably, coal rank data reported by the producing entity is used. However, coal rank is frequently reported in generic terms, but often with data on heat

content. Using this information, along with the geographical locations of coal mines, enables coal rank categorization when entities fail to do so themselves. If this information is only available for specific years, this coal rank split may be applied to production data outside these years as an estimation.

Emissions Calculations

Fossil Fuel Emissions

Emission factors for each fuel type are used to estimate the carbon content released when these fossil fuels are combusted. These emissions factors were mostly derived from Tier 1 defaults from the Intergovernmental Panel on Climate Change's (IPCC) *Guidelines for National Greenhouse Gas Inventories.* Other sources, including the International Energy Agency (IEA), United Nations, EIA, US Environmental Protection Agency (EPA), and Carbon Dioxide Information Analysis Center (CDIAC), were also consulted.

These emissions factors are then modified by deducting net non-energy uses of each fuel. This is due to some proportion of the fuel produced being refined into products that effectively store carbon, such as various petrochemicals. Non-energy uses vary by a wide variety of factors, however, like other global emissions databases, a common factor must be applied for non-energy uses associated with each fuel type. While this factor is likely reasonably accurate on a global scale, it may not always precisely represent each specific entity's non-energy uses.

Applying this factor to the standardized production results in the emissions from the combustion of marketed products, comprising nearly 90% of total emissions tracked by the database. These are Scope 3 Category 11 emissions, corresponding to "use of sold products".

Emission factors for the combustion of oil & natural gas liquids, natural gas, and coal[8]

Fuel type	Carbon factor	CO_2 factor
Oil & Natural Gas Liquids	101.4 kgC/bbl	371.4 kgCO_2/bbl
Natural Gas	14.6 kgC/kcf	53.4 kgCO_2/kcf
Lignite Coal	328.4 kgC/tonne	1,203.2 kgCO_2/tonne
Sub-Bituminous Coal	495.1 kgC/tonne	1,814.1 kgCO_2/tonne
Bituminous Coal	665.5 kgC/tonne	2,438.6 kgCO_2/tonne
Anthracite Coal	715.4 kgC/tonne	2,621.5 kgCO_2/tonne
Metallurgical Coal	727.4 kgC/tonne	2,665.4 kgCO_2/tonne
Thermal Coal	581.0 kgC/tonne	2,128.9 kgCO_2/tonne

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[8] *Emissions factors include deduction for non-energy uses.*

Four further direct operational Scope 1 emission types are then estimated:

- Flaring of CO_2 at oil and gas facilities, including various upstream and midstream facilities, relevant to oil and gas production.
- Venting of CO_2 from natural gas processing plants, also relevant to oil and gas production.
- Fugitive methane emissions from coal mines, oil extraction and storage, and gas production, processing, and transportation systems, applicable to oil, gas, and coal production.
- CO_2 emissions resulting from entity's use of their own fuel, limited to gas production, primarily the difference between total gas produced and "gas available for sale".

Emission factors for the vented, flared, and fugitive carbon dioxide and methane, and use of own fuel

Fuel type	Combustion (kgCO₂/tCO₂)	Flaring (kgCO₂/tCO₂)	Venting (kgCO₂/tCO₂)	Fugitive methane (kgCH4/tCO₂)	Fugitive methane (kgCO₂/tCO₂)	Own fuel use
Oil & Natural Gas Liquids	1,000	15.94	3.83	1.92	53.86	-
Natural Gas	1,000	1.74	28.53	9.88	276.59	57.26
Coal	1,000	-	-	4.03	112.97	-

Note: This analysis uses the IPCC AR5 100 year warming potential of 28 x CO_2 for methane.

Cement Emissions

Estimation of CO_2 emissions for cement production differs from that for fossil fuel production. Cement-related emissions are estimated as a proportion of gross emissions reported by the major cement companies to the Cement Sustainability Initiative. This proportion of gross emissions estimates the process emissions from the calcining of limestone into clinker or Portland cement and excludes the emissions from fuel and electricity inputs, thus avoiding the double-counting of fuels from fossil fuels producers already accounted for in Carbon Majors. From all these calculations, the database tracks the total emissions value in CO_2 equivalent units generated by each entity each year.

Global Fossil Fuel & Cement Emissions

This research compares the emissions tracked by Carbon Majors to total fossil fuel and cement emissions since the beginning of the Industrial Revolution. Data from the Carbon Dioxide Information Analysis Center (CDIAC), and more recently the *Global Carbon Project*, provides this total, amounting to 1,812 GtCO₂ from 1750 to 2023. The CO_2 emissions figures obtained from the above calculations (excluding fugitive methane CO_2 equivalent emissions) are compared to this total to calculate entities' relative contributions to total fossil fuel and cement emissions.

Appendix 2: Historical Emissions (1854–2023)

The emissions column in the table below includes four direct production-linked operational emission types (comprising part of Scope 1 emissions) and emissions from the combustion of marketed products (categorized as Scope 3 Category 11: Use of Sold Products). One of the four direct emission types is fugitive methane (see the Methodology for more information), given in CO_2 equivalent units. In the final column, *Percentage of global CO_2 emissions*, the value for fugitive methane is not considered when comparing an entity's total CO_2 emissions to total fossil fuel and cement CO_2 emissions.

Carbon Majors entities ranked by emissions (1854–2023)

	Entity	Emissions (MtCO₂e)	Percentage of global CO₂ emissions
1	Former Soviet Union	135,113	6.54%
2	China (Coal)	104,888	5.20%
3	Saudi Aramco	70,670	3.56%
4	Chevron	58,598	2.85%
5	ExxonMobil	55,667	2.66%
6	Gazprom	51,823	2.14%
7	National Iranian Oil Company	44,439	2.16%
8	BP	42,877	2.09%
9	Shell	41,092	1.96%
10	Coal India	30,939	1.53%
11	Pemex	25,861	1.27%
12	China (Cement)	24,211	1.34%
13	Poland	22,695	1.13%
14	CHN Energy	21,796	1.08%
15	ConocoPhillips	20,495	0.96%
16	British Coal Corporation	19,745	0.98%
17	CNPC	19,684	0.95%
18	Abu Dhabi National Oil Company	18,089	0.89%
19	Peabody Energy	18,019	0.89%
20	TotalEnergies	17,943	0.87%
21	Petroleos de Venezuela	17,073	0.85%
22	Kuwait Petroleum Corp.	16,339	0.83%
23	Iraq National Oil Company	15,841	0.81%
24	Sonatrach	15,515	0.70%
25	Rosneft	14,925	0.74%
26	Jinneng Group	13,364	0.66%
27	Occidental Petroleum	13,089	0.63%
28	Petrobras	11,211	0.55%

	Entity	Emissions (MtCO$_2$e)	Percentage of global CO$_2$ emissions
29	BHP	11,162	0.55%
30	CONSOL Energy	10,555	0.52%
31	Shandong Energy	10,541	0.52%
32	Nigerian National Petroleum Corp.	10,431	0.51%
33	Czechoslovakia	9,618	0.48%
34	Eni	9,443	0.44%
35	China National Coal Group	9,150	0.45%
36	Petronas	9,001	0.41%
37	QatarEnergy	8,901	0.41%
38	Pertamina	8,426	0.41%
39	Libya National Oil Corp.	8,280	0.42%
40	Anglo American	8,213	0.41%
41	Lukoil	8,167	0.41%
42	Arch Resources	8,116	0.40%
43	Equinor	8,036	0.38%
44	RWE	7,649	0.38%
45	Shanxi Coking Coal Group	7,015	0.35%
46	Rio Tinto	6,767	0.34%
47	Shaanxi Coal and Chemical Industry Group	6,720	0.33%
48	Glencore	6,642	0.33%
49	Alpha Metallurgical Resources	6,173	0.31%
50	ONGC India	6,035	0.29%
51	Sasol	5,091	0.25%
52	SUEK	5,075	0.25%
53	Surgutneftegas	4,918	0.24%
54	Repsol	4,677	0.21%
55	Sinopec	4,624	0.22%
56	North Korea	4,592	0.23%
57	Petroleum Development Oman	4,558	0.22%
58	Egyptian General Petroleum	4,446	0.21%
59	TurkmenGaz	4,432	0.19%
60	CNOOC	4,422	0.22%
61	Petoro	4,321	0.20%
62	Henan Energy and Chemical Industry Group	4,188	0.21%
63	China Huaneng Group	4,068	0.20%
64	Bumi Resources	3,946	0.20%
65	State Power Investment Group	3,920	0.19%
66	Luan Chemical Group	3,919	0.19%
67	Marathon Oil	3,865	0.18%

	Entity	Emissions (MtCO$_2$e)	Percentage of global CO$_2$ emissions
68	Jizhong Energy Resources	3,762	0.19%
69	Sonangol	3,541	0.18%
70	Singareni Collieries	3,431	0.17%
71	Devon Energy	3,395	0.15%
72	Novatek	3,345	0.14%
73	Huaihe Energy Holding Group	3,263	0.16%
74	Holcim Group	3,242	0.18%
75	Ecopetrol	3,204	0.16%
76	Suncor Energy	3,181	0.16%
77	Hess Corporation	3,085	0.15%
78	Ovintiv	3,079	0.14%
79	Huayang New Material Technology Group	3,037	0.15%
80	Liaoning Energy Industry Holding Group	2,968	0.15%
81	Ukrainian Ministry of Fuel and Energy	2,885	0.14%
82	Canadian Natural Resources	2,839	0.13%
83	Kuzbassrazrezugol	2,696	0.13%
84	Samruk-Energy	2,670	0.13%
85	Cyprus AMAX Minerals	2,569	0.13%
86	Kailuan Group	2,541	0.13%
87	Polska Grupa Gornicza (PGG)	2,540	0.13%
88	Longmay Mining Group	2,423	0.12%
89	Inner Mongolia Yitai Group	2,383	0.12%
90	BASF	2,363	0.11%
91	American Consolidated Natural Resources	2,363	0.12%
92	Westmoreland Mining	2,355	0.12%
93	Exxaro Resources Ltd	2,253	0.11%
94	Adaro Energy	2,205	0.11%
95	Bapco Energies	2,200	0.10%
96	YPF	2,111	0.10%
97	Mitsubishi Corporation	2,102	0.10%
98	Inner Mongolia Dian Tou Energy	2,097	0.10%
99	Cenovus Energy	2,081	0.10%
100	Tatneft	2,062	0.11%
101	Eurasian Resources Group	2,055	0.10%
102	Banpu	2,048	0.10%
103	APA Corporation	2,022	0.09%
104	PetroEcuador	1,992	0.10%
105	China Pingmei Shenma Energy and Chemicals	1,955	0.10%
106	EOG Resources	1,953	0.09%

	Entity	Emissions (MtCO$_2$e)	Percentage of global CO$_2$ emissions
107	Alliance Resource Partners	1,863	0.09%
108	Heidelberg Materials	1,741	0.10%
109	Kiewit Mining Group	1,711	0.08%
110	Chesapeake Energy	1,706	0.07%
111	North American Coal	1,675	0.08%
112	INPEX	1,645	0.08%
113	Syrian Petroleum	1,642	0.08%
114	Inner Mongolia Huineng Coal and Electricity	1,568	0.08%
115	Huadian Coal Industry Group	1,536	0.08%
116	Huaibei Mining Group	1,478	0.07%
117	Cloud Peak	1,476	0.07%
118	EVRAZ	1,431	0.07%
119	Vistra	1,405	0.07%
120	PGE Group	1,381	0.07%
121	Teck Resources	1,378	0.07%
122	DTEK	1,375	0.07%
123	Mechel	1,352	0.07%
124	Coterra Energy	1,288	0.06%
125	Naftogaz	1,286	0.05%
126	Inner Mongolia Yidong Investment Group	1,222	0.06%
127	Guizhou Panjiang Coal Power Group	1,192	0.06%
128	PTTEP	1,182	0.05%
129	EQT Corporation	1,147	0.05%
130	Xuzhou Coal Mining Group	1,125	0.06%
131	Southwestern Energy	1,102	0.05%
132	Inner Mongolia Mengtai Group	1,094	0.05%
133	OMV Group	1,069	0.05%
134	Woodside Energy	995	0.04%
135	Huating Coal Industry Group	939	0.05%
136	Pioneer Natural Resources	932	0.04%
137	Cemex	896	0.05%
138	UK Coal	882	0.04%
139	Santos	873	0.04%
140	SDS Coal	871	0.04%
141	En+ Group	866	0.04%
142	JSW	819	0.04%
143	Murphy Oil	794	0.04%
144	Orlen	749	0.03%
145	Mubadala	734	0.03%

	Entity	Emissions (MtCO$_2$e)	Percentage of global CO$_2$ emissions
146	Severstal	723	0.04%
147	Antero	694	0.03%
148	Novaya Gornaya	650	0.03%
149	Metinvest	633	0.03%
150	Taiheiyo Cement	598	0.03%
151	ARC Resources	586	0.03%
152	Russian Coal	573	0.03%
153	Tourmaline Oil	537	0.02%
154	Continental Resources	522	0.02%
155	Kazakhmys Holding Group	513	0.03%
156	Navajo Transitional Energy Company	500	0.02%
157	UltraTech Cement	495	0.03%
158	Seriti Resources	474	0.02%
159	Whitehaven Coal	465	0.02%
160	ArcelorMittal	458	0.02%
161	Kuzbasskaya Toplivnaya	450	0.02%
162	ELSI	448	0.02%
163	Xinjiang Tianshan Energy	448	0.02%
164	Adani Enterprises	446	0.02%
165	Severoceske doly	443	0.02%
166	Stroyservis	437	0.02%
167	LW Bogdanka	430	0.02%
168	Wolverine Fuels	398	0.02%
169	Obsidian Energy	361	0.02%
170	OKD	352	0.02%
171	SM Energy	339	0.02%
172	Vale	317	0.02%
173	CNX Resources	268	0.01%
174	Sev.en Group	247	0.01%
175	CRH	238	0.01%
176	Poludniowy Koncern Weglowy	236	0.01%
177	Tullow Oil	220	0.01%
178	Sokolovska uhelna	206	0.01%
179	TALTEK	203	0.01%
180	Elgaugol	196	0.01%

Appendix 3: 2023 Emissions

The emissions column in the table below includes four direct production-linked operational emission types (comprising part of Scope 1 emissions) and emissions from the combustion of marketed products (categorized as Scope 3 Category 11: Use of Sold Products). One of the four direct emission types is fugitive methane (see the Methodology for more information), given in CO_2 equivalent units. In the final column, *Percentage of global CO_2 emissions*, the value for fugitive methane is not considered when comparing an entity's total CO_2 emissions to total fossil fuel and cement CO_2 emissions.

Carbon Majors entities ranked by emissions (2023)

	Entity	Total emissions (MtCO₂e)	Percentage of global CO₂ emissions
1	Saudi Aramco	1,839	4.38%
2	Coal India	1,548	3.68%
3	CHN Energy	1,533	3.65%
4	National Iranian Oil Company	1,262	2.75%
5	Jinneng Group	1,228	2.92%
6	Gazprom	1,136	2.31%
7	China (Cement)	1,050	2.78%
8	Rosneft	805	1.86%
9	CNPC	733	1.62%
10	Shandong Energy	728	1.73%
11	China National Coal Group	719	1.71%
12	Abu Dhabi National Oil Company	705	1.64%
13	Shaanxi Coal and Chemical Industry Group	681	1.62%
14	Sonatrach	576	1.22%
15	ExxonMobil	562	1.28%
16	Shanxi Coking Coal Group	548	1.30%
17	Iraq National Oil Company	540	1.32%
18	Chevron	487	1.09%
19	Shell	418	0.92%
20	Kuwait Petroleum Corp.	417	1.01%
21	Petrobras	412	0.97%
22	QatarEnergy	387	0.80%
23	Pemex	364	0.86%
24	TotalEnergies	359	0.82%
25	BP	347	0.76%
26	Lukoil	332	0.77%
27	Glencore	313	0.74%
28	Equinor	297	0.66%

	Entity	Total emissions (MtCO$_2$e)	Percentage of global CO$_2$ emissions
29	China Huaneng Group	292	0.69%
30	Luan Chemical Group	292	0.69%
31	Nigerian National Petroleum Corp.	282	0.64%
32	Peabody Energy	278	0.66%
33	CNOOC	274	0.64%
34	ConocoPhillips	273	0.63%
35	Petronas	258	0.54%
36	Eni	257	0.56%
37	SUEK	250	0.59%
38	Sinopec	249	0.56%
39	Novatek	248	0.50%
40	State Power Investment Group	219	0.52%
41	Henan Energy and Chemical Industry Group	215	0.51%
42	Huaihe Energy Holding Group	205	0.49%
43	Canadian Natural Resources	199	0.46%
44	Liaoning Energy Industry Holding Group	198	0.47%
45	TurkmenGaz	197	0.40%
46	Bumi Resources	184	0.44%
47	Surgutneftegas	183	0.44%
48	Occidental Petroleum	182	0.42%
49	Sonangol	174	0.42%
50	Petroleos de Venezuela	172	0.39%
51	Huadian Coal Industry Group	170	0.40%
52	Petroleum Development Oman	165	0.38%
53	Jizhong Energy Resources	157	0.37%
54	Pertamina	156	0.35%
55	Petoro	147	0.31%
56	EOG Resources	147	0.34%
57	Libya National Oil Corp.	147	0.35%
58	Arch Resources	146	0.35%
59	EQT Corporation	146	0.29%
60	Inner Mongolia Yitai Group	141	0.33%
61	Singareni Collieries	140	0.33%
62	Adaro Energy	136	0.32%
63	Inner Mongolia Huineng Coal and Electricity	136	0.32%
64	Xinjiang Tianshan Energy	136	0.32%
65	Inner Mongolia Dian Tou Energy	126	0.30%
66	Egyptian General Petroleum	125	0.27%
67	Huayang New Material Technology Group	124	0.30%

	Entity	Total emissions (MtCO$_2$e)	Percentage of global CO$_2$ emissions
68	American Consolidated Natural Resources	123	0.29%
69	Southwestern Energy	120	0.24%
70	BHP	120	0.28%
71	ONGC India	118	0.26%
72	Samruk-Energy	117	0.28%
73	Longmay Mining Group	116	0.28%
74	Cenovus Energy	115	0.27%
75	Seriti Resources	113	0.27%
76	Mitsubishi Corporation	111	0.25%
77	Suncor Energy	109	0.27%
78	Ecopetrol	108	0.25%
79	Adani Enterprises	107	0.26%
80	Pioneer Natural Resources	106	0.25%
81	Banpu	105	0.24%
82	Coterra Energy	104	0.22%
83	Exxaro Resources Ltd	104	0.25%
84	PTTEP	102	0.21%
85	Kuzbassrazrezugol	101	0.24%
86	Devon Energy	98	0.23%
87	Sasol	97	0.23%
88	Chesapeake Energy	97	0.19%
89	Repsol	93	0.20%
90	INPEX	90	0.20%
91	Navajo Transitional Energy Company	89	0.21%
92	Antero	88	0.18%
93	Tourmaline Oil	87	0.18%
94	Ovintiv	86	0.19%
95	Alliance Resource Partners	86	0.20%
96	Tatneft	86	0.21%
97	China Pingmei Shenma Energy and Chemicals	83	0.20%
98	Eurasian Resources Group	80	0.19%
99	Woodside Energy	77	0.16%
100	Bapco Energies	73	0.16%
101	Kailuan Group	73	0.17%
102	YPF	72	0.16%
103	UltraTech Cement	71	0.19%
104	Teck Resources	70	0.17%
105	PetroEcuador	70	0.17%
106	Holcim Group	69	0.18%

	Entity	Total emissions (MtCO$_2$e)	Percentage of global CO$_2$ emissions
107	Continental Resources	67	0.15%
108	CONSOL Energy	65	0.15%
109	RWE	65	0.15%
110	Elgaugol	62	0.15%
111	North Korea	61	0.14%
112	Marathon Oil	61	0.14%
113	Mubadala	60	0.13%
114	Huating Coal Industry Group	59	0.14%
115	Huaibei Mining Group	59	0.14%
116	Hess Corporation	59	0.14%
117	Polska Grupa Gornicza (PGG)	58	0.14%
118	APA Corporation	58	0.13%
119	Heidelberg Materials	57	0.15%
120	EVRAZ	56	0.13%
121	Xuzhou Coal Mining Group	55	0.13%
122	OMV Group	55	0.12%
123	ARC Resources	54	0.12%
124	Inner Mongolia Yidong Investment Group	54	0.13%
125	ELSI	53	0.13%
126	PGE Group	51	0.12%
127	Anglo American	50	0.12%
128	DTEK	50	0.12%
129	BASF	50	0.11%
130	Stroyservis	44	0.11%
131	Guizhou Panjiang Coal Power Group	44	0.11%
132	Alpha Metallurgical Resources	44	0.10%
133	CNX Resources	41	0.08%
134	Inner Mongolia Mengtai Group	41	0.10%
135	En+ Group	40	0.09%
136	JSW	39	0.09%
137	Whitehaven Coal	37	0.09%
138	Santos	36	0.07%
139	Naftogaz	34	0.07%
140	North American Coal	31	0.07%
141	SDS Coal	31	0.07%
142	Mechel	29	0.07%
143	Murphy Oil	29	0.07%
144	Cemex	29	0.08%
145	Orlen	29	0.06%