



DISASTER DIVIDE

How climate chaos deepens
inequality and enriches the few

Methodology note

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1. Private jet emissions

The analysis uses the dataset provided by Gössling, Humpe and Leitão,¹ which has been maintained after the paper was published.² The dataset calculates the CO₂ emissions of private jets using flight tracker data from the ADS-B Exchange platform.³

Private jets include all aircraft categorised as business jets, there is no way of knowing who takes these flights and the purpose they are used for. Medical flights will inevitably be included in the data, but in most countries this likely account for a very small part of the total flight and emissions

Analysis of the 2025 dataset reveals:

- Total CO₂ emissions: 16,053,728 tonnes
- Total time in the air: 6,585,970 hours
- Total distance travelled: 4,205,865,431 km
- Average emissions per flight: 3.65 tonnes of CO₂
- Sixty-eight percent of the flights departed from the USA.⁴

Stylized facts based on this analysis

1.1. It would take 80 million trees to offset these emissions.

This assumes that each tree offsets 10 kg of carbon per year over 20 years, based on in-depth analysis by forestry experts at One Tree Planted.⁵

1.2. Sixty-eight percent of the flights departed from the USA, despite the USA being home to only 4% of the world's population.

Using the standard estimates from the Population Division of the UN Department of Economic and Social Affairs,⁶ the world's population is 8,056,505,564 people, and the population of the USA is 342,475,098, which is 4.3% of the global total.

1.3. These flights were in the air for the equivalent of 750 years.

Calculated by dividing the total hours in the air, 6,585,970, by the number of hours in a year, 8,760, which equals 752.

1.4. These flights were equivalent to circumnavigating the world 105,000 times.

Calculated by dividing the total distance, 4,205,865,431 km, by the equatorial circumference of Earth, 40,075 km,⁷ which equals 104,950.

1.5. Each flight caused 3.7 tonnes of CO₂ on average, around what the average world citizen emits in a year.

The global average per capita emissions are 4.6 tonnes CO₂, so a single flight is 78% of an average person's entire annual carbon footprint. The per capita emissions is a mean average and so is heavily skewed by high emitters.

Billionaires' private jets

The private jet tail numbers associated with billionaires, as used in Oxfam's *Carbon Inequality Kills* report,⁸ were searched on the 2025 private jet database: 57 billionaire jets were identified, with average emissions of 1,123 tonnes of CO₂ in 2025. These are individuals from the Forbes billionaire list that Oxfam was able to identify, rather than necessarily the highest emitters. With global average per capita emissions at 4.6 tonnes of CO₂, this is 244 times what the average person would emit in a year.

2. Consumption-based emissions

Data and methodology

The report uses the consumption-based emissions dataset developed by the Stockholm Environment Institute (SEI) and used in Oxfam's *Climate Plunder* report. A detailed explanation can be found in the methodology note of that report.⁹ In short, emissions measure carbon dioxide (CO₂) and exclude non-CO₂ emissions and emissions from land use, land-use change and forestry due to limited publicly available data.

National consumption emissions data for 196 countries from 1990 to 2022 from the Global Carbon Atlas,¹⁰ which covers nearly 99% of global emissions, were utilized. These emissions were allocated to individuals within each country based on a functional relationship between income and emissions, drawing on income-distribution data from the World Inequality Database.¹¹ These estimates of the consumption emissions of individuals in each country were then sorted into a global distribution according to income.

The approach assumes that all humans emit a minimum amount of carbon for their survival (an emissions floor) and applies a country-specific per capita emissions floor below which it is assumed that an individual's emissions will not fall. This floor is the emissions associated with an income equal to 30% of the median income of a country.

Given that carbon emissions are finite, it was assumed that a household has a maximum amount of carbon emissions that it produces (an emissions ceiling). The chosen maximum emissions ceiling is 3,000 tonnes CO₂ per capita to reflect evidence of the carbon footprint of the richest individuals.

National income data (i.e. gross domestic product (GDP)) was obtained from the World Bank's World Development Indicators,¹² with any gaps filled with data from Penn World Tables.¹³

The data can be found at <https://emissions-inequality.org>.

Stylized facts based on this analysis

2.1. The richest 0.1% (8 million people) emit more than the poorest 44% (3.5 billion people) combined.

In 2023, the richest 0.1% emitted 2,361 million tonnes of CO₂, while the poorest 44% emitted 2,312 million tonnes of CO₂.

2.2. The richest 0.1% (8 million people) emit more than three times as much as the entire population of sub-Saharan Africa (1.3 billion people).

In 2023, the richest 0.1% emitted 2,361 million tonnes of CO₂, while sub-Saharan Africa's entire population emitted 737 million tonnes of CO₂.

$$2361/737 = 3.2$$

2.3. The world's richest 0.1% emit 37 times more CO₂ than all the carbon-capture and storage plants removed in a year.

According to the Global CCS Institute, as of October 2025, 77 commercial carbon-capture and storage projects were operating, capturing 64 million tonnes of CO₂ per annum.¹⁴

In 2023, the richest 0.1% emitted 2,361 million tonnes of CO₂.

$$2361/64 = 36.9$$

2.4. The world's private jets together emit more in two seconds than someone in the poorest 50% will emit all year.

In 2023 (latest available data), the average annual emissions of someone in the poorest 50% globally was 0.8 tonnes of CO₂.

Total private jet emissions for 2025 were 16,053,728 tonnes of CO₂, divided by the number of seconds in a year (3.15E+07), is 0.51.

2.5. Just one year of emissions from the richest 1% will cause 1.9 million excess deaths due to heat.

The calculations use a concept called the mortality cost of carbon (MCC), which assesses excess deaths due to temperature changes caused by climate change. It is one of the metrics used to calculate the social cost of carbon (SC-CO₂).¹⁵ The SC-CO₂ measures the monetized value of the damages to society caused by an incremental metric ton of CO₂ emissions, including also changes in agricultural productivity, damages caused by sea level rise, mortality and decline in human health and labour productivity. The SC-CO₂ is widely used, for instance, by the United States Environmental Protection Agency to evaluate the impact of mitigation policies. The concept is used to calculate the cost-benefit analysis required when agencies propose environmental rules.

The estimated MCC per metric ton of 2020 emissions (CO₂e) is 2.26×10^{-4} (0.000226).¹⁶ The MCC varies minimally from year to year, meaning that the 2020 MCC estimate can be used to calculate the mortality cost of 2023 emissions.

The deaths calculated span a period of 100 years, rising to a peak at around 10 years in. This is because CO₂ emissions reach their maximum warming potential around 10 years after

being emitted.¹⁷

The emissions of the richest 1% were 6.0 gigatonnes of CO₂ in 2023. This is equivalent to 8.25 gigatonnes of CO₂e; 8.25 billion multiplied by 0.000226 (the estimated MCC per metric ton of emissions) is 1,864,500 deaths.

3. Shareholder emissions

Data and methodology

The methodology for calculating billionaire investment emissions was developed by Oxfam in 2022 and is now the basis of peer-reviewed research building on Oxfam's work.¹⁸ Using data from the Forbes billionaire list, Bloomberg, S&P Capital IQ, media reporting and public filings, Oxfam has developed a database of the investment portfolios of the world's billionaires. The data was filtered, removing cases where:

- the ownership positions of the billionaires could not be identified.
- a billionaire had less than a 10% stake in the company. The 10% threshold was chosen based on the definition used by the US Securities and Exchange Commission of a principal shareholder, as these shareholders are considered to have a significant influence over a company.
- the company had not publicly disclosed any information on its Scope 1 and 2 emissions.

Of the 3,428 billionaires on the Forbes billionaire list, the investments of 1,000 billionaires were identified, with these billionaires having investments in 1,095 companies.

These companies were then cross-referenced with Scope 1 and 2 emissions (CO₂e) according to the S&P Capital IQ database. Billionaires' investment emissions were calculated by summing Scope 1 and 2 emissions and multiplying these by the equity percentage owned – for example, a person with a 20% share in a company has 20% of its emissions allocated to their shareholder emissions.

Table 1. Billionaire total and average emissions

Number of billionaires	Total emissions (tonnes CO ₂ e)	Average emissions (tonnes CO ₂ e)
1,000	485,959,106	485,959
500	482,646,940	965,294
100	415,587,133	4,155,871

Stylized facts based on this analysis

3.1. The emissions of 1,000 billionaires are equivalent to them being the 19th-most polluting country in the world, just after Australia and ahead of South Africa.

As national emissions are usually reported in CO₂ and companies in CO₂e, billionaire emissions were converted to CO₂ using the conversion coefficient 1.375. This puts billionaire emissions at 353,424,804 tonnes of CO₂. Using consumption-based emissions from 2023,¹⁹ these total emissions are between those of Australia and South Africa:

Australia is the 18th-most polluting country in the world at 372,151,400 tonnes of CO₂ and South Africa is in 19th place at 325,381,300 tonnes of CO₂.

3.2. The emissions of the top 100 emitting billionaires are equivalent to those of 3.78 million people combined.

Someone in the poorest 50% emits 0.8 tonnes of CO₂ per year on average, which equates to approximately 1.1 tonnes of CO₂e. Divided by the average emissions of the top 100 emitters (Table 1) equals 3,778,065.

3.3. Their average emissions are 486,000 tonnes of CO₂e, which means that in just over a minute, a billionaire on average emits more carbon than the yearly total emitted by someone in the poorest half of humanity.

Someone in the poorest 50% emits 0.8 tonnes CO₂ per year on average, which equates to approximately 1.1 tonnes of CO₂e. There are 525,600 minutes in a year, therefore the average billionaire emits 0.925 tonnes CO₂e per minute.

3.4. Seventy-one percent of billionaire investments are categorized as being in 'high climate-impact sectors' such as oil, gas or chemicals, compared to 63% in the S&P Global 1,200 Index.²⁰

The classification of high climate-impact sectors was based on the S&P Capital IQ Trucost methodology.²¹

3.5. Based on independent assessments of each company's decarbonization plan, 69% of billionaire-owned companies are not aligned with the 1.5°C Paris Agreement target compared to 51% in the S&P Global 1,200.

Companies' emissions pathways were identified by using the Trucost Paris Alignment dataset on S&P Capital IQ.²²

4. Environmental damage costs

Using S&P Capital Trucost, the damage from billionaire investment emissions can be estimated in monetary terms.²³ According to Trucost:

'Damage costs' are estimates of the negative externality associated with the use of a resource or the emission of a pollutant. They reflect the environmental impact of nearly 500 business activities that the Trucost dataset tracks in monetary terms. Damage costs reflect that the cost of maintaining an environmental benefit is a reasonable estimate of its value. They are calculated by multiplying company data on the quantity of resources used or pollutants emitted (i.e. tCO₂e, m³ of water use, kg of waste generated, etc.) by the Trucost environmental valuation coefficients.

Each company's environmental damage costs are attributed to billionaires based on their ownership share (Table 2).

Table 2. Examples of billionaires' environmental damage costs

Billionaire	Company	Share of ownership	Environmental damage costs (individual's share) in US\$ (most recent year)
Bernard Arnault	LVMH Moët Hennessy Louis Vuitton	49% ²⁴	1,749,003,994
Tyson family	Tyson Foods	20.7% ²⁵	3,309,600,189
Carlos Slim	FCC Group	81.5% ²⁶	2,451,491,756

Double dividend

By combining the publicly listed companies in the Carbon Majors database,²⁷ which are the world's largest oil, gas, coal and cement producers, and the Bloomberg Prepare and Repair Index,²⁸ which comprises companies involved in either climate mitigation or disaster recovery, Oxfam created a sample of 217 companies that are involved in either highly polluting industries or climate mitigation and disaster recovery in order to identify investors who are profiting from both inflicting climate damage and from recovering from it.

S&P Capital IQ's investor screening tool revealed that six major asset managers own 25.38% of the total market capitalization of the companies in the sample. The top three are shown in Table 3.

Table 3. Top three investors in Oxfam's double dividend database

Investor	Market value (US\$m)	Number of constituents held	Percentage of constituents held	Percentage of total market capitalization
Vanguard Group Inc.	583,641.8	177	92	8.19
BlackRock Inc.	508,039.2	176	92	7.13
State Street Global Advisors Inc.	266,038.5	173	90	3.73

Using S&P Capital IQ to screen investment funds for just the Carbon Majors database, and filtering for environmental, social and governance (ESG) funds, reveals eight ESG funds who are invested in at least 25% of the publicly listed Carbon Majors companies.

This includes the HC Capital Trust – Catholic SRI Growth Portfolio, which holds 45% of the Carbon Majors companies, including shares in Exxon Mobil, Chevron, Shell, BHP and Total Energies. The BlackRock Carbon Transition Readiness Aware Active fund, which 'offers a way to target the low carbon transition', holds 19% of the Carbon Majors in this fund.

5. Attribution of emissions to extreme heat events

Data and methodology

Oxfam collaborated with Sarah Schöngart from the Institute for Atmospheric and Climate Science, ETH Zürich, to attribute the emissions of different income groups to yearly extreme heat events (defined as a one in 100-years event relative to 1990).

The methodology follows that in Schöngart et al.,²⁹ where the authors constructed emissions pathways (called counterfactual pathways) without the emissions of selected population groups.

For Oxfam, Sarah Schöngart assessed how the climate in 2023 would be if the richest 10%, 1% and 0.1% globally, as well as in the USA, the EU, India and China, and regional groupings, had not contributed to global emissions between 1990 and 2023, using the emissions data per income group developed by SEI (see Section 2).

These emissions pathways were translated into gridded temperature, precipitation and potential drought data via a chain of emulators. In Schöngart et al., the authors use the MAGICC Earth System model. For this dataset, the FAIR model (version 2.2.4) was used.

The authors built on the framework of extreme event attribution to quantify changes in the distributions of the climatic variables. To do so, they statistically tested whether changes in the distribution of a climatic variable under a given scenario were significantly different from its present-day distribution. If this was the case, emissions were attributed to extreme weather events using the modelled distribution of climatic variables over the reference period to derive grid-cell-specific intensity thresholds for the defined events.³⁰

Original code used for the published study: <https://github.com/sarasita/attribution>

Code for including FAIR: https://github.com/sarasita/emulator-based_attribution

Note that since the climatic response to emissions is not linear, the final results cannot be added together.

Table 4. Warming attributable to global income groups, expressed as a share of total observed warming

Income group	Attributable warming expressed as a share of total observed warming since 1990 in %
Poorest 50%	9%
Middle 40%	46%
Richest 10%	59%
Richest 1%	19%
Richest 0.1%	7%

Table 5. Number of extreme weather events (globally) attributable to global income groups

Income group	Median number of counts over 100 years
Poorest 50%	4.5
Middle 40%	20.0
Richest 10%	23.2
Richest 1%	9.5
Richest 0.1%	3.5

Stylized facts based on this analysis

Attributable warming

5.1. Almost 20% of global warming since 1990 is attributable to the richest 1% – 20 times more than their share of the world population.

The research findings show that the warming attributable to the richest 1% is 19.3%.

The share of the world population of the richest 1% is 1%.

$$19.3 / 1 = 19.3$$

5.2. A person from the richest 1% has contributed over 100 times more to the global warming observed since 1990 than someone from the poorest 50%.

The average global population between 1990 and 2023 was 6.71 billion.

In the top 1%, there were therefore 67.1 million people.

In the bottom 50%, there were 3.355 billion people.

The attributable warming to the richest 1% is 19.3%: $19.3 / 67100000 = 0.00000029$.

The attributable warming to the poorest 50% is 8.7%: $8.7 / 3355000000 = 0.0000000026$.

$$0.29 / 0.00000026 = 111$$

5.3. Seven percent of global warming since 1990 is attributable to the richest 0.1%, which is 70 times more than their share of the world population.

The research findings show that the attributable warming to the richest 0.1% is 6.8%.

The share of the world population of the richest 0.1% is 0.1%.

$$6.8 / 0.1 = 68$$

5.4. A person from the richest 0.1% has contributed almost 400 times more to the global warming observed since 1990 than someone from the poorest 50%.

The average global population between 1990 and 2023 was 6.71 billion.

In the top 1%, there were therefore 6.71 million people.

In the bottom 50%, there were 3.355 billion people.

The attributable warming to the richest 0.1% is 6.8%: $6.8 / 6710000 = 0.000001$.

The attributable warming to the poorest 50% is 8.7%: $8.7 / 3355000000 = 0.0000000026$.

$$0.000001 / 0.0000000026 = 392$$

Attributable extreme heat events

5.5. **Someone from the richest 1% has contributed 34 times more than the average world citizen to extreme heat events we see today, and over 100 times more than someone from the bottom 50%.**

The average global population between 1990 and 2023 was 6.71 billion.

In the richest 1%, there were therefore 67 million people.

In the poorest 50%, there were 3.355 billion people.

The median number of additional extreme events (one in a 100-year events) caused by the world's richest 1% to the world is 9.5. Per person that is $9.5 / 67100000 = 0.00000014$.

The median number of additional extreme events (one in a 100-year events) caused by the world's total population is 28.1. Per person that is $28.1 / 6710000000 = 0.0000000042$.

The median number of additional extreme events (one in a 100-year events) caused by the world's poorest 50% is 4.5. Per person that is $4.5 / 3355000000 = 0.0000000013$.

$0.00000014 / 0.0000000042 = 33.9$

$0.00000014 / 0.0000000013 = 106.5$

5.6. **Someone from the richest 0.1% has contributed 125 times more than the average citizen to extreme heat events we see today, and almost 400 times more than the someone from the bottom 50%.**

The average global population between 1990 and 2023 was 6.71 billion.

In the richest 0.1%, there were therefore 6.71 million people.

In the poorest 50%, there were 3.355 billion people.

The median number of additional extreme events (one in a 100-year events) caused by the world's richest 0.1% to the world is 3.5. Per person that is $3.5 / 6710000 = 0.00000052$.

The median number of additional extreme events (one in a 100-year events) caused by the world's full population is 28.1. Per person that is $28.1 / 6710000000 = 0.0000000042$.

The median number of additional extreme events (one in a 100-year events) caused by the world's poorest 50% to the world is 4.5. Per person that is $4.5 / 3355000000 = 0.0000000013$.

$0.00000052 / 0.0000000042 = 125.2$

$0.00000052 / 0.0000000013 = 393.0$

6. Other statistics

6.1. **Food billionaire wealth has increased by over US\$130bn since 2020 in real terms.**

The Forbes billionaire list³¹ was queried as of 10 June 2026 and 10 June 2020, filtered by industry for food and beverage, and the 2020 data adjusted to current prices using the US Consumer Price Index (Table 4).³²

Table 6. Food billionaire wealth, 2020 and 2026

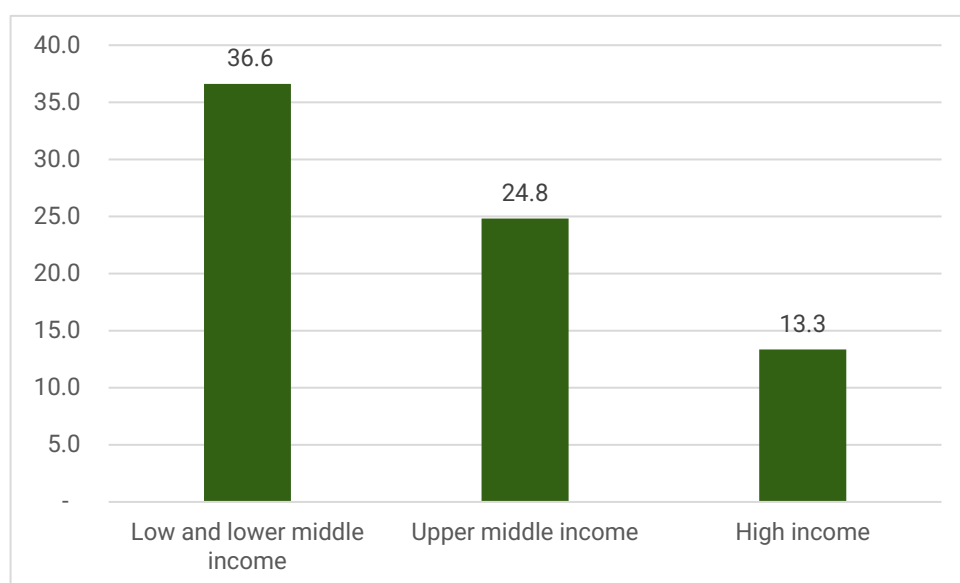
Year	Real net worth (US\$m)
2020	1,043,149.71
2026	1,177,113.34
Difference	133,963.63

6.2. For a person in a low- and lower-middle-income country, the share of their income spent on food is 2.74 times that of a person in a high-income country

Food expenditure data for a sample of 73 countries, comprising 26 low- and lower-middle-income countries and 47 high-income countries, was used. The population-weighted calculation shows that in low- and lower-middle-income countries, the share of total household expenditure on food is 36.6%, compared with 13.3% in high-income countries (Figure 1). The total population of low- and lower-middle-income countries in the sample is 3.1 billion people, while that of high-income countries is 1.2 billion.

Food expenditure data was sourced from Our World in Data,³³ while World Bank population data from 2024 was used.³⁴

Figure 1. Food expenditure (average population-weighted) as a share of household's total expenditure (%)



Notes

- ¹ S. Gössling, A. Humpe and J. Cardoso Leitão. (2024). 'Private Aviation is Making a Growing Contribution to Climate Change'. *Communications Earth & Environment*, 5, 666. Accessed 6 July 2026. <https://www.nature.com/articles/s43247-024-01775-z>
- ² For the full 2025 datafile, see <https://private-jets.fra1.digitaloceanspaces.com/leg/v2/all/year=2025/data.csv>
- ³ ADS-B Exchange. <https://www.adsbexchange.com>. Accessed 19 August 2026.
- ⁴ Contiguous USA was defined using latitude 24.5–49 and longitude –124.8 to –66.9; Alaska using latitude 51–71 and longitude –179.9 to –129; and Hawaii using latitude 18.5–22.5 and longitude –160.5 to –154.5. Observations were assigned to a region if their coordinates fell within these ranges. These simple bounds approximate each region and may include small non-USA areas or miss edge cases.
- ⁵ R. Bernet. (25 July 2023). How much CO2 does a tree absorb? One Tree Planted. Accessed 6 July 2026. <https://onetreeplanted.org/blogs/stories/how-much-co2-does-tree-absorb>
- ⁶ United Nations Department of Economic and Social Affairs, Population Division. (2024). *World Population Prospects 2024: Download Files (Standard Projections)*. Accessed 6 July 2026. <https://population.un.org/wpp/downloads?folder=Standard%20Projections&group=Most%20used>
- ⁷ Space.com. (2012). *How big is Earth?* Accessed 6 July 2026. <https://www.space.com/17638-how-big-is-earth.html>
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- ¹⁰ Global Carbon Atlas. <https://globalcarbonatlas.org>. Accessed 19 August 2026.
- ¹¹ World Inequality Database. <https://wid.world>. Accessed 19 August 2026.
- ¹² World Development Indicators. <https://databank.worldbank.org/source/world-development-indicators>. Accessed 19 August 2026.
- ¹³ Penn World Tables. <https://cid.ucdavis.edu/pwt>. Accessed 19 August 2026.
- ¹⁴ Global CCS Institute. (2025). *Global Status of CCS 2025*. Accessed 19 August 2026. <https://www.globalccsinstitute.com/wp-content/uploads/2025/10/Global-Status-of-CCS-2025-report-9-October.pdf>
- ¹⁵ K. Rennert, F. Errickson, B.C. Prest, L. Rennels, R.G. Newell, W. Pizer, et al. (2022). 'Comprehensive Evidence Implies a Higher Social Cost of CO2'. *Nature*, 610, 687–92. Accessed 19 August 2026. <https://www.nature.com/articles/s41586-022-05224-9>
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- ¹⁷ K.L. Ricke and K. Caldeira. (2014). 'Maximum Warming Occurs about One Decade After a Carbon Dioxide Emission'. *Environmental Research Letters*, 9 (12), 124002. Accessed 19 August 2026. <https://iopscience.iop.org/article/10.1088/1748-9326/9/12/124002>
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- ¹⁹ Our World in Data. (2025). *Consumption-based CO₂ emissions*. Accessed 19 August 2026. <https://ourworldindata.org/grapher/consumption-co2-emissions?tab=table&time=2023&tableFilter=countries>
- ²⁰ This was used as a comparison index covering 70% of the global market value of companies.
- ²¹ S&P Dow Jones Indices. (2023). *S&P Global Trucost Climate Impact Sectors Classification*. Accessed 8 September 2025. <https://www.spglobal.com/spdji/en/documents/additional-material/trucost-climate-impact-sectors-classification.pdf?kw=%257bkeyword%257d>
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- ²⁵ Based on ownership data from S&P Capital IQ Pro, Tyson LP holds 2,743,680 Class A Common Stock and 70,000,000 Class B Common Stock.
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- ³⁰ The original code used for the published study can be found at <https://github.com/sarasita/attribution>; the code for including FAIR is available at https://github.com/sarasita/emulator-based_attribution.
- ³¹ Forbes. (n.d). *The world's real-time billionaires*. Accessed 19 August 2026. <https://www.forbes.com/real-time-billionaires>
- ³² US Bureau of Labor Statistics. (n.d). *Databases, tables & calculators by subject: Consumer Price Index for All Urban Consumers (CPI-U)*. Accessed 19 August 2026. <https://www.bls.gov/data>
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- ³⁴ World Bank Group. (2025). *Population, total*. Accessed 19 August 2026. <https://data.worldbank.org/indicator/SP.POP.TOTL>

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Cover photo: Beachgoers relax at Moutchic beach in Lacanau, southwestern France, as a vast wildfire rages nearby, sending clouds of smoke across the sky. Photo: Maximilien Lamy/Getty Images

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