MSCI Sustainability Institute

Transition Finance Tracker

A quarterly report on financing the shift to a low-carbon economy

April 2025

Sections

Report information:

- Foreword →
- Key findings →
- Charts index →
- Key terms →
- Acknowledgements →

Report sections:

- Emissions →
- Financial flows →
- Targets →
- Transition →
- Disclosure →
- Physical risk & nature →

Foreword

Much has changed since we began tracking progress by the world's listed companies to curb climate risk four years ago.

The past two years have been the warmest on record, amplifying severe weather events and other climate-related physical risks that institutional investors in every region overwhelmingly say threaten long-term financial returns.

Finance has also changed. While investors have consistently identified a warming climate as one of the most significant risks to their investments, they've shifted focus from lowering the emissions of their portfolios to financing the decarbonization of the real-world economy (from net-zero to transition finance, if you will) while questioning the efficacy of collective target-setting efforts.

The world itself has fragmented. Even before trade-policy shifts, the divergence in climate policies between countries drove investors to increasingly differentiate the pace and scope of the opportunities in the energy transition. Tensions over trade and tariffs introduce greater uncertainty as to which companies, industries and regions will ultimately be the winners and losers in the transition. And which will need to pivot toward managing the escalating risks – and opportunities – from the physical impacts of climate change.

Our tracking has changed accordingly. What started as a tracker of corporate progress based on projected emissions of listed companies to 2050 has expanded over time to track disclosures and the ambition of corporate climate targets, while covering multiple facets of transition finance, including investment flows and unlisted companies.

This edition of the report, which we have renamed a "Transition Finance Tracker" to reflect the increased breadth of its focus, leverages an array of datasets that illuminate progress to curb climate risk in the economy. Besides projecting future climate impact of listed and unlisted companies, we provide multiple views on progress such as clean-tech revenues, innovation, and sector emissions intensities. We report on the flow of investment into assets to advance the energy transition, as well as the use of market mechanisms such as carbon trading to finance the transition and conserve nature. Finally, we also delve into climate-related physical hazards, which are quickly becoming a prominent focus of investors as companies around the world combat extreme weather events that endanger their assets and communities.

We draw on both MSCI and external sources of data to offer a widening lens on the intersection of the energy transition and capital markets. Our revamped format translates data into a series of charts that we hope will advance evidence-based thinking and discussion among readers on the state of the economic transition and climate finance.

The ever-changing headlines that pop up on our screens daily can challenge even experienced practitioners to assess real-world progress. We hope this report helps readers sharpen their view of the transition by separating the signals from the noise.

Linda-Eling Lee
Founding Director,
MSCI Sustainability Institute

Key findings

1. Few companies align with a 1.5°C pathway… Only 12% of listed companies are aligned with limiting average global temperature rise to 1.5°C (2.7°F) above preindustrial levels. Sixty-one percent project warming of more than 2°C (3.6°F), including nearly one-quarter that could warm the planet by over 3.2°C (5.76°F).

2.… even as corporate ambition continues to rise. As of March 31, 2025, 14% of listed companies had climate targets validated by the Science Based Targets initiative (SBTi) — up nearly five percentage points from a year earlier. The industrials sector leads in SBTi-validated targets, followed by consumer discretionary and IT.

3. Climate transition funds have high carbon intensity… for good reason. Their carbon intensity (tons of emissions per USD million in sales), at nearly 5x that of so-called Paris-aligned funds, reflects their stated mission of advancing decarbonization by investing in emissions-intensive sectors.

4. Private assets are leaning in. Private-capital climate funds allocate 40% of their investments to the emissions-heavy utilities sector—compared with just 8% for publicly listed climate funds—as of March 31, 2025.

5. Trade policy poses uncertainty. Climate funds across asset classes have significant exposure to the U.S., where tariffs could drive up the cost of clean-energy technologies.

6. Emissions and revenue growth have decoupled in advanced economies, but not yet in emerging markets. From 2015 to 2023, revenues of listed companies domiciled in developed markets grew 49%, while their emissions fell by nearly 25%.

7. Among the three countries that generate the most emissions — China, the U.S. and India — the U.S. has the least-carbon intensive electricity grid, with 43% of electricity generated from low-carbon sources. low-carbon energy (solar, wind, hydro and nuclear) in its electricity mix, with 43%, compared with 37% in China and 16% in India.

8. While China dominates in both fossil fuel consumption and green innovation. Chinese-listed companies lead globally in patents for clean-tech innovation, while firms listed in India, Taiwan and China lead in clean-tech revenue growth.

9. Carbon trading plays an increasingly pivotal role in transition finance… The carbon credit market, which could soon be augmented by trading between countries, is channeling capital from developed to emerging economies and providing private-sector finance for nature.

10. Climate-related physical risk is rising. Factories, warehouses and other facilities belonging to listed companies and located in cities that span Miami, Osaka Pune, Sao Paulo, New York and Riyadh are in the top quartile of exposure globally to hazards such as flooding, extreme heat, wildfires and severe storms.

Charts

Emissions (pages 6-14)

- Global mean temperature 1850–2024
- Global and corporate greenhouse gas emissions
- Annual emissions of listed companies by domicile
- Emissions trend of listed companies by country of domicile
- The 10 largest listed-company Scope 1 emissions
- The 10 largest listed-company Scope 2 emissions
- The 10 largest listed-company upstream Scope 3 emissions
- The 10 largest listed-company downstream Scope 3 emissions
- Revenue and emissions trend of listed companies
- Remaining emissions budget

Targets (pages 15-17)

- Share of listed companies by target type
- Share of SBTi-approved targets by GICS® sector

Disclosure (pages 18-21)

- Emissions disclosure by listed companies
- Emissions disclosure across portfolio companies in private-capital funds
- A snapshot of climate reporting requirements

Financial flows (pages 22-35)

- Capital in climate funds
- Sector exposure of climate funds
- Investment by country
- Climate fund types by Scope 1 and 2 carbon intensity
- Clean tech innovation leaders
- Electric-vehicle growth leaders
- Wind power growth leaders
- Solar power growth leaders
- Carbon credits retired annually
- Amount of carbon credits issued quarterly, by type
- Amount of carbon credit retirements disclosed quarterly, by type
- Monthly average carbon credit prices by type
- The 20 largest carbon projects by annual credits issued
- Amount of green bonds issued each quarter

Transition (pages 36-45)

- Projected temperature alignment of the world's listed companies
- Projected temperature alignment of the world's listed companies by industry group
- Projected temperature alignment of listed companies by country
- Listed companies by Net Zero Investment Framework 2.0 maturity scale category
- Production-based greenhouse gas intensities
- Global primary energy consumption by source
- Top 10 countries by primary energy consumption
- Carbon intensity of electricity, 90-day average
- Annual change in operating coal-fired capacity

Physical risk & nature (pages 46-49)

- Areas of physical climate risk to facilities of listed companies
- Potential contribution to species loss
- Listed companies' assets located in biodiversity-sensitive areas

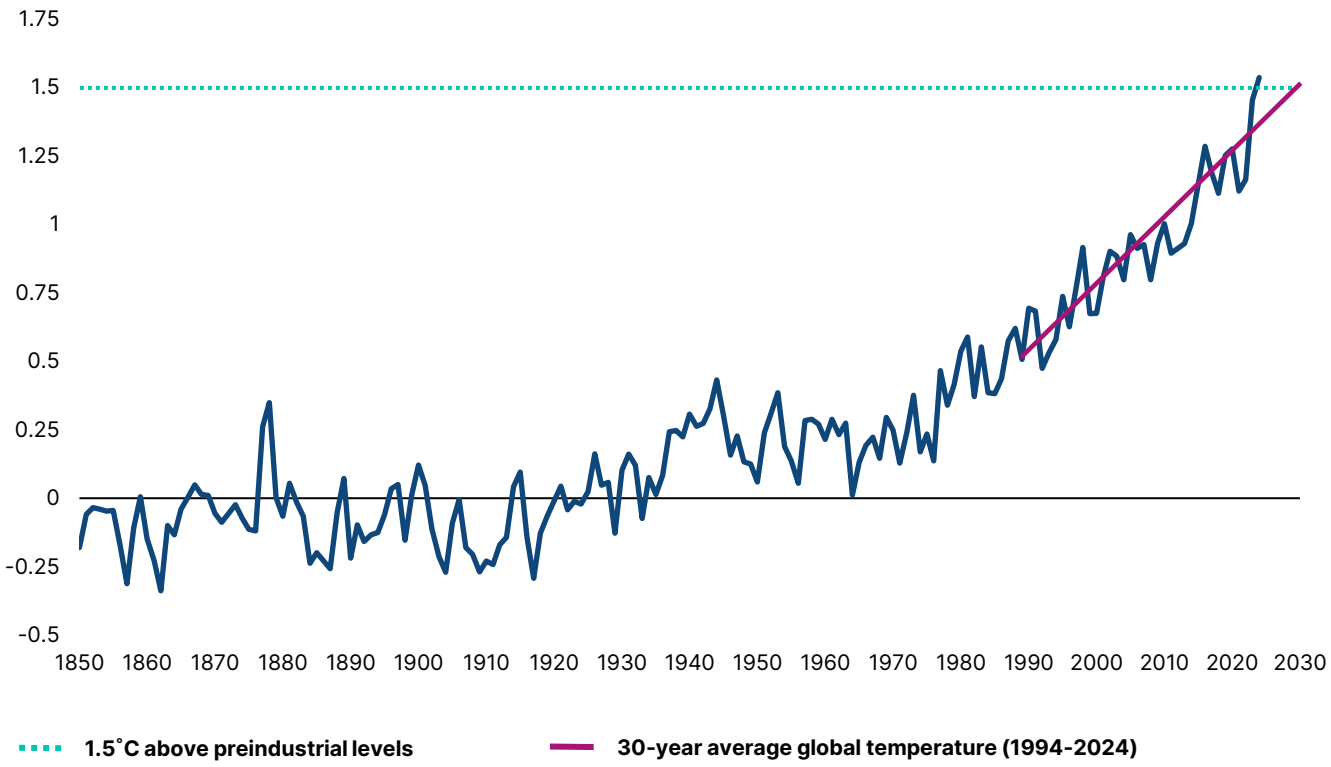
MSCI Sustainability Institute

Emissions

A warming world

- 2024 was the hottest on record and the first to exceed 1.5°C (2.7°) above the preindustrial era. While long-term warming remains below 1.5°C —scientists define the long term in decades — the past 10 years have been the 10 warmest on record.
- If annual warming were to continue at its current 30-year average rate, long-term global warming would reach 1.5°C by 2030, according to the European Union's Copernicus Climate Change Service.
- The buildup of greenhouse gases (GHG) in the atmosphere from the burning of fossil fuels drives warming, which amplifies climate-related physical risk. A majority (57%) of investors globally say that floods, wildfires and other extreme weather events are creating economic fallout and growing in severity sooner than current climate scenarios anticipate, a survey by our Institute finds.

Global mean temperature 1850-2024 (˚C)



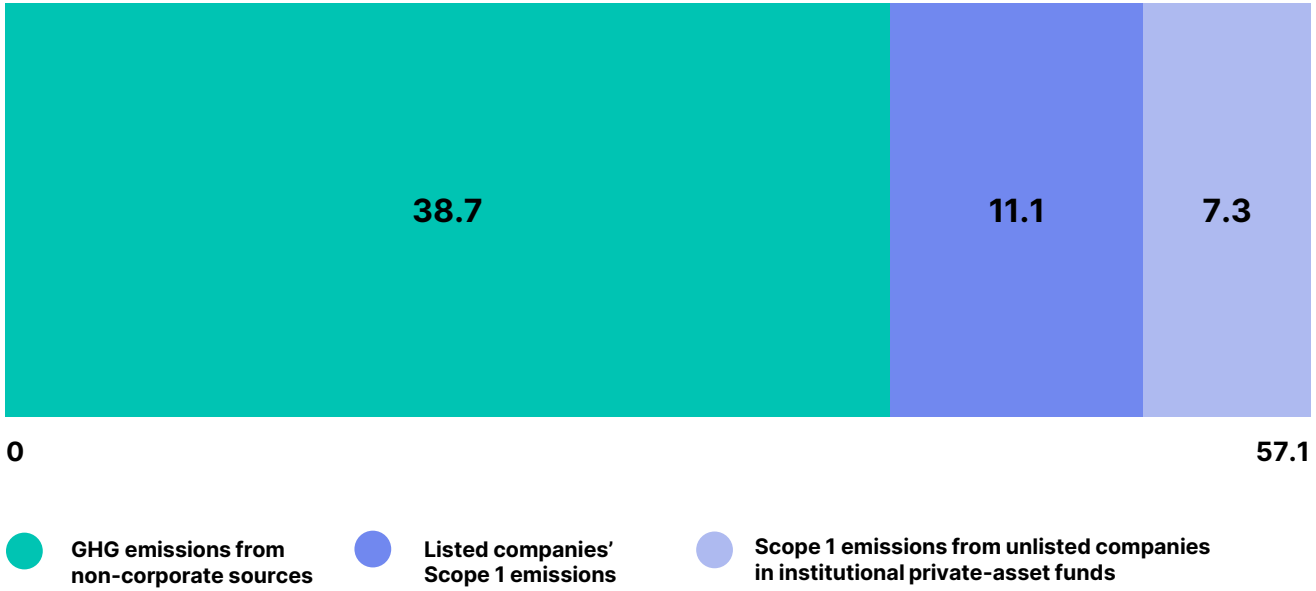
Source: "State of the Global Climate 2024," World Meteorological Organization, March 2025, based on an analysis of six datasets.

Corporate emissions count

- Taken together, listed companies and their investable unlisted counterparts contribute nearly one-third (32%) of global greenhouse gas emissions.
- We estimate that the direct (Scope 1) GHG emissions of the world's listed companies fell by nearly 2% last year, to 11.1 gigatons (Gt).*
- Listed-company emissions contribute nearly one-fifth (19%) of global GHG emissions, while Scope 1 emissions of the roughly 65,000 companies in private-asset funds add nearly 13%.** A small share of both listed and unlisted companies generate the lion's share of corporate emissions.
- National climate commitments from the nearly 200 signatories to the Paris Agreement that are due this year create opportunity for governments to support decarbonization in such critical sectors as power, industry and transportation, along with interim targets and spending that could spur action by companies and investors.

* Listed companies in this report are represented by the MSCI ACWI Investable Market Index (IMI), which he captures large-, mid- and small-cap listed companies across 23 developed markets and 24 emerging market countries. With 8,406 constituents, the index covers approximately 99% of the global equity investment opportunity set, as of March 31, 2025.
**See source note beneath chart for detail on estimate of unlisted-company emissions

Global and corporate greenhouse gas emissions ($GtCO_2e$)

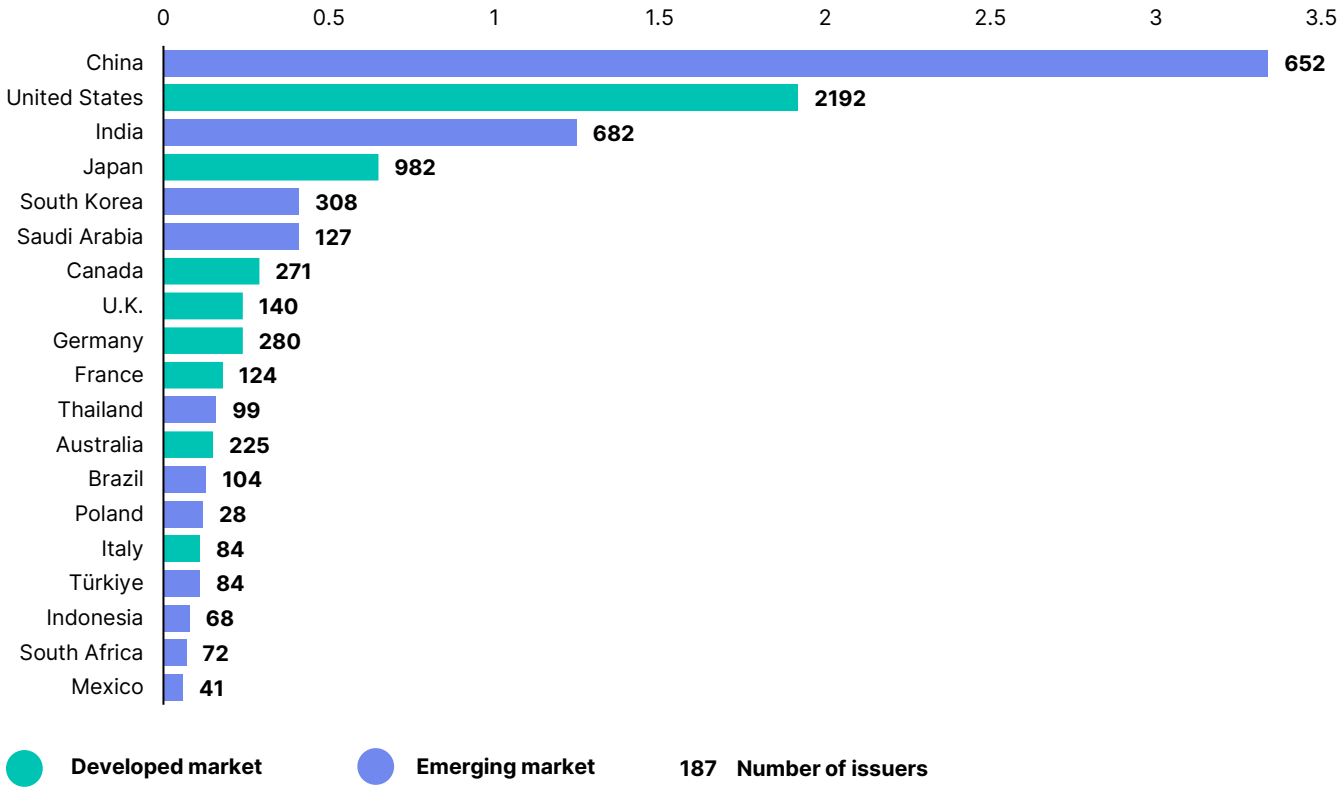


Source: MSCI ESG Research and MSCI Private Capital, data as of March 31, 2025. Estimate reflects the aggregate projected annual Scope 1 emissions of listed companies in 2024, based on company reporting and decarbonization targets, including an assessment of specificity of the target and the company's track record toward achieving its targets. We assume that the emissions of listed companies that have yet to set a decarbonization target will rise 1% annually. Estimate for unlisted company emissions based on estimated and reported carbon-intensity data for 65,000 companies globally that private-capital funds invested in as of June 30, 2024. Global emissions are based on annual UN Environment Programme reports. Note that we may revise estimates throughout this report post-publication.

Where corporate emitters are

- The data at right highlights the annual Scope 1 GHG emissions of listed companies by their country of domicile. We refer here to listed companies' total emissions, not the share of their emissions in those countries. Hence, the data shows where investors may need to engage companies on climate change, not where all emissions are taking place.
- Companies listed in China top the list, emitting nearly 3.3 Gt annually, followed by those in the United States (1.9 Gt) and India (1.3 Gt). Companies in Japan, South Korea and Saudi Arabia contribute moderate levels, while those in Canada, the U.K. and Germany emit comparatively less.

Annual emissions of listed companies by domicile (Scope 1 emissions/$GtCO_2e$)

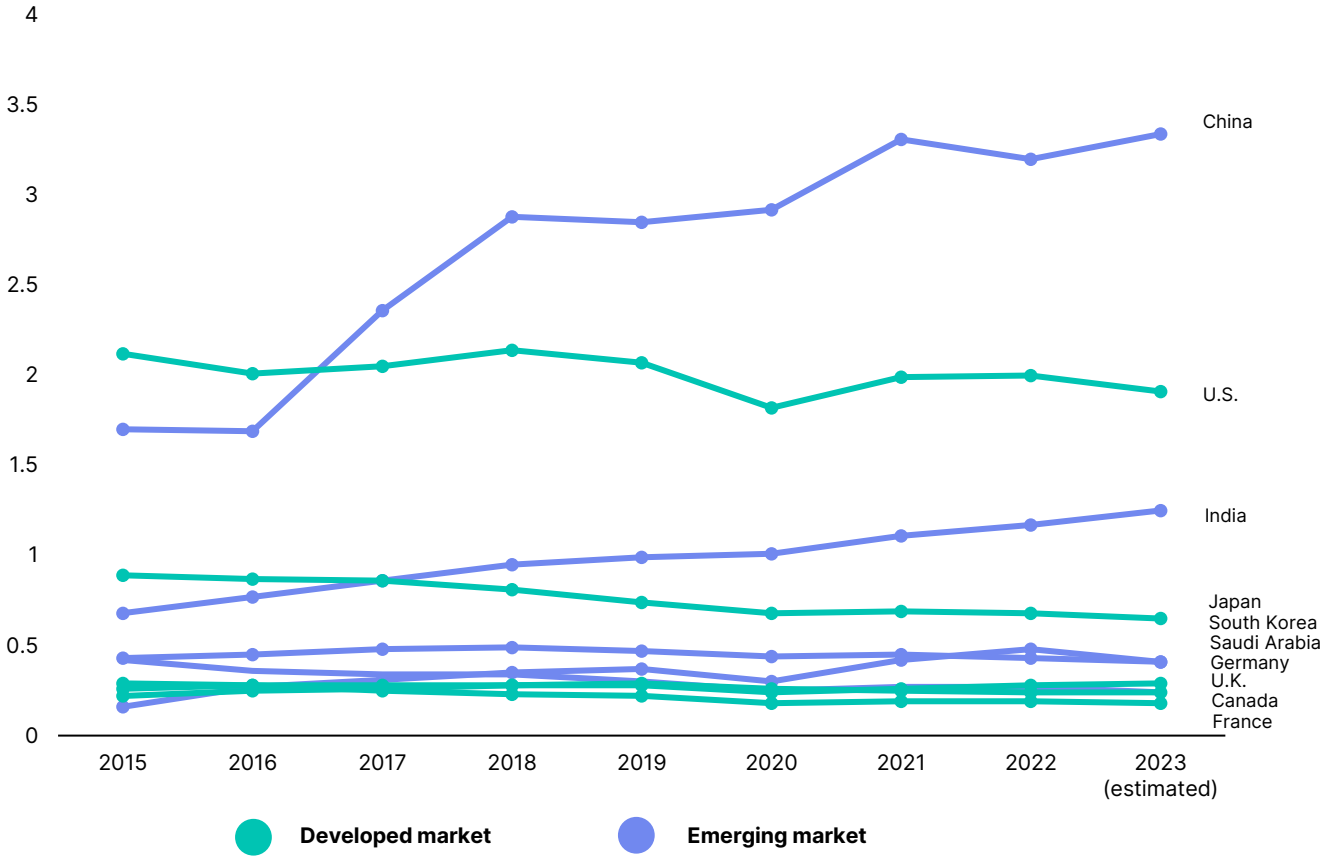


Source: MSCI ESG Research, data as of March 31, 2025.

Tracking corporate emissions over time

- This time-series data tracks the direct (Scope 1) emissions of listed companies in 10 economies where such emissions are highest over the nine years ended Dec. 31, 2023. (Note that universe of listed companies in every market changes over time.) In aggregate, companies in China show a steady and significant rise, from 1.7 to 3.3 GtCO2e, reflecting growth in industrial activity. Listed companies in India more than doubled their emissions over the period.
- The emissions of listed companies in the U.S., Japan, Germany and the U.K. have ticked down over the same period. Emissions of U.S.-listed companies in aggregate fell 10%, to an estimated 1.9 Gt, between 2015 and 2023.
- The divergence underscores the ongoing challenge of balancing economic growth with decarbonization, especially in rapidly developing nations. But decarbonization could grow harder for some domestically-focused companies in the U.S. as well if uncertainty surrounding tariffs on imports of solar panels, wind turbines and other clean technologies make renewable energy projects more expensive.

Emissions trend of listed companies by country of domicile (Scope 1 emissions, $GtCO_2e$)

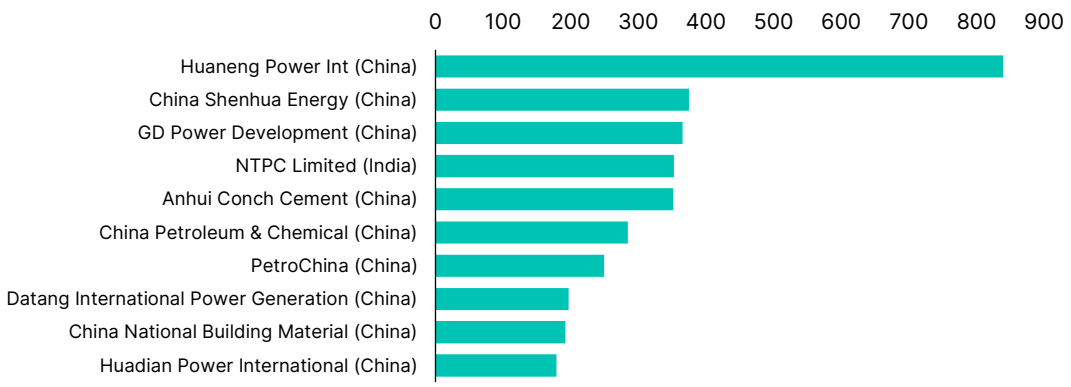


Source: MSCI ESG Research, data as of March 31, 2025.

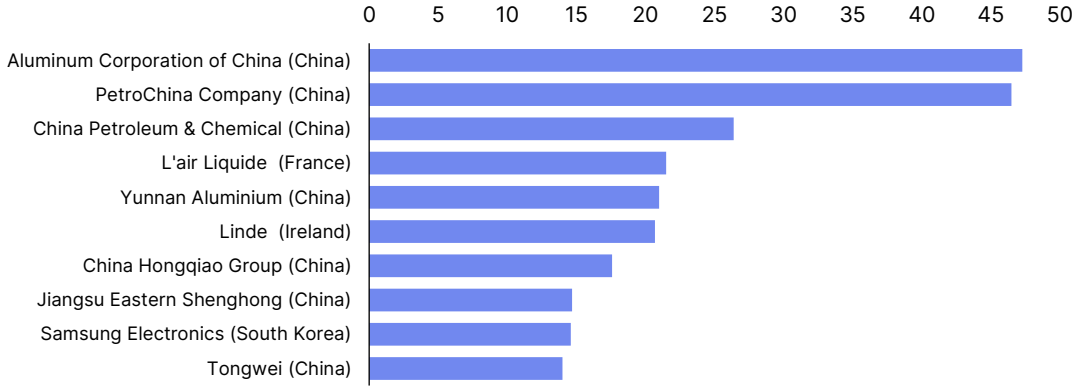
Listed companies with the largest absolute Scope 1 and 2 emissions

- Companies' emissions show their contribution to climate change. Though this does not necessarily correlate directly with climate-related financial risk, businesses with high emissions contribute to global warming and its effects.
- Utilities have the largest Scope 1 emissions because some rely on fossil fuels for power generation. The largest emissions based on electricity use (Scope 2) belong to companies with energy-hungry industrial processes.
- At the same time, companies' emissions today don't tell us much about their future trajectory. For that, we use forward-looking indicators such as companies' targets and capital expenditures along with Implied Temperature Rise and other impact metrics.

The 10 largest listed-company Scope 1 emissions (MtCO2e)



The 10 largest listed-company Scope 2 emissions (MtCO2e)

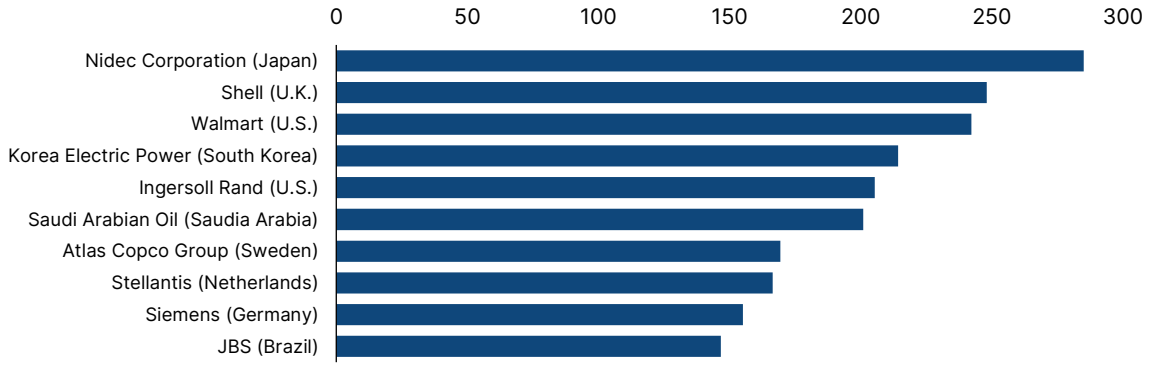


Source: MSCI ESG Research, data as of March 31, 2025.

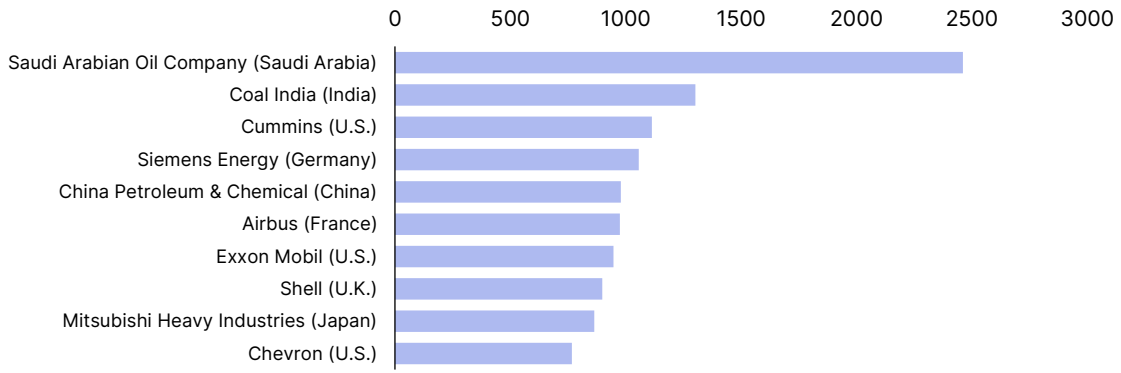
Listed companies with the largest absolute Scope 3 emissions

- The emissions from companies' value chains (Scope 3) make up the largest share (about 75% on average) of most companies' total GHG emissions.
- Industries with large upstream (Scope 3) emissions tend to use a lot of steel, aluminum or chemicals that are emissions-heavy to produce or, for retailers like Walmart, rely on complex supply chains. Oil companies have the biggest downstream carbon footprints because the use of their products produces massive quantities of GHG emissions.
- Measuring and managing Scope 3 emissions continues to challenge companies because such emissions occur outside their direct control. In its latest draft corporate net-zero standard, for example, the SBTi, an arbiter of standards for corporate climate targets, proposes that companies measure the share of procurement from net-zero-aligned suppliers and the share of revenue derived from net-zero-aligned activities

The 10 largest listed-company upstream Scope 3 emissions (MtCO2e)



The 10 largest listed-company downstream Scope 3 emissions (MtCO2e)

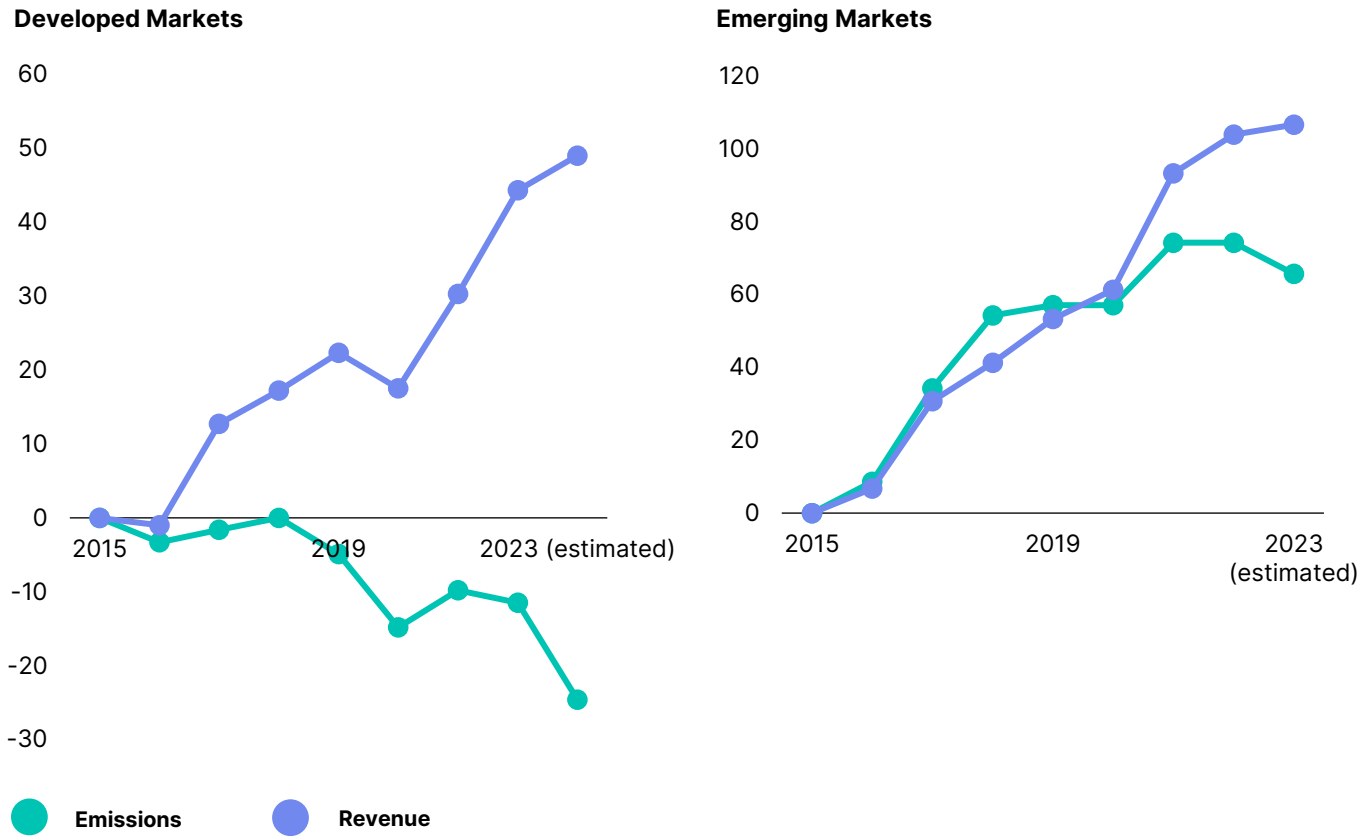


Source: MSCI ESG Research, data as of March 31, 2025. We estimate Scope 3 emissions for all companies in our coverage based on company reporting of total Scope 3 emissions or, alternatively, by using company-specific information that considers both the revenue intensity of emissions and production data in line with the Greenhouse Gas Protocol framework. For more information, please see "MSCI Climate Change Metrics Methodology and Definition" and "Scope 3 Carbon Emissions Estimation Methodology," MSCI ESG Research.

Creating more value with fewer emissions

- Economic and GHG emissions growth have correlated over time. But that has begun to decouple in advanced economies, indicating progress toward more sustainable business practices and improved efficiency globally. Global emissions growth slowed to 0.8% in 2024, while the global economy expanded by more than 3%, according to the International Energy Agency.
- From 2015 to 2023, revenues of listed companies domiciled in developed markets outpaced the growth in emissions, rising nearly 50%, while those companies' emissions fell by nearly 25%.
- In emerging markets, emissions and growth have continued to climb roughly together. Over the nine years ended in 2023, revenues of listed companies domiciled in emerging markets more than doubled, while emissions grew 65%.

Revenue and emissions trend of listed companies (% change relative to 2015 levels)



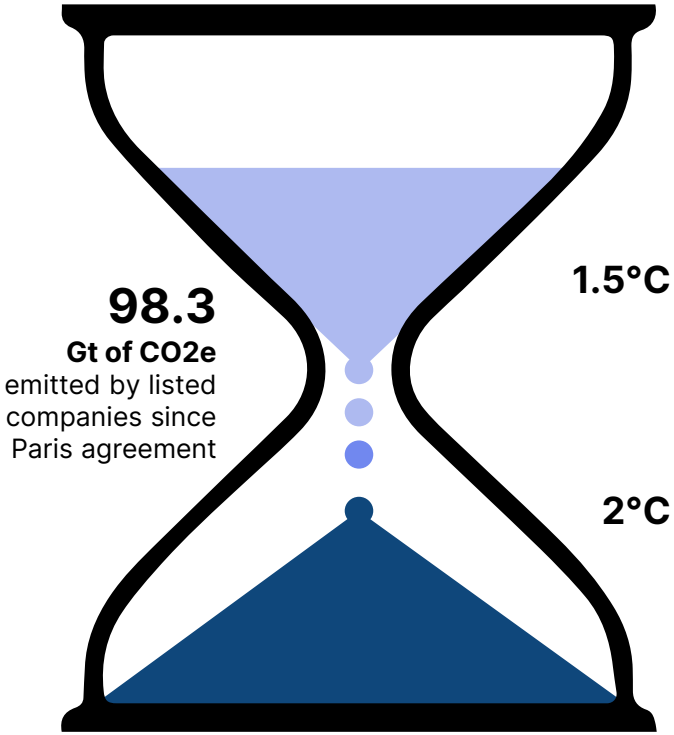
Source: MSCI ESG Research, data as of March 31, 2025.

Emissions budgets 101

- An emissions budget estimates how much carbon dioxide (CO2) and other greenhouse gases the world can emit while remaining likely to keep global warming within a certain threshold, such as to limit global warming to 1.5°C or well below 2.0°C above preindustrial levels, as set forth in the Paris Agreement.
- We calculate an emissions budget for listed companies that includes both emissions from CO2 and other greenhouse gases, which we refer to collectively as CO2-equivalent (CO2e) emissions.
- We estimate listed companies' remaining GHG emissions budget to be 34 Gt CO2e for a 50% likelihood of limiting warming to 1.5°C and 111 Gt CO2e for a 50% likelihood of limiting warming to 2°C, as of March 31, 2025.
- A growing number of companies have mapped out climate targets in line with global goals but may be unable to avoid consuming their sector's share of the global budget if the economy takes too long to decarbonize at scale.

*Estimates of listed companies' remaining emissions reflect the latest update to MSCI's Implied Temperature Rise model, which incorporates the Net Zero 2050 scenario developed by the Network for Greening the Financial System. The update increases the remaining 1.5°C-aligned budget for listed companies by about five months while roughly halving the 2°C-aligned budget and aligns both estimates more closely with the latest climate science.

Remaining emissions budget (Gt CO2e)



1.5°C

Remaining budget

35 Gt CO2e

38
months left to limit warming to **1.5°C**

2°C

Remaining budget

112 Gt CO2e

122
months left to limit warming to **2°C**

Source: MSCI ESG Research, data as of March 31, 2025. The hourglass and countdown clock show annual total Scope 1 emissions of MSCI ACWI IMI constituents (not index weighted) based on listed companies' reported emissions data and MSCI estimates as of that date. Emissions that companies haven't yet reported are based solely on MSCI estimates, given a lag in company reporting. The remaining future emissions budget to achieve 1.5°C and 2°C warming scenarios are calculated based on bottom-up estimates (sum of remaining emissions budget of all MSCI ACWI IMI constituents) as of March 31, 2025.

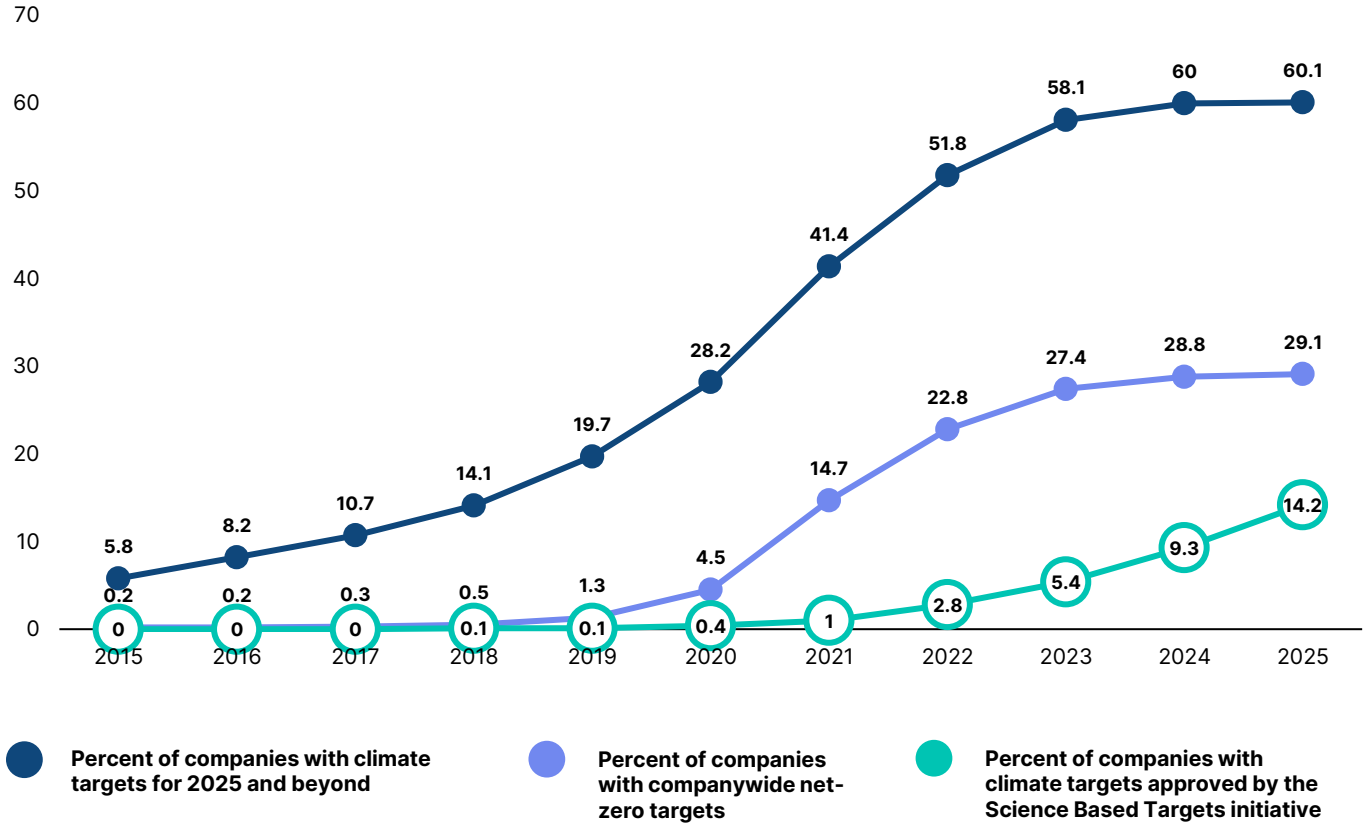
MSCI Sustainability Institute

Targets

Tracking climate commitments

- Corporate climate targets matter because companies that are setting ambitious targets need capital to decarbonize their operations. Targets also help investors who are supporting emissions-intensive companies measure the quantity of emissions those companies may be expected to reduce. But targets differ markedly.
- 14.2% of listed companies have set a climate target validated by SBTi as of March 31, 2025, an increase of 4.9 percentage points from a year earlier. Many investors view SBTi-approved targets as a gold standard because SBTi ensures that the target ambition is consistent with the aim of constraining warming to 1.5°C.
- Nearly one-third (29.1%) of companies have set a target that aspires to reduce emissions to net-zero (though not necessarily in line with climate science), relatively flat compared with the same period a year earlier. Overall, 60% of listed companies have published some kind of climate commitment, also roughly the same as a year ago.
- On a cumulative basis, SBTi has removed about 1% (124 companies) of listed companies' targets it previously approved, usually after a company fails to meet submission deadlines or revalidation requirements. In all, SBTi has removed the climate commitments of roughly 1,000 companies, including both listed and unlisted firms, as of March 31, 2025.

Share of listed companies with climate targets by target type (%)

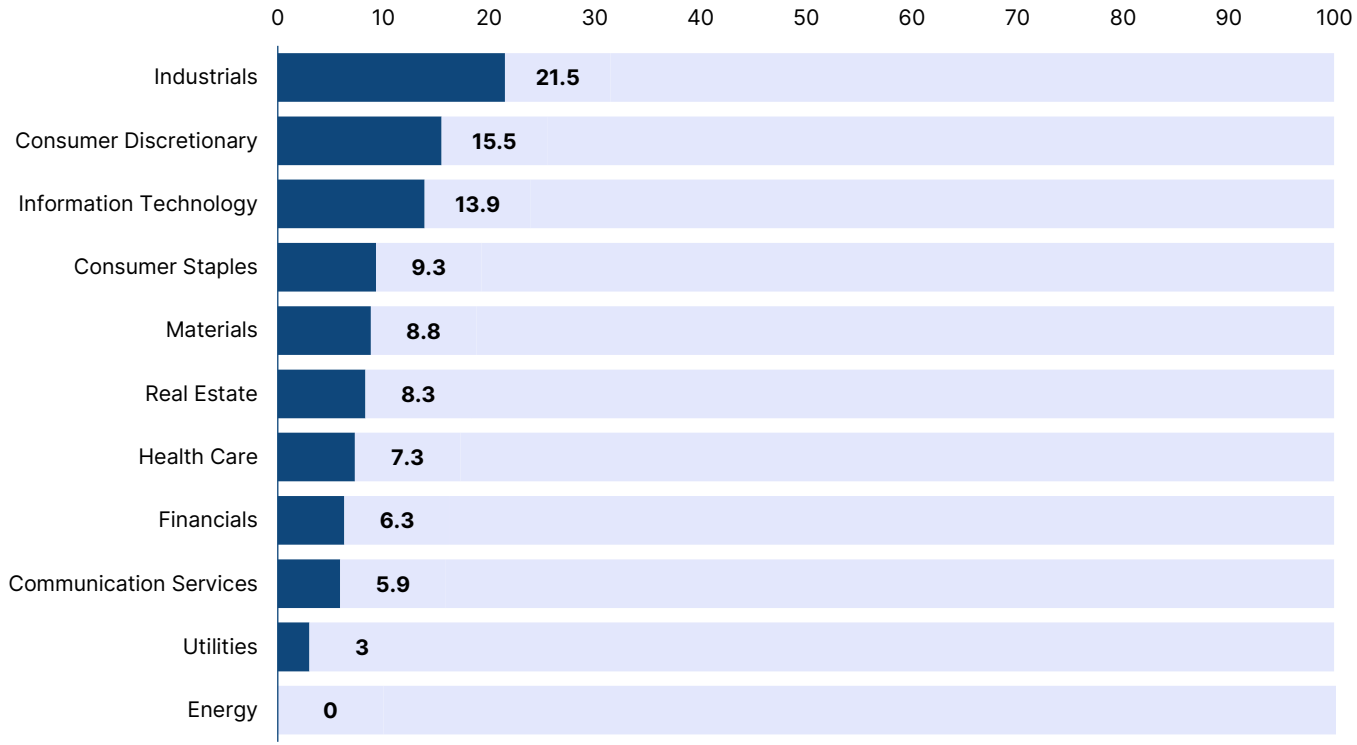


Source: MSCI ESG Research, data as of March 31, 2025.

Climate commitments by sector

- Listed companies in the industrials sector had the highest share of companies with SBTi-validated climate goals, as of March 31, 2025, followed by their counterparts in the consumer discretionary and IT sectors. The absence of energy sector companies reflects the fact that SBTi does not currently validate targets from oil and gas companies.
- While listed financial institutions lag their counterparts in obtaining validated net-zero targets, that could change with the SBTi's finalizing a net-zero standard for the financial sector. In March, ING became the first global bank to have its climate targets validated by SBTi .

Share of SBTi-approved targets by GICS® sector (%)



Source: MSCI ESG Research, data as of March 31, 2025. GICS® refers to the global industry classification standard jointly developed by MSCI Inc. and S&P Global Market Intelligence. The GICS structure comprises 11 sectors, 24 industry groups, 69 industries and 158 subindustries.

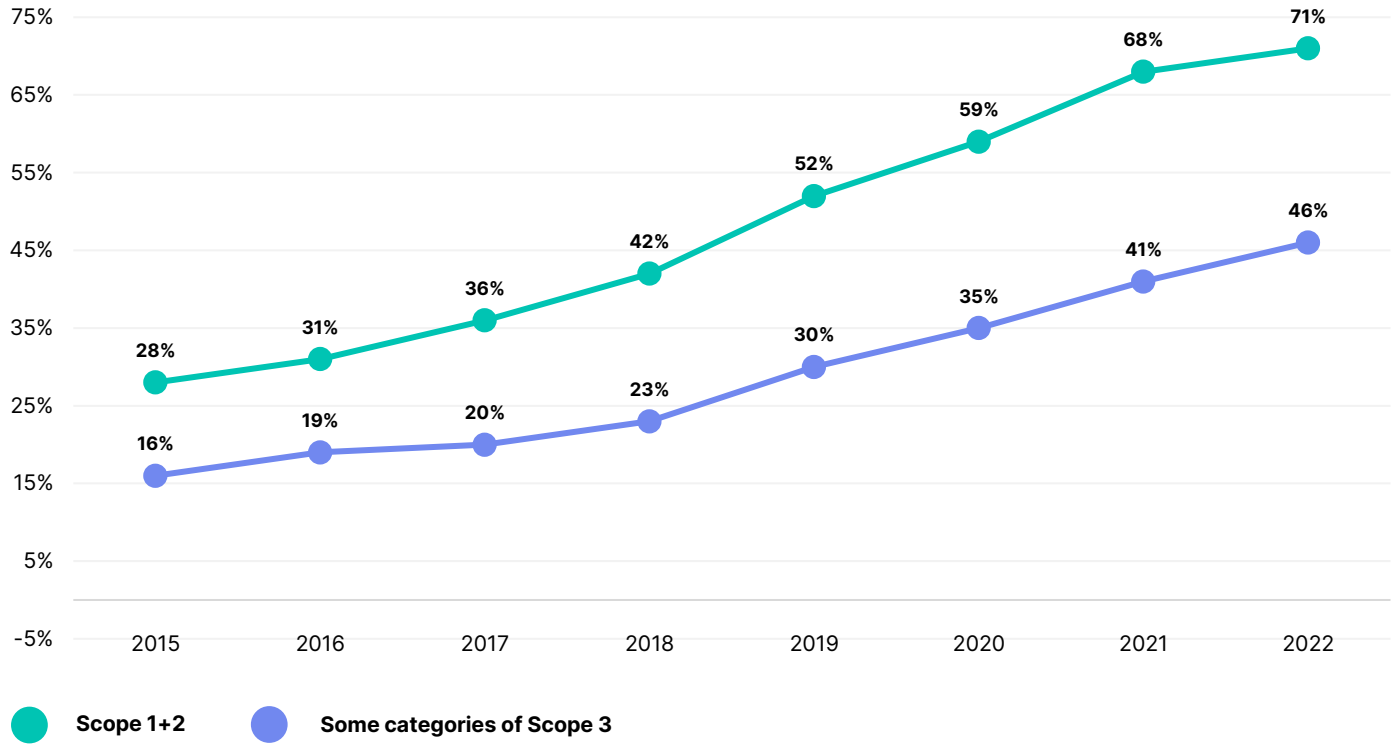
MSCI Sustainability Institute

Disclosure

Emissions disclosure: Listed companies

- Disclosure of corporate GHG emissions allows investors to compare companies across sectors and track progress toward climate commitments, as well as to assess financially relevant climate risks in their portfolios and loan books.
- Overall, 71% of listed companies disclosed their Scope 1 and/or Scope 2 emissions as of Dec. 31, 2022, the most recent year for which completely collected and vetted reporting is available, an increase of 3 percentage points from a year earlier.
- 46% of companies reported at least some of their Scope 3 emissions, a rise of 5 percentage points from a year earlier.

Emissions disclosure by listed companies (%)

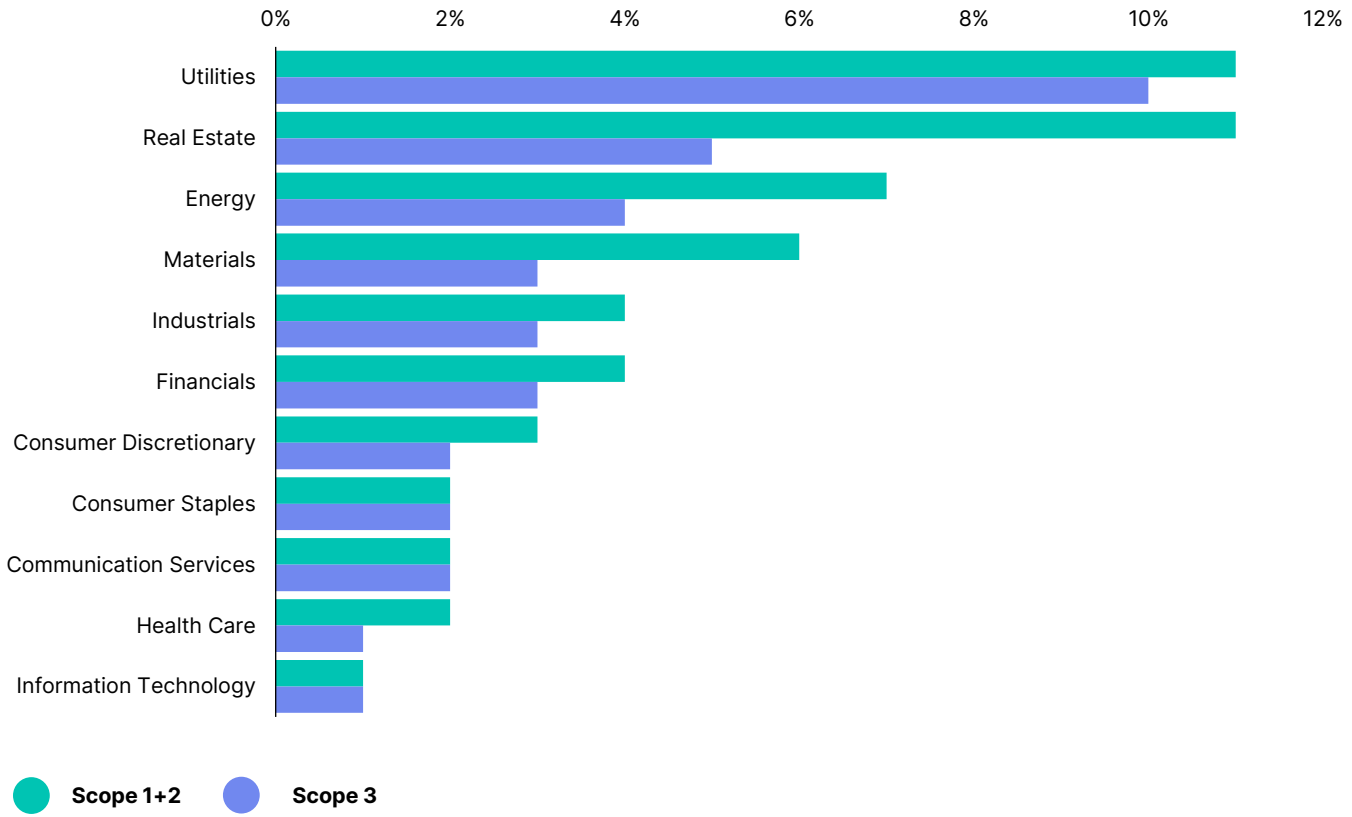


Source: MSCI ESG Research, data as of March 31, 2025.

Emissions disclosure: Unlisted companies

- Among private-capital funds that publish the emissions of their investments, portfolio companies in the most emissions-heavy industries, including utilities, real estate, and energy, tend to have the highest rates of disclosure.
- Emissions disclosure from unlisted companies can provide investors, who typically have public and private companies in their portfolios, with a total portfolio view of climate impacts and risks.
- Overall, far fewer unlisted companies disclose their GHG emissions than listed companies, suggesting less pressure from regulators and investors to publish such information compared with publicly traded counterparts.

Emissions disclosure across portfolio companies in private-capital funds (%)



Source: MSCI Private Capital, data as of March 31, 2025.

Disclosure becoming standardized

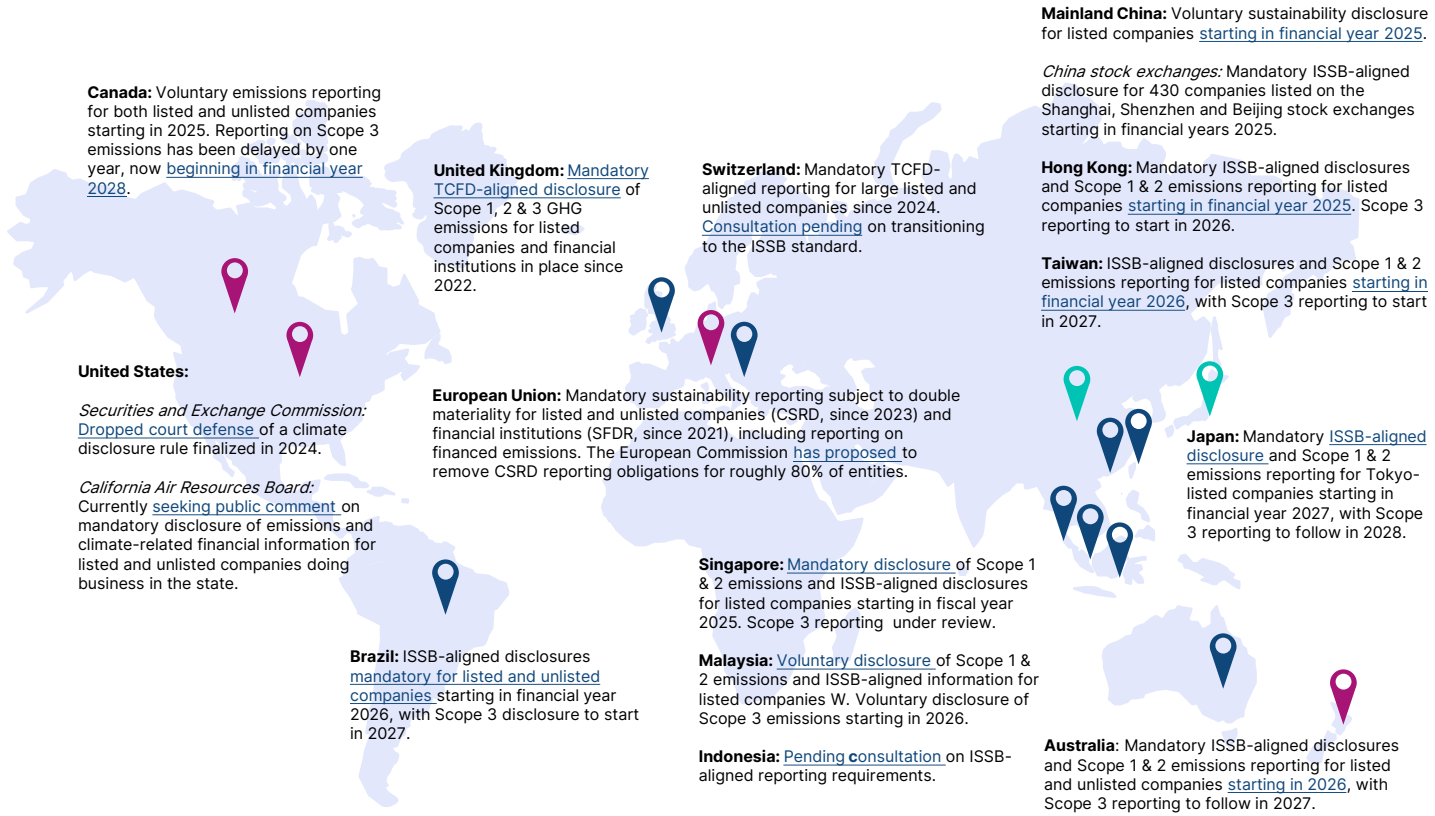
Countries in most regions have adopted sustainability and climate disclosure standards. These standards help financial institutions assess financially material sustainability risks in their portfolios and loan books, while also identifying leaders and laggards in the transition toward a low-carbon economy.

Guide to map

- **International Sustainability Standards Board (ISSB):** A reporting framework that includes standards covering sustainability reporting (S1) and climate disclosure (S2).
- **Taskforce on Climate-related Financial Disclosures (TCFD):** A global baseline for climate disclosure released in 2017. The TCFD was taken over by the ISSB as of 2024.
- **Corporate Sustainability Reporting Directive (CSRD):** An EU reporting framework that covers a broad spectrum of environmental, social and governance topics.
- **Sustainable Finance Disclosure Regulation (SDFR):** An EU reporting framework for financial institutions, mandating disclosures on sustainability risks and impacts, including portfolio emissions, and their integration into investment decision-making.

Rules taking effect **Regulatory rollback or delay** **New requirements**

A snapshot of climate reporting requirements



Source: MSCI ESG Research, data as of March 31, 2025.

MSCI Sustainability Institute

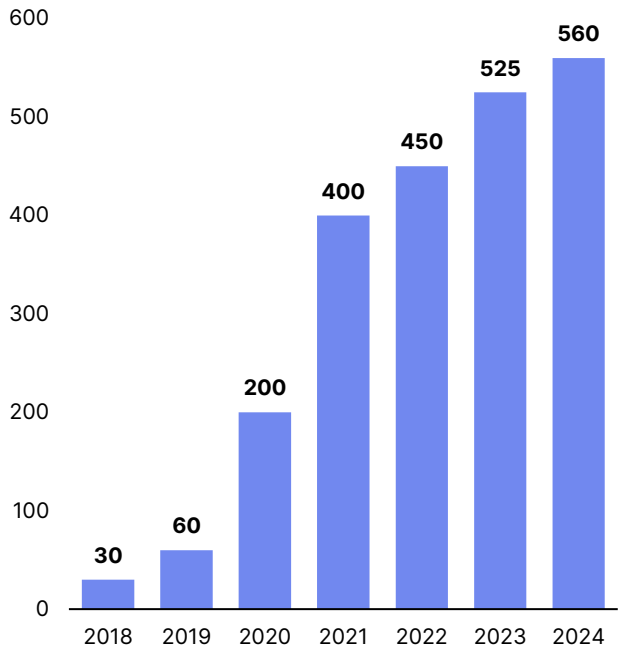
Financial flows

Climate capital across asset classes

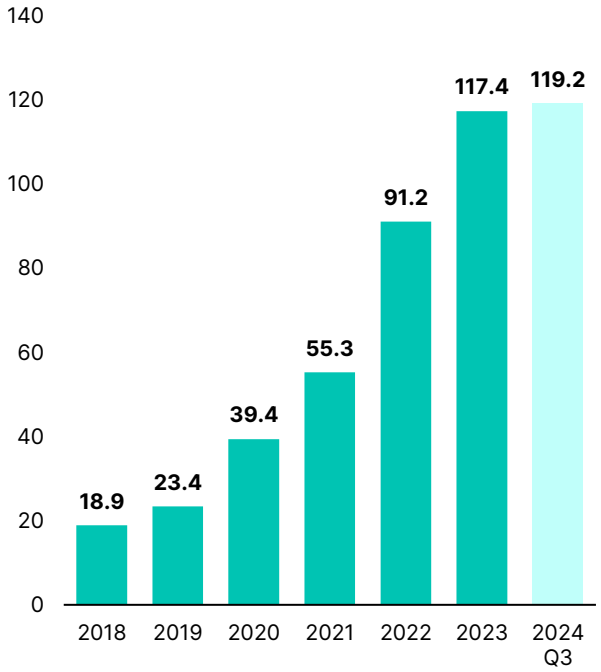
- Climate-named funds have expanded rapidly in recent years in both publicly listed and private capital markets, reflecting growing investor interest in the energy transition and decarbonization opportunities across asset classes.
- Assets under management in publicly traded climate funds grew nearly 20-fold to USD 560 billion over the seven years ending Dec. 31, 2024.
- There were about 202 private capital climate funds globally — including private equity, private credit and venture capital — as of Sept. 30, 2024, with a cumulative capitalization of about USD 119 billion. Private capital climate funds launched between 2021 and 2023 represented about 43% of the total private climate-fund count and accounted for nearly two-thirds (65%) of the USD 119 billion cumulative capitalization.

Capital in climate funds (USD billion)

Publicly traded climate funds (assets under management)



Private climate funds (cumulative capital raised)

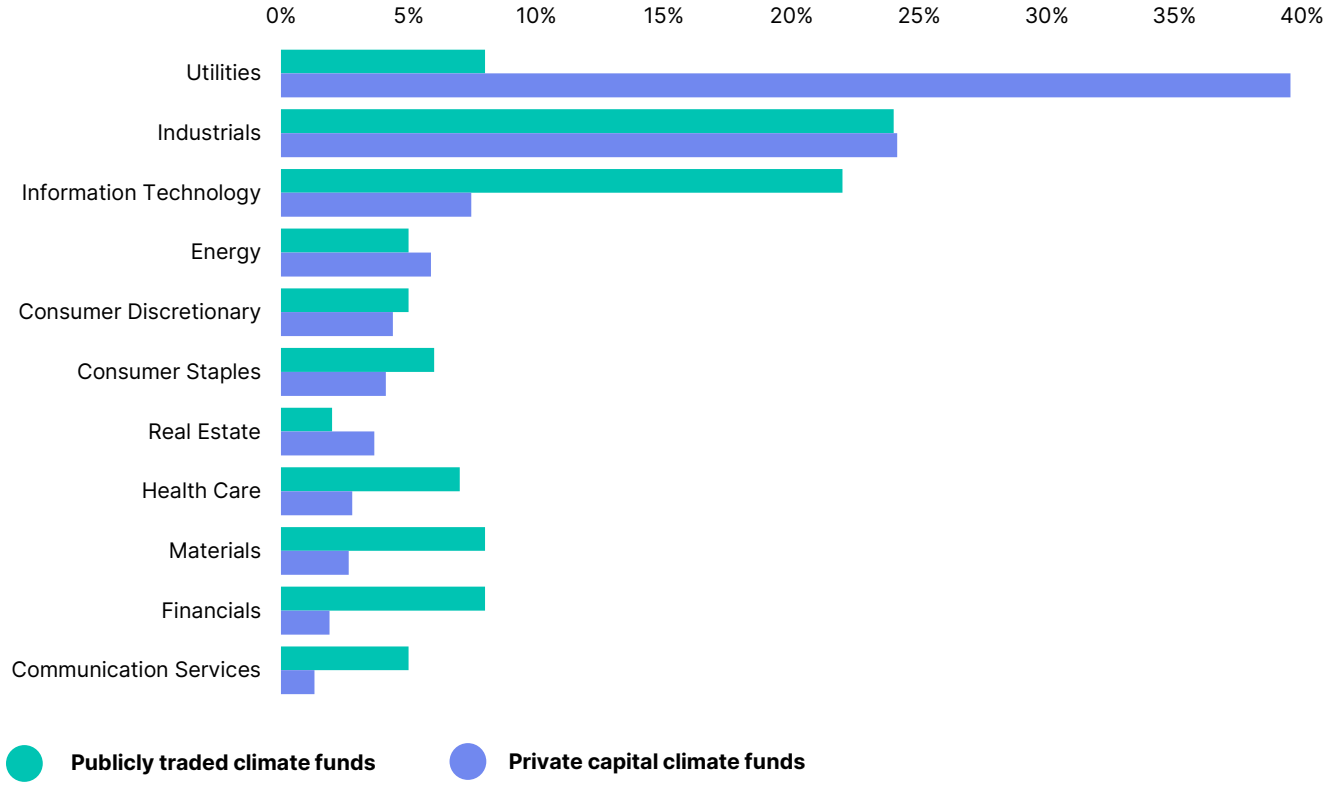


Source: MSCI ESG Research and MSCI Private Capital. Public funds data as of March 31, 2025. Private funds data as of Sept. 30, 2024.

Investing in (and around) the transition

- Financing the energy transition requires investors to deploy capital in ways that help companies in hard-to-abate sectors reduce their emissions. Investors in privately held companies — whether through private equity, venture capital or hybrid funds — can often influence corporate behavior more directly by virtue of their controlling ownership stakes.
- 40% of investments in private capital climate funds are allocated to the utilities sector — an emissions-intensive industry that offers significant opportunities to support the energy transition — compared with just 8% of publicly traded climate funds.
- Public climate funds tend to focus more on transition-enabling sectors. Twenty-two percent of investments in publicly traded climate funds are in the information technology sector and 8% are in materials — both essential to scaling low-carbon technologies. In contrast, private capital funds allocate just 7% and 3%, respectively, to these industries.

Sector exposure of climate funds (% of assets)

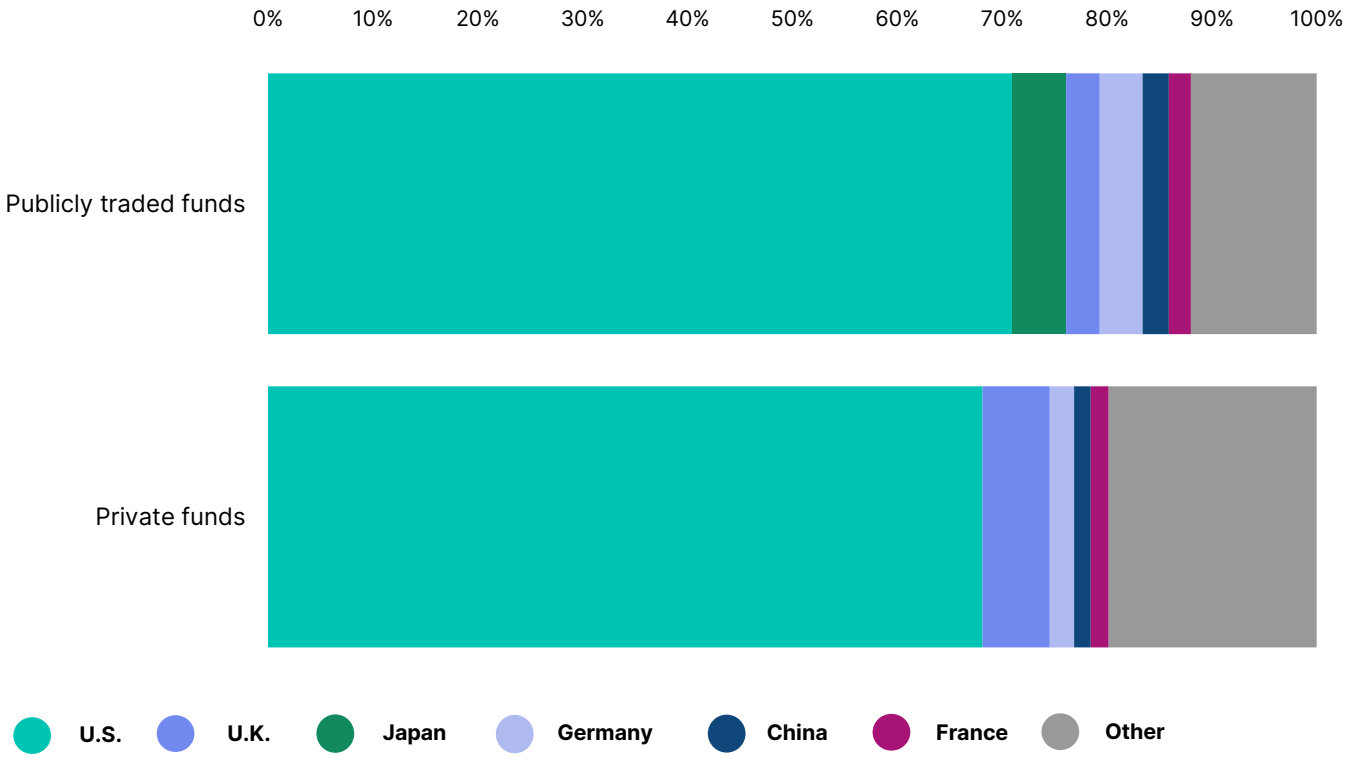


Source: MSCI ESG Research, data as of March 31, 2025.

Where the capital in climate funds is invested

- Climate-focused funds, whether publicly traded or privately held, are primarily investing in the U.S.
- 71% of the investments in publicly traded climate funds were in U.S.-listed companies or other U.S.-domiciled assets, as of March 31, 2025. Privately held climate funds follow a similar pattern, with more than two-thirds (68%) of assets allocated to U.S.-based investments.
- Japanese companies and assets represent 5.1% of publicly traded climate fund holdings — the second-largest country exposure after the U.S.— compared with less than 1% of assets held by private capital climate funds.
- For investors, portfolio geography may be a current source of both risk and opportunity. Climate funds tilt heavily toward the U.S., Japan and China — countries exposed to tariff and trade tensions. At the same time, the dynamics of tariffs, though evolving, may prompt investors to diversify geographically with the aim of unlocking opportunities in regions such as Latin America and Southeast Asia.

Investment by country (%)

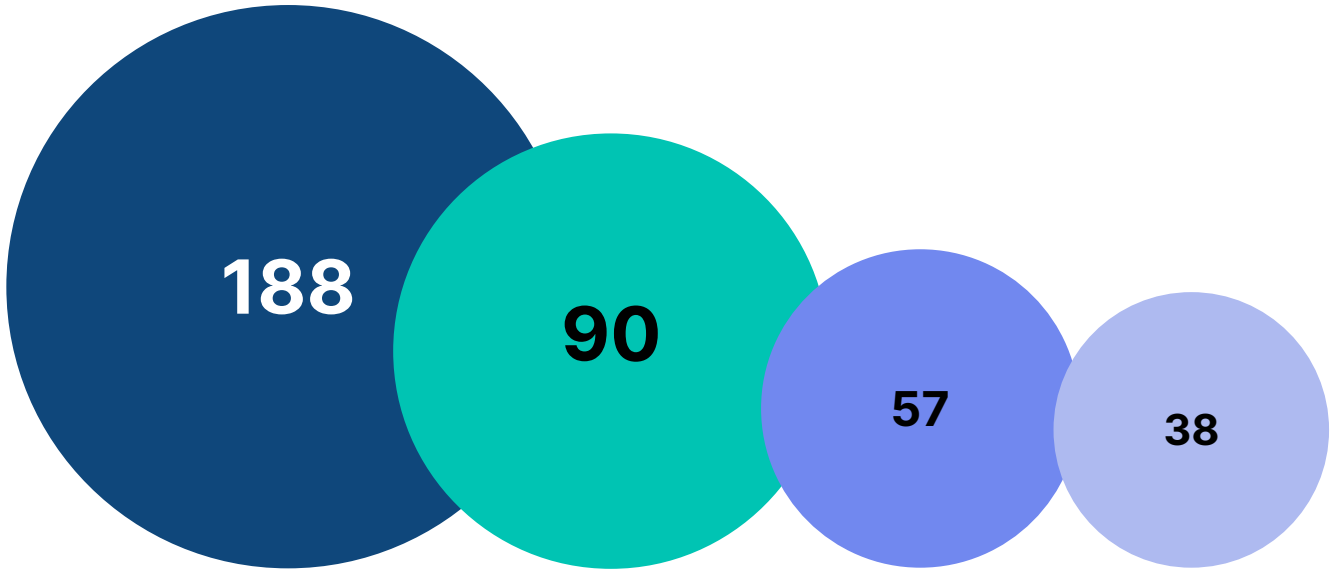


Source: MSCI ESG Research and MSCI Private Capital, data as of March 31, 2025.

Transition finance in focus

- Some claim that transition finance is about doing the hard work — investing in emissions-intensive sectors and encouraging long-term decarbonization — as opposed to decarbonizing portfolios by excluding high emitting assets. A comparison of the carbon intensity of climate funds underscores this point.
- Transition funds have a carbon intensity (measured in tons of emissions per USD million dollars in sales) nearly three times higher than that of so-called Paris-aligned funds, which avoid investing in fossil fuels and require annual emissions reductions in line with the goals of the Paris Agreement.
- Climate transition benchmarks, which mandate an initial 30% emissions cut and 7% annual reductions in emissions, fall somewhere in between. All three fund types, however, display a lower Scope 1 and 2 carbon intensity than the total funds universe.

Scope 1 and 2 weighted-average carbon intensity by climate fund type (tCO2e/USDm sales)

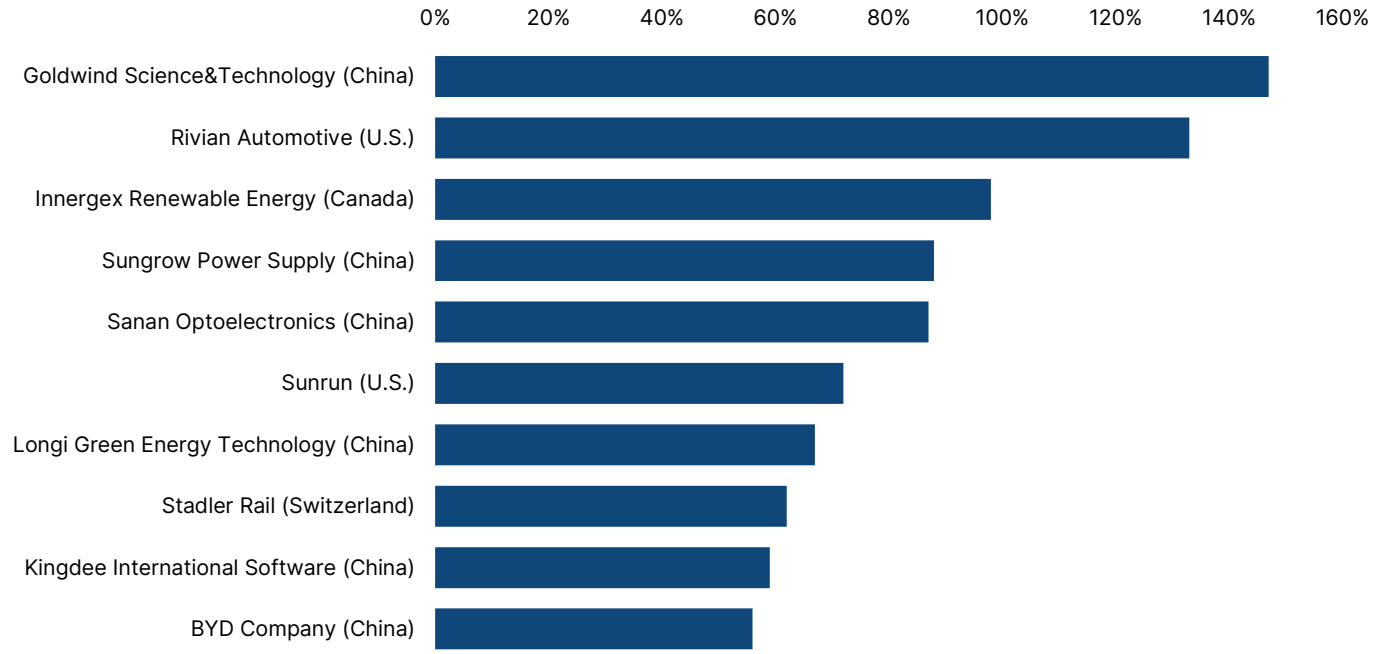


Source: MSCI ESG Research, data as of March 31, 2025.

Clean tech innovation leaders

- In the race for clean technology innovation, China holds the pole position. The world's largest emitter of greenhouse gases and second-largest economy is also home to six of the top 10 companies in clean-tech innovation, based on the pace and growth of their holdings of high-quality patents over the five years ending Dec. 31, 2023, the most recent year for which complete data is available.
- Listed Chinese companies leading their peers in strategic research and development investment include turbine manufacturer Goldwind, solar photovoltaic maker Sungrow and semiconductor producer Sanan. Rounding out the top five are U.S.-based electric vehicle maker Rivian and Canadian renewable energy company Innergex, which has agreed to be acquired by pension fund CDPQ

Clean tech innovation leaders
(annual growth in high-quality low-carbon patents)

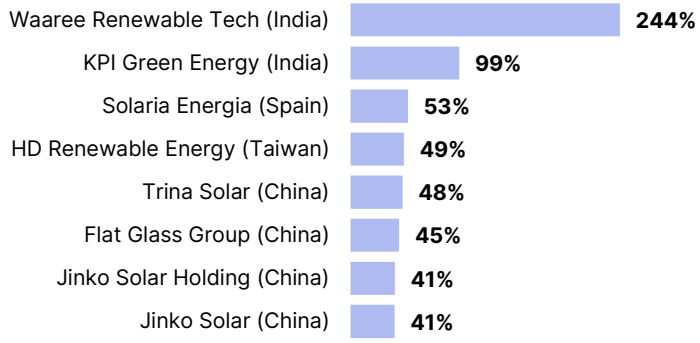


Source: MSCI ESG Research as of March 31, 2025. Notes: Companies shown here derived more than 50% of total revenues from solutions that address alternative energy, energy efficiency or green buildings. MSCI ESG Research's Low-Carbon Patent Score seeks to establish a picture of the relative level and quality of patents held by companies. Patents receive a score based on forward citations, backward citations, market coverage and Cooperative Patent Classification (CPC)/International Patent Classification (IPC) coverage, based on a universe of roughly 125 million unique patents granted by more than 70 patent authorities worldwide as of October 2024. For more information, see "Climate Value-at-Risk Methodology: Transition Risk." MSCI Research, Oct. 27, 2024. Client access only. We estimate the compound annual growth rate of Low Carbon Patent Quality Scores based on a time series of the scores.

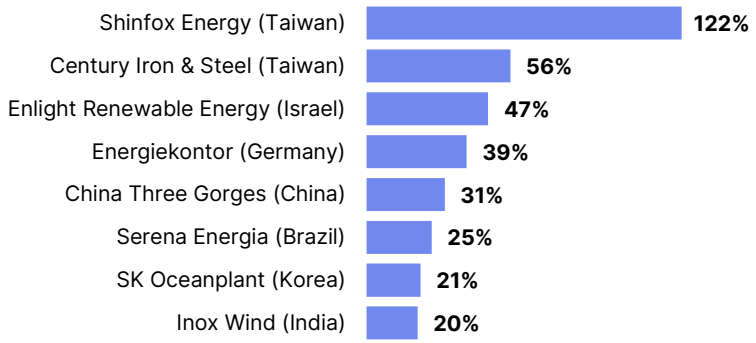
Clean tech growth leaders

- The energy transition is underway, with surging demand for power driving investment in renewables and other clean technologies. Clean-tech leaders are domiciled predominantly in the Asia-Pacific region, based on average annual revenue growth over the five years ending Dec. 31, 2023. China, the world's biggest solar market, installed 333 GW of solar capacity domestically in 2024, while exporting 242 GW, according to Ember.
- Growth leaders include solar power providers such as Waaree Renewables and KPI Green Energy in India, and wind power provider Shinfox Energy and Century Iron and Steel, a turbine manufacturer, in Taiwan. Transition leaders, however, are not exclusive to the APAC region. They also include Solaria, a Spanish manufacturer of solar photovoltaic panels, and Energiekontor, a German company specializing in wind farm development.
- Among carmakers, growth leaders aside from BYD, the world's best-selling electric-vehicle maker, include Leapmotor, a Chinese electric vehicle startup, as well as China-based Xpeng and Nio; U.S.-based Lucid Motors and Tesla; Olectra Greentech, the India-based maker of electric buses; and Polestar, the Swedish electric car manufacturer.

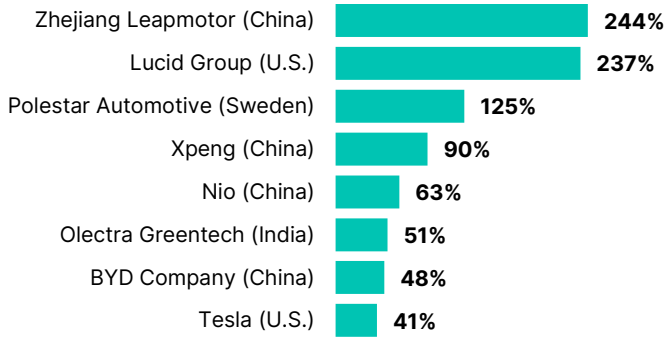
Solar power growth leaders (% CAGR, 2019-2023)



Wind power growth leaders (% CAGR, 2019-2023)



Electric-vehicle growth leaders (% CAGR, 2019-2023)

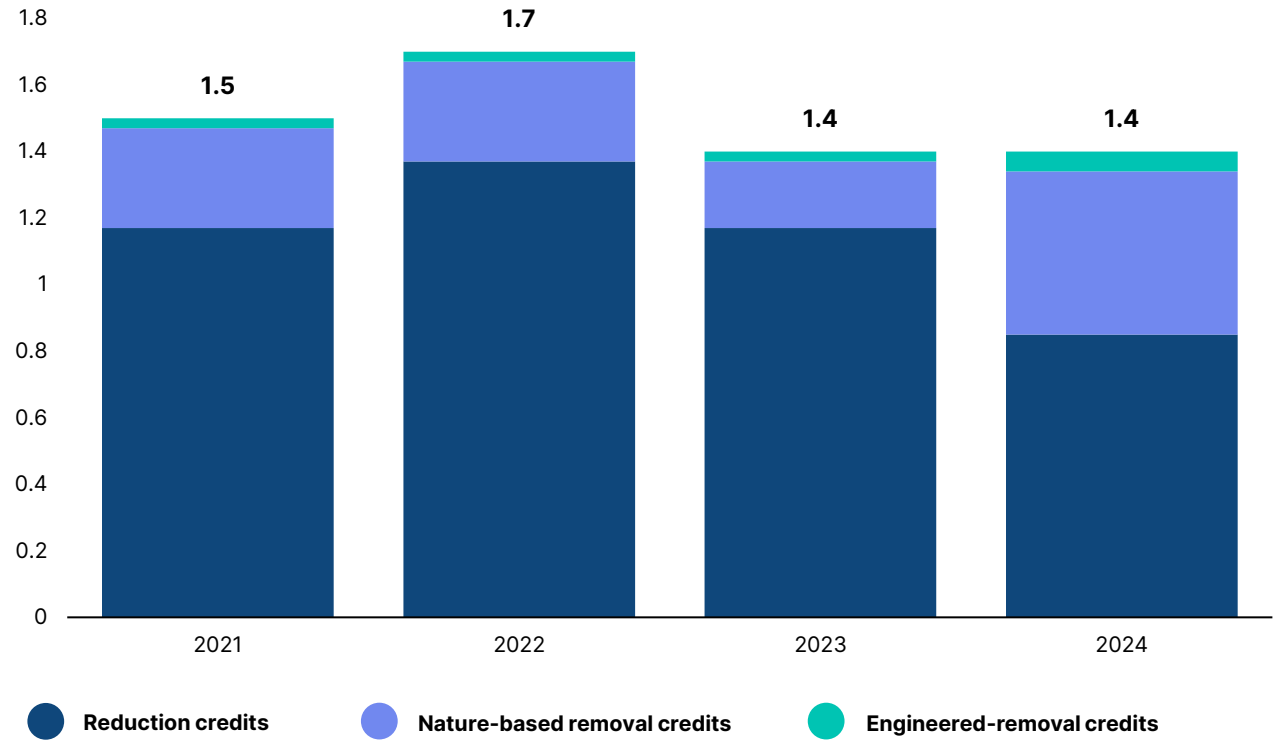


Source: MSCI ESG Research, data as of Dec. 31, 2023.

Tracking the size of the carbon credit market

- The global market for carbon credits totaled an estimated USD 1.4 billion, as of Dec. 31, 2024, based on the total value of credits used by companies, roughly in line with 2023 and slightly below 2022's peak of USD 1.7 billion.
- Credits used (referred to as retired) by companies comprise two main types: reduction credits, issued by projects that reduce or avoid emissions being released into the atmosphere, and removal credits, issued by projects that directly remove emissions from the atmosphere, either via nature-based or engineered processes.
- About 70% of credits retired by companies in 2024 were reduction credits and 30% were removal credits. Among removal credits, 99% were nature-based, with the remainder from engineered processes.

Value of carbon credits retired annually (USD bn, 2024 prices)

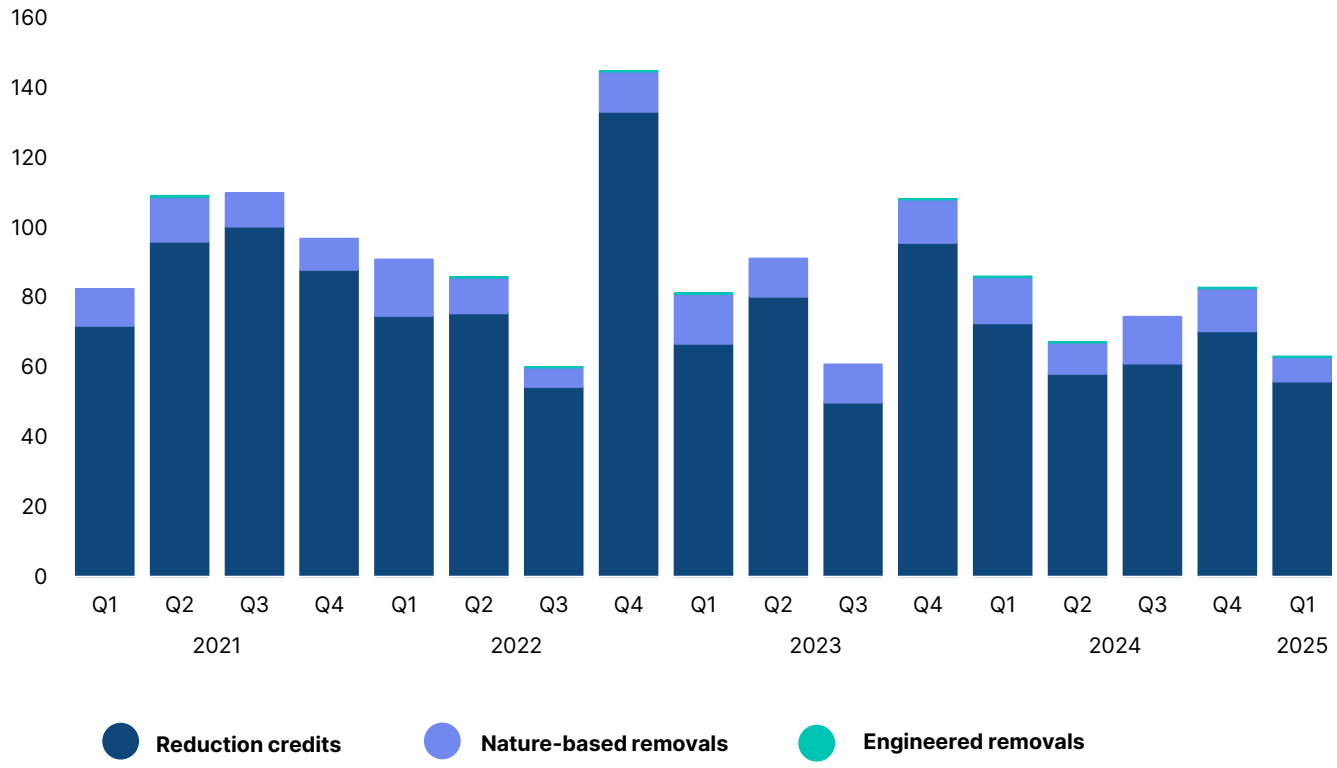


Source: MSCI Carbon Markets, data as of Dec. 31, 2024.

Tracking the supply of carbon credits

- Registered projects issued credits for 63 million tonnes of CO2e (MtCO2e) in the first quarter of 2025, down 24% from the prior quarter and 27% from the same period a year earlier.
- The lion's share (89%) of carbon credits that entered the market in the quarter came from projects that reduce the amount of CO2e entering the atmosphere, with the remainder representing removal projects. Nearly all removal credits issued in the quarter came from nature-based projects.

Amount of voluntary carbon credits issued quarterly, by type (MtCO2e)

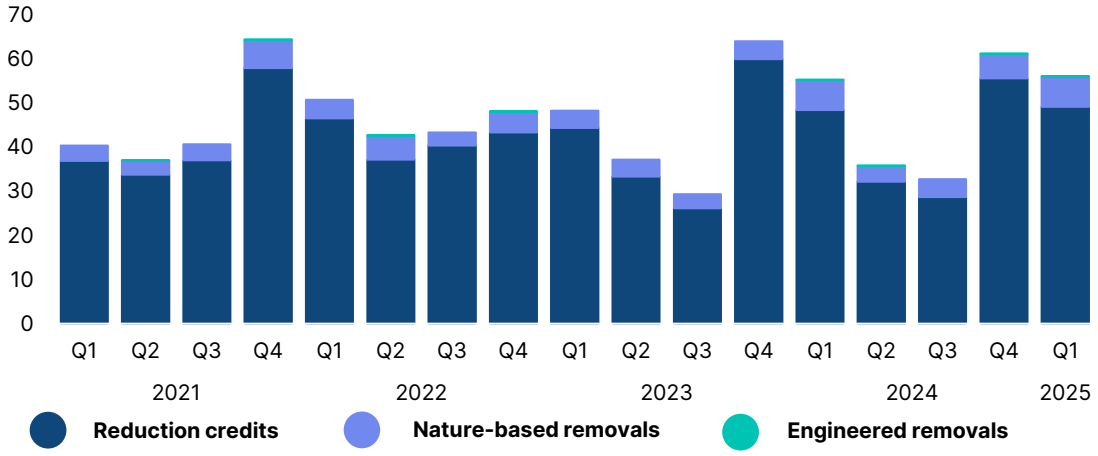


Source: MSCI Carbon Markets, data as of March 31, 2025, based on data from , based on data from ACR, ART, BioCarbon, CAR, Cercarbono, Climate Forward, CDM (NDC eligible credits only), GCC, Gold Standard, Plan Vivo, Puro Earth and Verra.

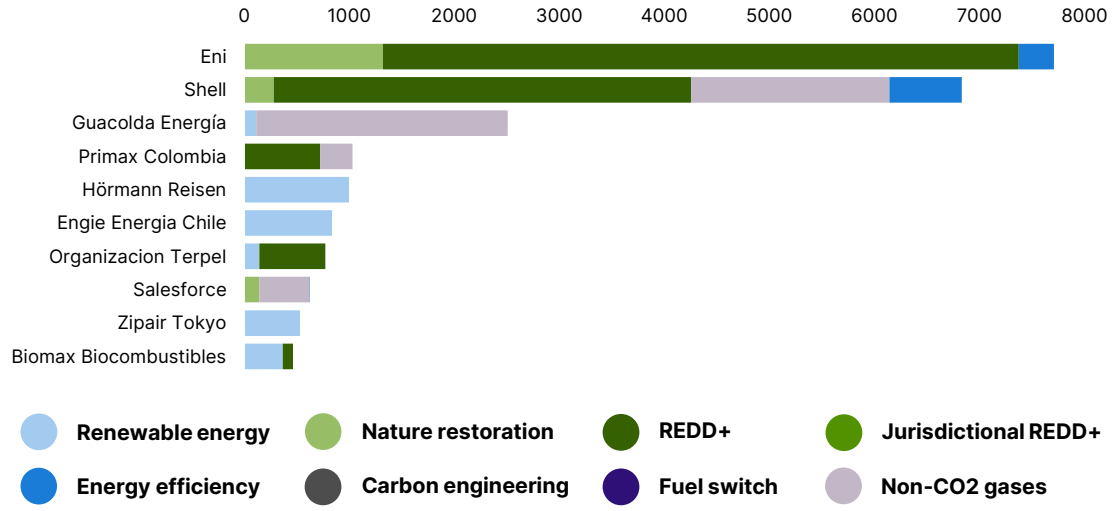
Tracking demand for carbon credits

- Companies retired 56 MtCO2e of carbon credits during the first quarter of 2025, down 8% from the prior quarter but up 1% from the same period last year. This marks the fourth-highest quarterly retirement volume on record.
- Nearly 88% of retirements in the quarter came from projects that reduce the amount of CO2e entering the atmosphere, compared with those that remove CO2e from the atmosphere. The overwhelming share of removal credits retired came from nature-based projects.
- Oil majors Eni and Shell, together with Chilean energy company Guacolda Energía, topped the list of companies that disclosed retiring the most credits in the quarter.

Amount of carbon credit retirements disclosed quarterly, by type (MtCO2e)



Top 10 disclosed retirees, Q1 2025

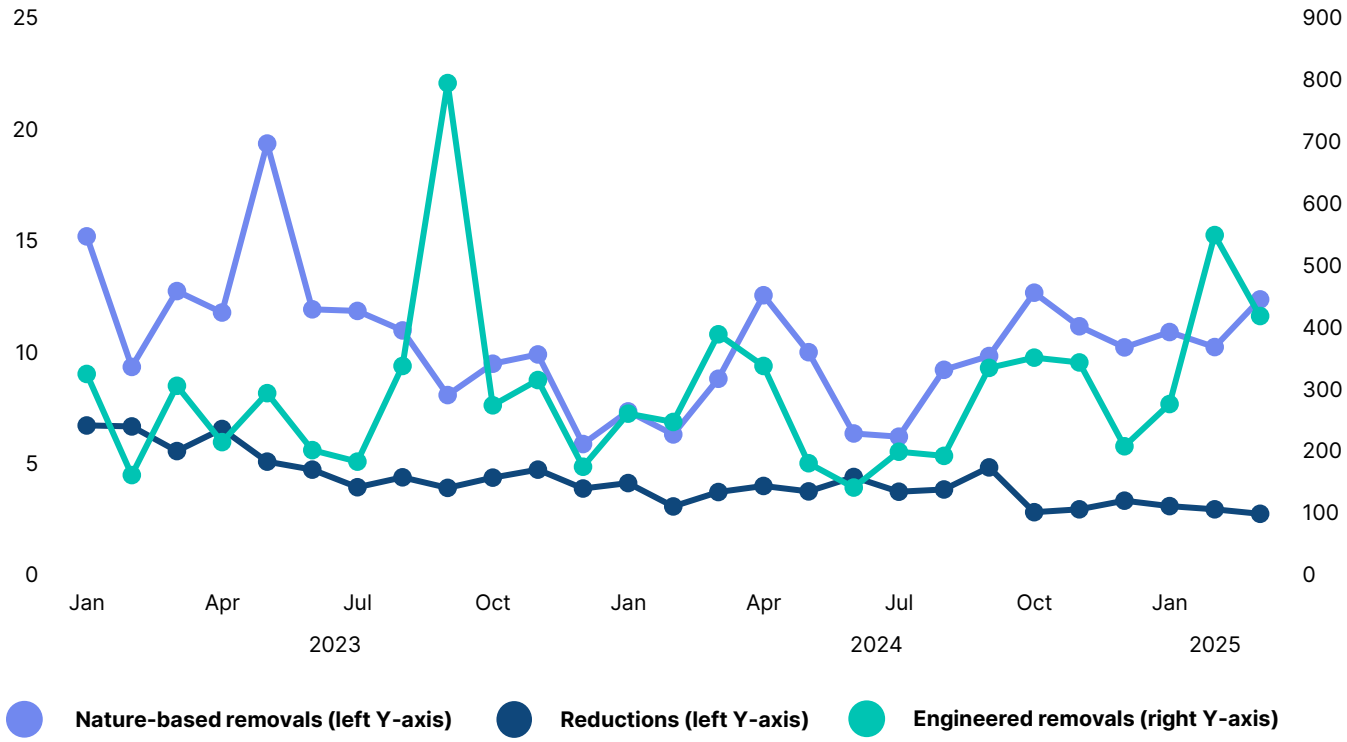


Source: MSCI Carbon Markets, data as of March 31, 2025, based on data from ACR, ART, BioCarbon, CAR, Cercarbono, Climate Forward, CDM (NDC eligible credits only), GCC, Gold Standard, Plan Vivo, Puro Earth and Verra.

Tracking the prices of carbon credits

- Volume-weighted average spot prices for carbon credits across all project types stood at USD 4.9 tCO2e in the first quarter, up 2% from the same period a year earlier and an increase of 4% from the prior quarter.
- The average price for all credit types masks a disparity between the average price of credits for emissions reduction compared with those for emissions removal. The volume-weighted average spot price of nature-based removal credits stood at USD 12.9 per tCO2e in three months ended March 31, 2025, up 27% from a year earlier, while the average spot price for engineered removal credits stood at USD 415 per tCO2e, up 38% from the same quarter in 2024.
- The Science Based Targets initiative (SBTi) is currently seeking comments on whether companies should be required to set interim carbon removal targets, a development that could add to demand for removal credits were the proposal to be adopted.

Monthly average carbon credit prices by type (USD/MtCO2e)

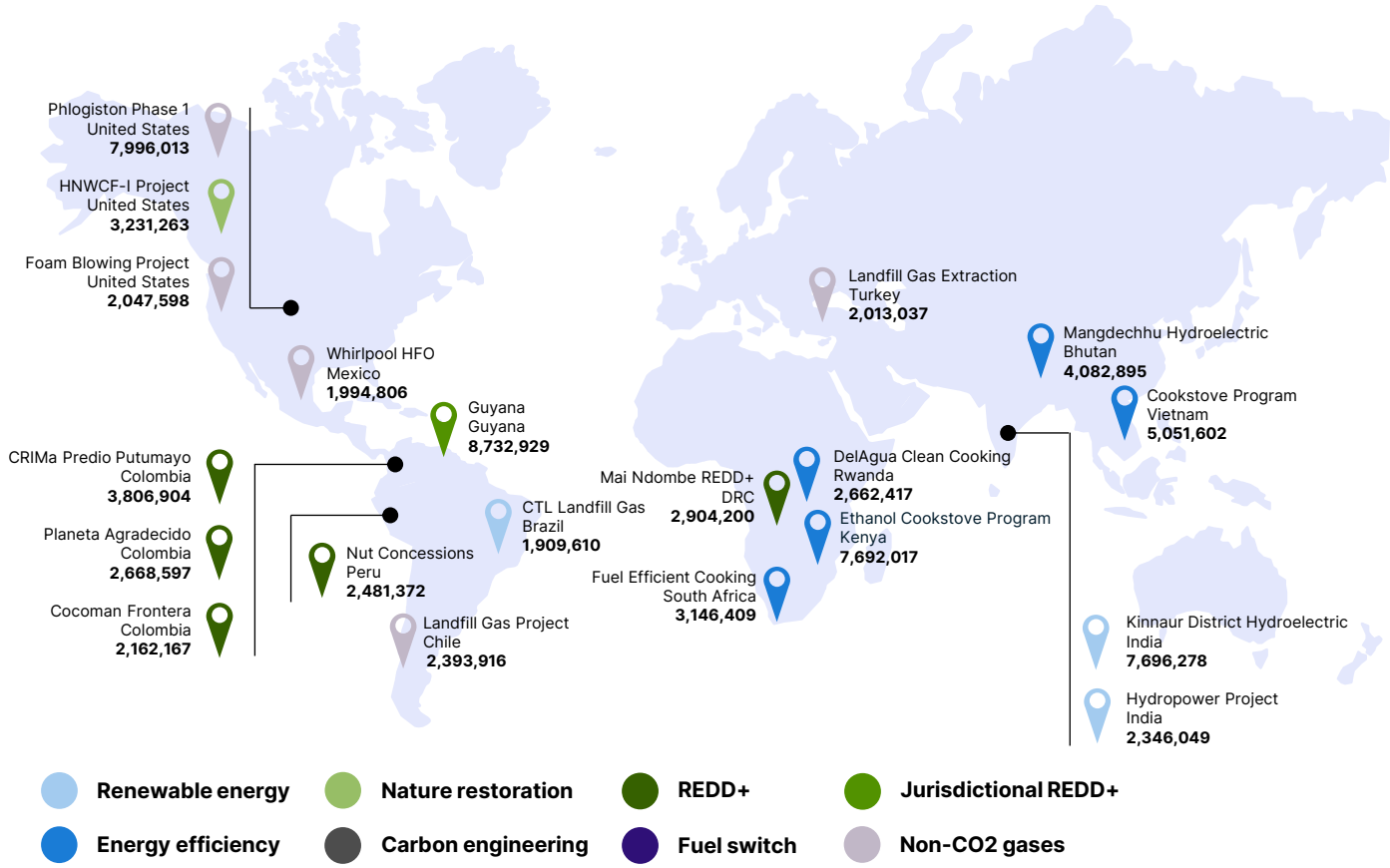


Source: MSCI Carbon Markets, data as of March 31, 2025. Note includes both exchange and over-the-counter trades and asks. Volume-weighted averages are weighted by reported volumes of asks and transactions, with asks given a lower weighting.

Tracking the biggest carbon projects

- The map opposite highlights the world's 20 largest projects by carbon credits issued (tCO_2e) in the 12 months ended March 31, 2025. Leading the list is Guyana's Jurisdictional REDD+ initiative, aimed at preserving high forest, low deforestation (HFLD) areas, with over 8.7 million credits issued in the last year.
- Reducing emissions through clean cooking is a recurring focus of projects underway in Kenya, Vietnam, South Africa and Rwanda. Across the Americas, efforts center on reducing non-CO2 gases, particularly through the capture of methane and the elimination of ozone-depleting substances. Significant REDD+ projects in Colombia and the Democratic Republic of Congo aim to combat deforestation.
- These projects represent a diversity of approaches to tackling climate change through forest conservation, energy efficiency and emissions-reduction technologies. Together, they highlight the role of carbon trading in channeling climate- and nature-focused capital from companies and investors in developed markets to low-carbon projects in emerging economies.

The 20 largest carbon projects by credits issued, as of 1Q 2025 (tCO_2e)*



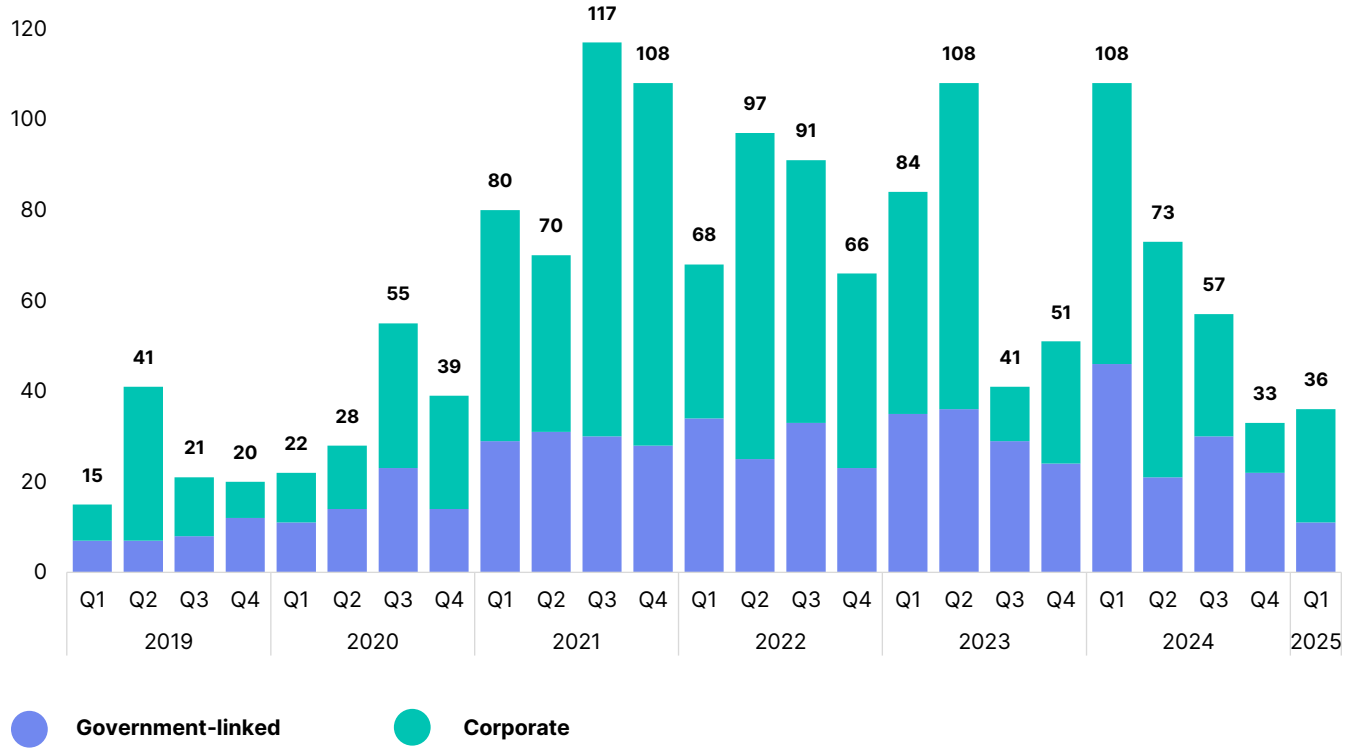
* Based on issuances from April 1, 2024 through March 31, 2025.

Source: MSCI Carbon Markets, data as of March 31, 2025, based on data from ACR, ART, BioCarbon, CAR, Cercarbono, Climate Forward, CDM (NDC eligible credits only), GCC, Gold Standard, Plan Vivo, Puro Earth and Verra.

Bonding with the environment

- Governments and corporate issuers use green bonds to borrow money specifically for projects that have environmental benefits, enabling investors to support green projects while earning a return on their investment. The global green bond market totaled USD 243 billion as of Dec. 31, 2025, up 6% from a year earlier.
- Since 2020, national treasuries, government agencies, and companies have all significantly increased their issuance of green bonds.
- Australia issued its first sovereign green bond, in the amount of USD 4.4 billion, in 2024. A series of sovereigns, including Austria, Germany, Italy, France, Canada, Poland, Singapore, Hong Kong, the U.K. and U.S., have all issued green bonds to fund initiatives in clean technology and environmental conservation. China issued its first green bond this month.

Amount of green bonds issued each quarter (USD billion)



Source: MSCI ESG Research, data as of March 31, 2025.

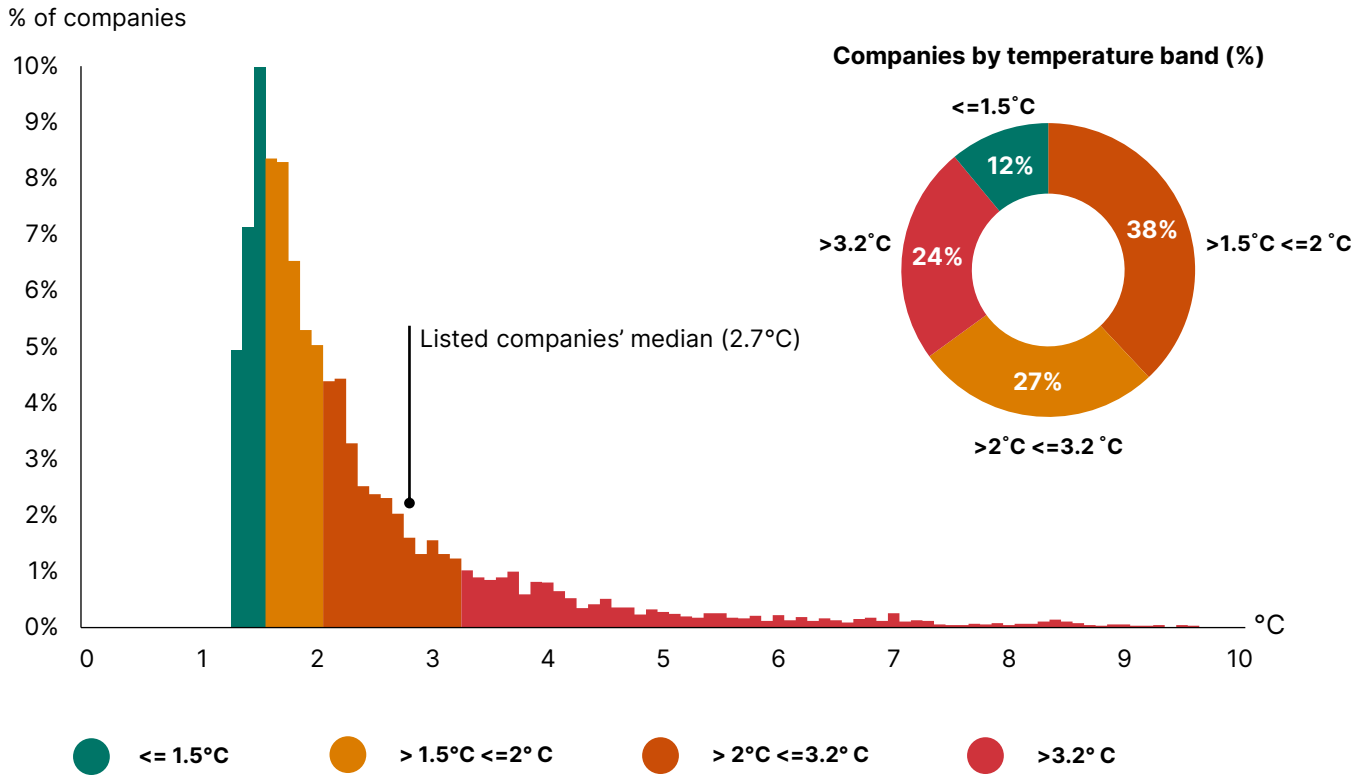
MSCI Sustainability Institute

Transition

Temperature check: Listed companies

- The world's listed companies align with projected warming of 2.7°C (5.04°F) above preindustrial levels, based on their aggregate emissions, sector-specific carbon budgets and climate targets as of March 31, 2025.
- Twelve percent of listed companies aligned with projected warming of 1.5°C or less, while an additional 27% aligned with warming between 1.5°C and 2°C (3.6°F). 61% percent of listed companies are on an emissions trajectory that would breach the 2°C threshold, including 24% of companies whose trajectories would exceed 3.2°C (5.76°F).
- Our extrapolation relies on MSCI's Implied Temperature Rise, a forward-looking climate impact metric that financial institutions use to assess the alignment of portfolios with global climate goals.
- Though Implied Temperature Rise represents an investor model, it finds the aggregate temperature alignment of listed companies correlates closely with policy-based projections such as those from Climate Action Tracker (which projects warming of 2.7°C above preindustrial levels) and the United Nations Environment Program, which estimates that global warming would reach between 2.6°C and 3.1°C above preindustrial times, depending on the trajectory of countries' national climate commitments.

Projected temperature alignment of the world's listed companies (Implied Temperature Rise in °C)

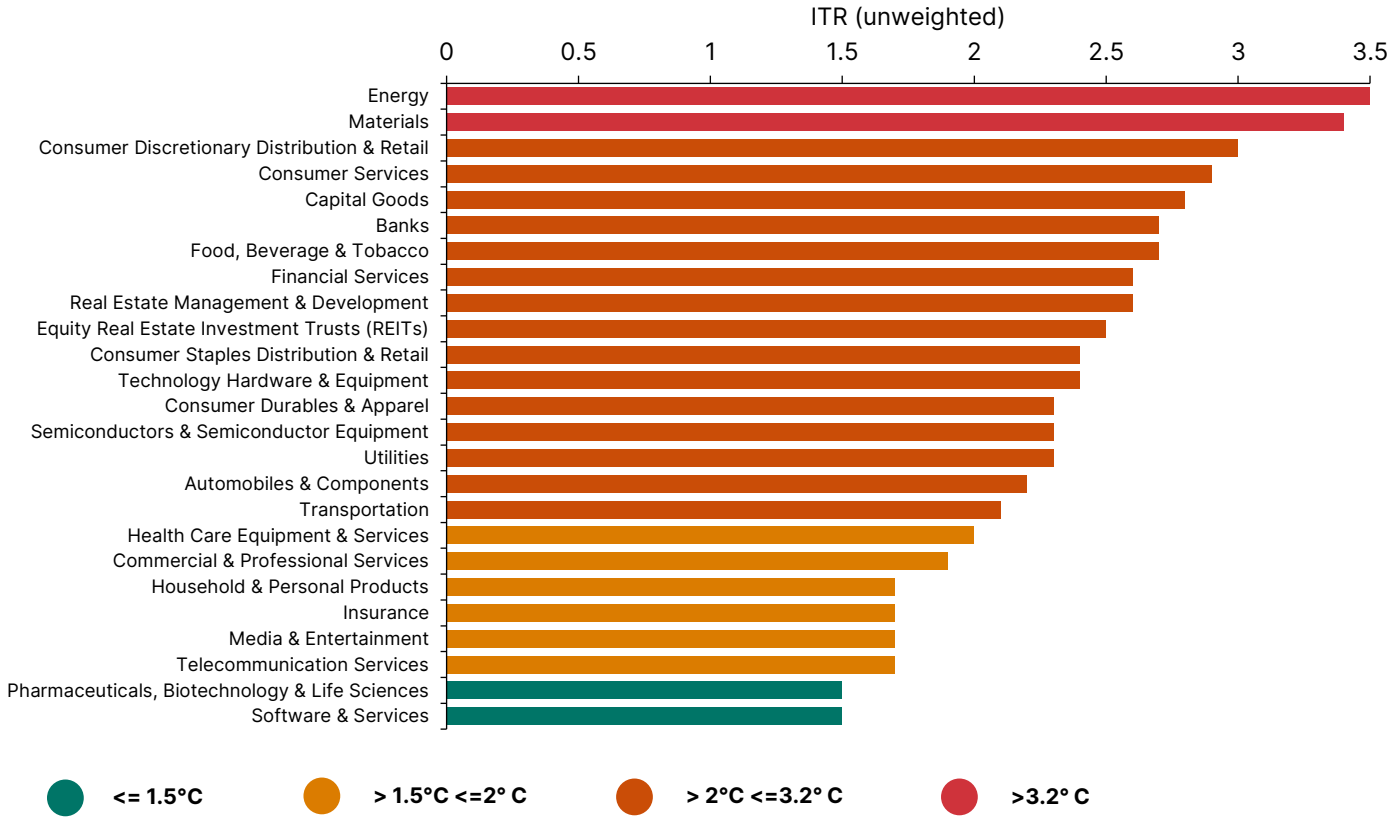


Source: MSCI ESG Research, data as of March 31, 2025. Not index weighted.

Temperature check: Industries

- The chart opposite shows the aggregate emissions trajectories associated with listed companies in 25 industries, reflecting how those trajectories align with global warming thresholds.
- Companies in industries like energy (3.5°C), materials (3.4°C), and consumer discretionary and retail (3.°C) have the highest estimated climate impact, significantly overshooting a 1.5°C warming threshold. Conversely, household and personal products, insurance, media, telecommunications, pharmaceuticals, and software and services show greater alignment despite a lower allocated sector carbon budget.
- The data highlights the opportunity for investors to finance the transition to a low-carbon economy, and for companies in emissions-heavy industries to adopt science-based emissions targets. Financing the transition means not just counting the total emissions financed but also considering carbon budgets and companies' forward-looking climate impact matters.

Projected temperature alignment of the world's listed companies by industry group (Implied Temperature Rise in °C)

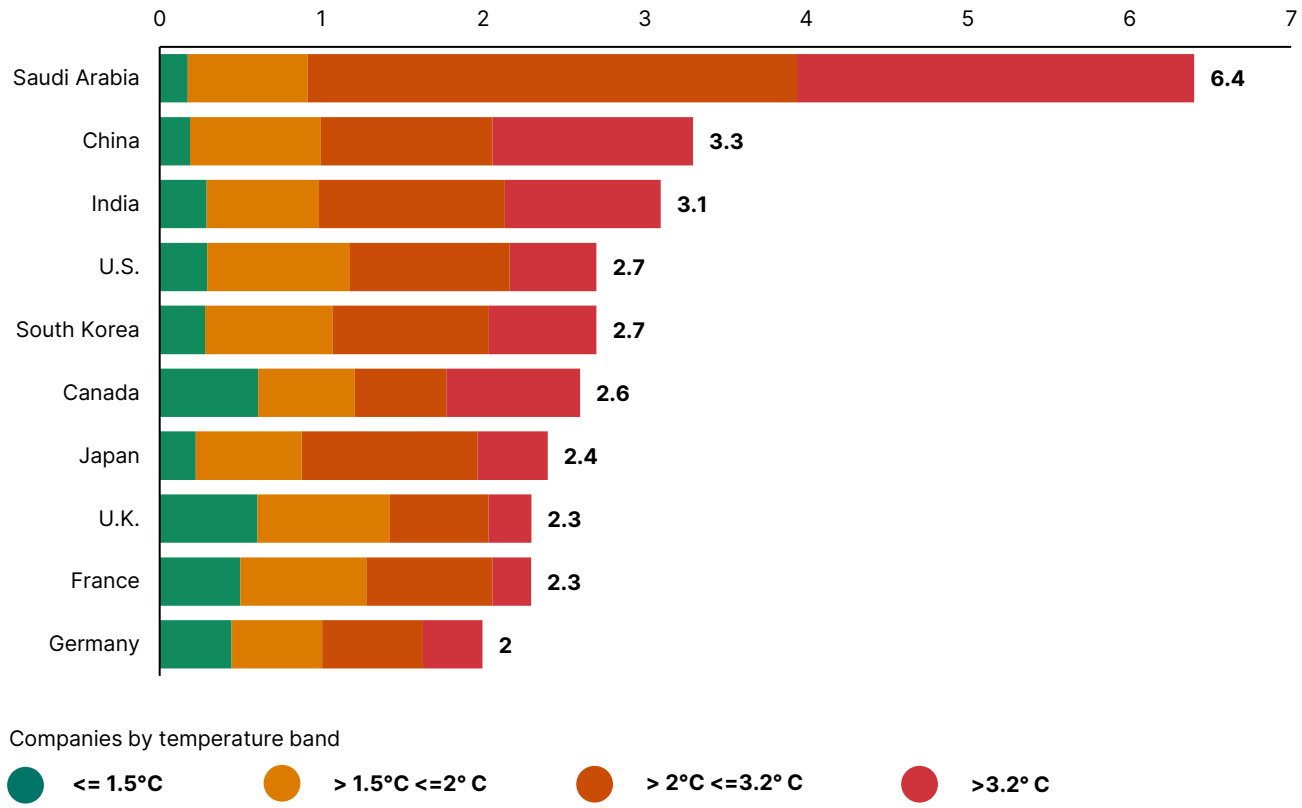


Source: MSCI ESG Research, data as of March 31, 2025. Not index weighted.

Temperature check: Companies by country

- The chart at right shows the estimated global warming attributed to listed companies by country based on their aggregate emissions, sector-specific carbon budgets and climate targets as of March 31, 2025.*
- Listed companies based in Saudi Arabia top the list with a projected temperature rise of 6.4°C, reflecting the large value chain emissions of the world's largest oil companies. Companies in China and India follow with 3.3°C and 3.1°C, respectively.
- Listed companies in the U.S. and South Korea both contribute to a 2.7°C rise, while those in Canada, Japan, the U.K. and France range from 2.6°C to 2.3°C. Companies in Germany ranks lowest among the 10, with 2°C.
- The estimate highlights differences in the projected climate impact of listed companies across nations and underscores both the value of country climate plans and the global nature of the challenge of decarbonizing.

Projected temperature alignment of listed companies by country

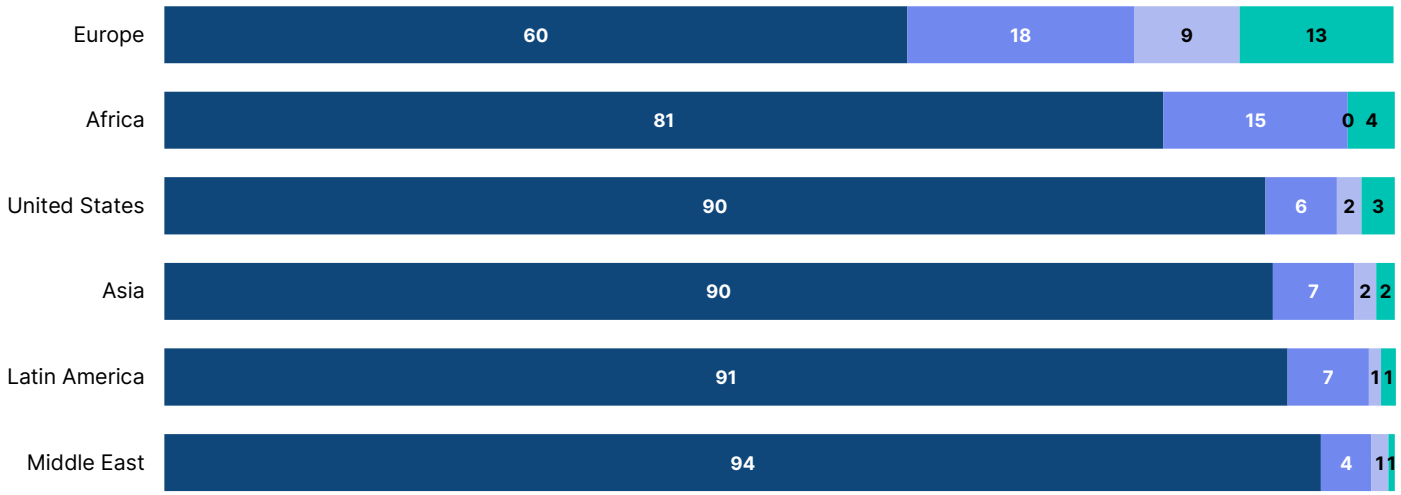


Russia and Iran not shown because the securities of companies listed there are not included in the MSCI ACWI IMI.
Source: MSCI ESG Research, data as of March 31, 2025.

Assessing alignment with a science-based pathway

- The Net Zero Investment Framework (NZIF) is designed to help institutional asset owners and managers analyze alignment of their investments with the low-carbon transition and develop climate strategies and plans in line with global goals.
- The voluntary framework, developed by the Paris Aligned Investment Initiative, a coalition of four investor networks, recommends a series of criteria for classifying companies into one of five categories representing a progression of alignment with science-based emissions trajectories that limit average global temperature rise to 1.5°C, ranging from "not aligning," indicating the lowest degree of alignment with global climate goals to "achieving net zero" indicating full alignment.
- The chart opposite categorizes the world's listed companies according to the NZIF 2.0 maturity scale. It shows that degrees of regional alignment vary, with more than one-fifth (21%) of companies in Europe either aligning or aligned to a net-zero pathway, compared with 4.7% and 3.3% of their counterparts in the U.S. and Asia, respectively. No company has yet achieved net-zero under the NZIF.

Listed companies by Net Zero Investment Framework 2.0 maturity scale category (%)



The Net Zero Investment Framework 2.0 maturity scale

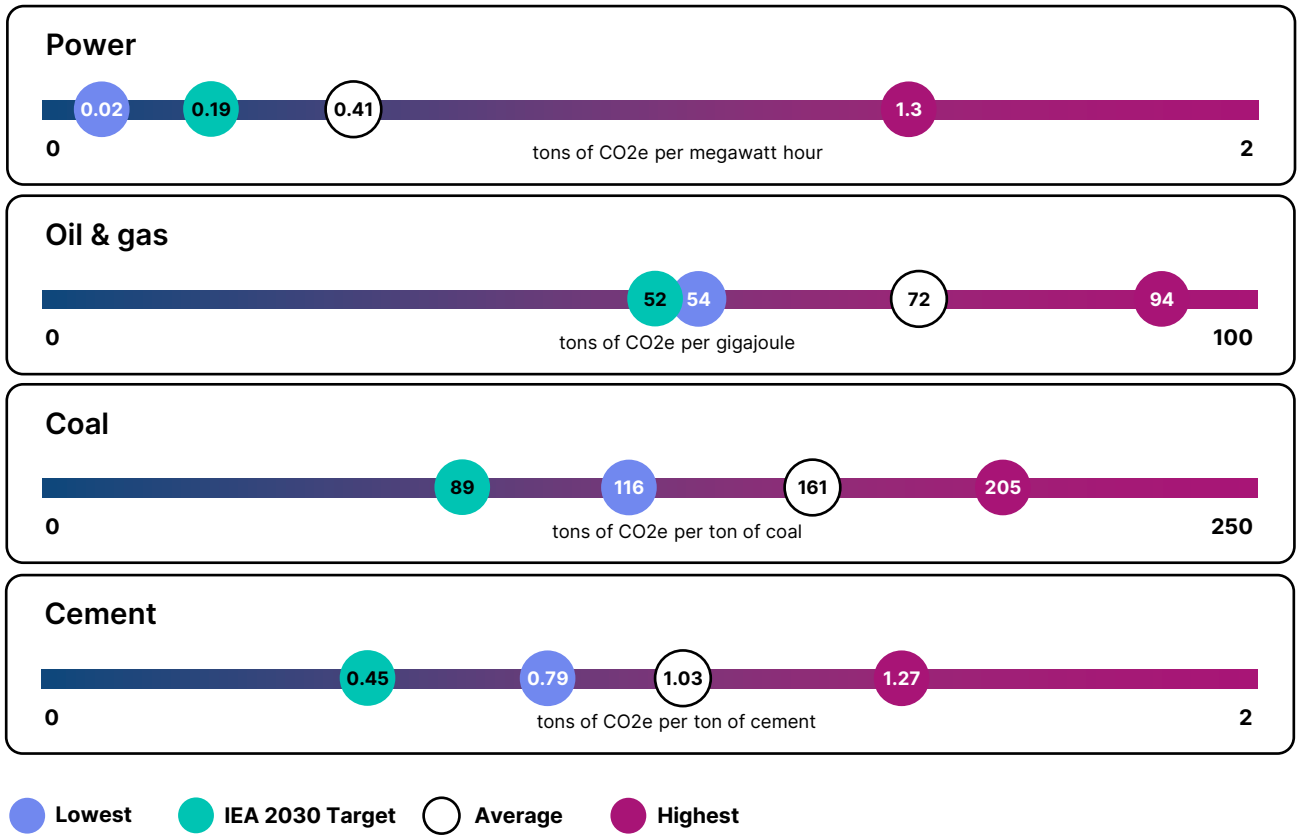
Not aligning	Committed to aligning	Aligning to a net zero pathway	Aligned to a net zero pathway	Achieving net zero
Companies without a commitment to decarbonize in a manner consistent with achieving net-zero emissions.	Companies with a long-term goal of reaching net-zero by 2050.	Companies that are not yet aligned with a net-zero pathway but have both a science-based target and a decarbonization plan that align with such a pathway.	Companies that have science-based targets, a decarbonization plan, and current absolute or emissions intensity at least equal to a net-zero pathway.	Companies that have current emissions at or near net- zero

Source: MSCI ESG Research, data as of March 31, 2025. Net Zero Investment Framework 2.0, Institutional Investors Group on Climate Change, June 2024.

Comparing carbon efficiency

- Some financial institutions use production-based emissions intensities to assess how carbon efficient companies within the same industry manage their industrial output. These metrics are calculated by dividing a company's GHG emissions by its annual production — whether measured in megawatt-hours of electricity generated, energy extracted from oil and gas, or tons of steel or cement produced.
- The chart at right compares the aggregate alignment of the largest companies in four industries (that derive at least 75% of their revenue from that industry, to ensure comparability)with the sector-specific 2030 target pathway set by the International Energy Agency (IEA).
- For illustration, we highlight in each industry the lowest, highest, average and IEA target benchmark. The lower, the more carbon efficient.
- Companies that derive at least 75% of their revenue from their respective industry and whose production intensity aligns most closely with the IEA benchmark as of March 31, 2025, are Huaneng Lancang River Hydropower (power/China), EQT Corp. (oil and gas/U.S.), Stanmore Resources Ltd. (coal/Australia) and Ultratech Cement Limited (cement/India).

Production-based greenhouse gas intensities (% distance to 2030 target of IEA scenario)

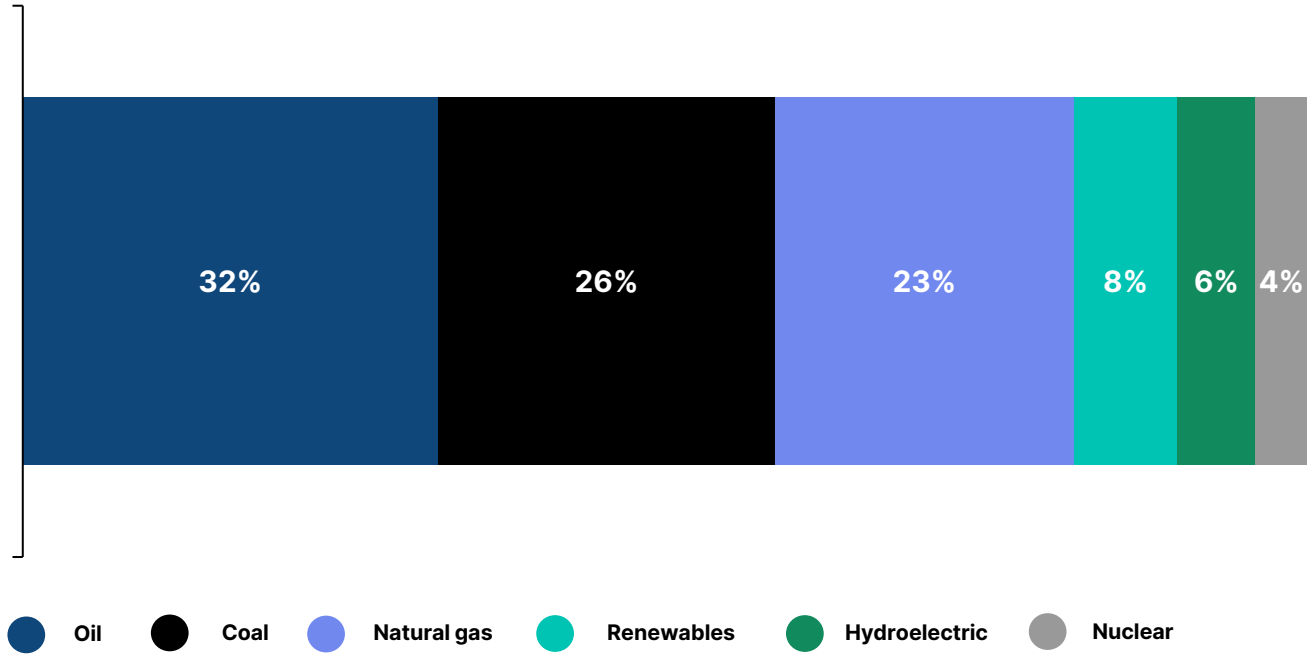


Source: MSCI ESG Research, data as of March 31, 2025.

Our reliance on fossil fuels

- Fossil fuels — coal, oil and natural gas — account for the lion's share (82%) of global primary energy consumption, a measure of total energy demand. The remaining share comes from low-carbon sources, including nuclear, hydropower, solar, wind, biomass and geothermal energy.
- Although the share of renewables in global energy consumption has increased in recent decades, overall consumption of all forms of primary energy — including carbon-intensive fuels such as oil and gas — has also continued to rise.
- The amount of electricity produced by burning fossil fuels rose by 1.4% in 2024 from a year earlier to meet a surge in demand from high heat, according to Ember, which notes that without the heat-driven demand, fossil generation would have risen by only 0.2%.

Global primary energy consumption by source (%)

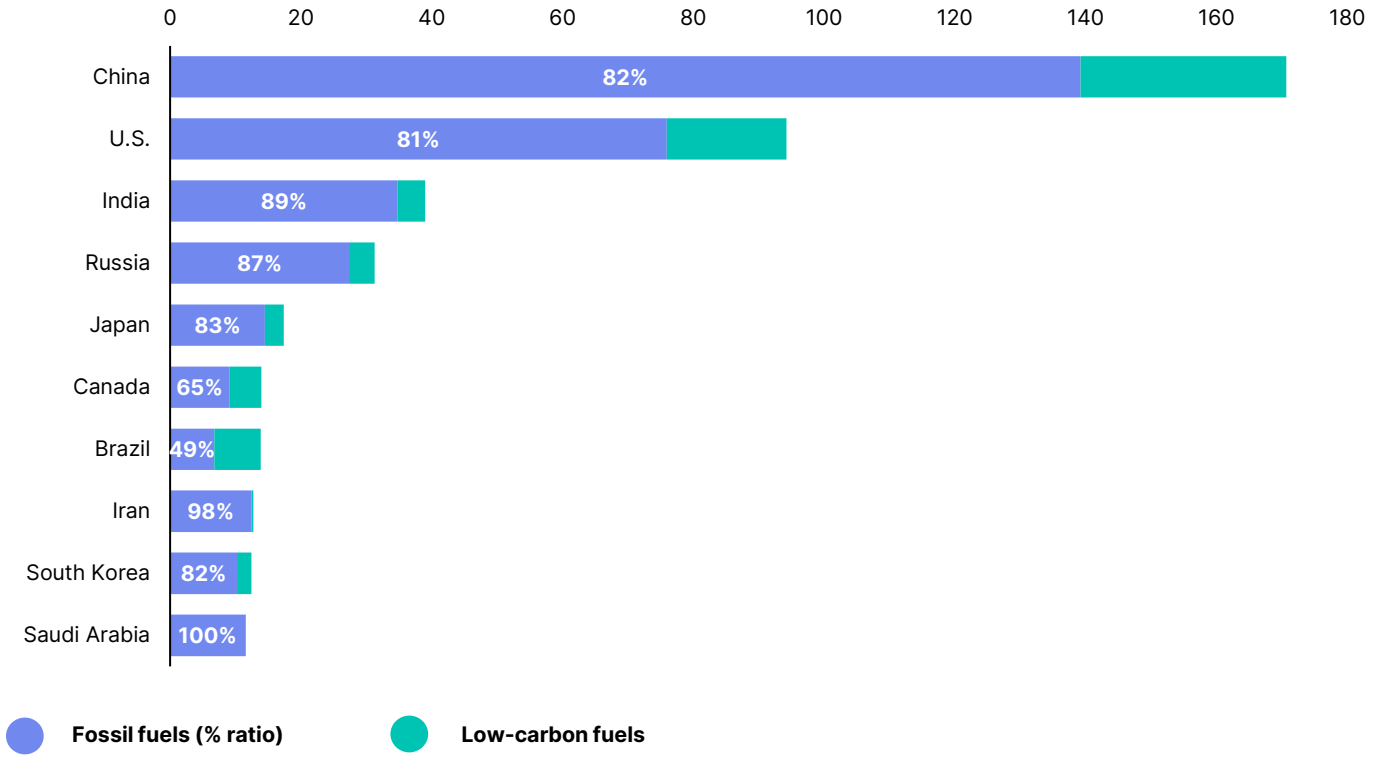


Source: MSCI ESG Research, based on data for 2023 from the Statistical Review of World Energy, The Energy Institute, 2024.

Comparing energy footprints

- Comparing absolute primary energy consumption conveys the scale of countries' appetite for energy and the role of both fossil fuels (coal, oil and gas) and low-carbon sources of energy (solar, wind, hydroelectric and nuclear) in meeting that demand.*
- While fossil fuels satisfy roughly similar shares of energy demand in China, the U.S. and India, 16% of the energy China consumes comes from low-carbon sources, compared with 12% in the U.S. and 10% in India.
- Canada and Brazil, which will host this year's COP30 climate summit, consume the smallest shares of fossil fuels, owing to their significant hydropower resources.

Top 10 countries by primary energy consumption (exajoules)

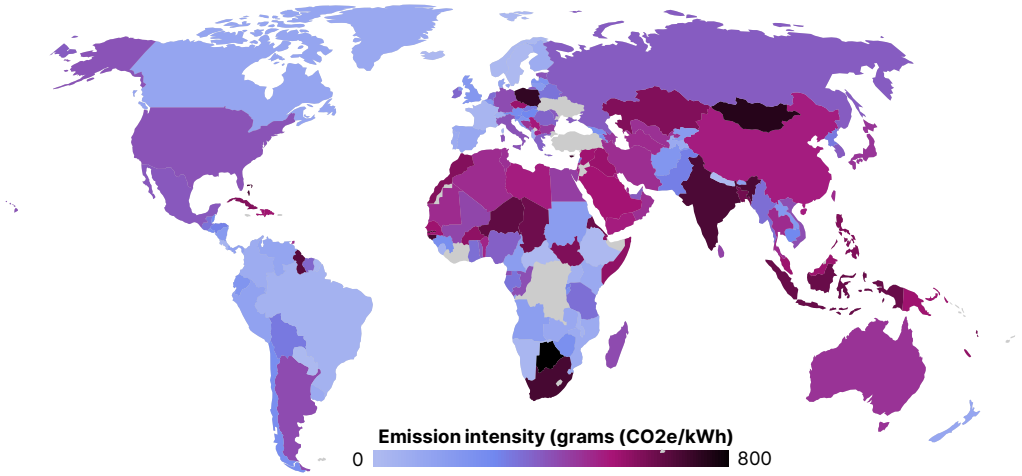


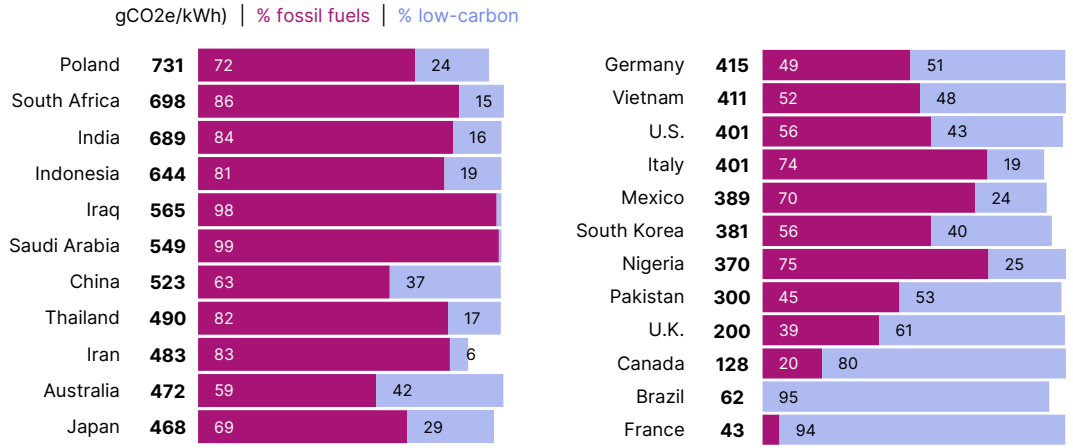
Source: MSCI ESG Research, based on data from the Statistical Review of World Energy, The Energy Institute, 2024. The chart is expressed in exajoules (EJ), a billion billion joules and a common metric used to measure large volumes of energy. (Global energy consumption is about 620 EJ.)

How green is your grid?

- Comparing countries by the carbon intensity of their electricity production provides a lens to identify markets where electrifying industrial processes, for example, may be most likely to deliver decarbonization, helping to spot potential energy transition leaders and laggards.
- Among the three countries that generate the most emissions — China, the U.S. and India — the U.S. has the least carbon-intensive electricity grid, with 43% of electricity generated from low-carbon sources (solar, wind, hydro and nuclear).
- Canada, Brazil and France have the least carbon-intensive electricity. The overwhelming share of electricity generated in all three countries comes from low-carbon power; hydropower in Canada and Brazil and nuclear energy in France.
- A high proportion of low-carbon energy does not always correlate with a low-carbon grid as the need for backup power (generally gas or coal) maintains carbon intensity, as Germany shows.

Carbon intensity of electricity, 90-day average (grams CO2e/kWh)



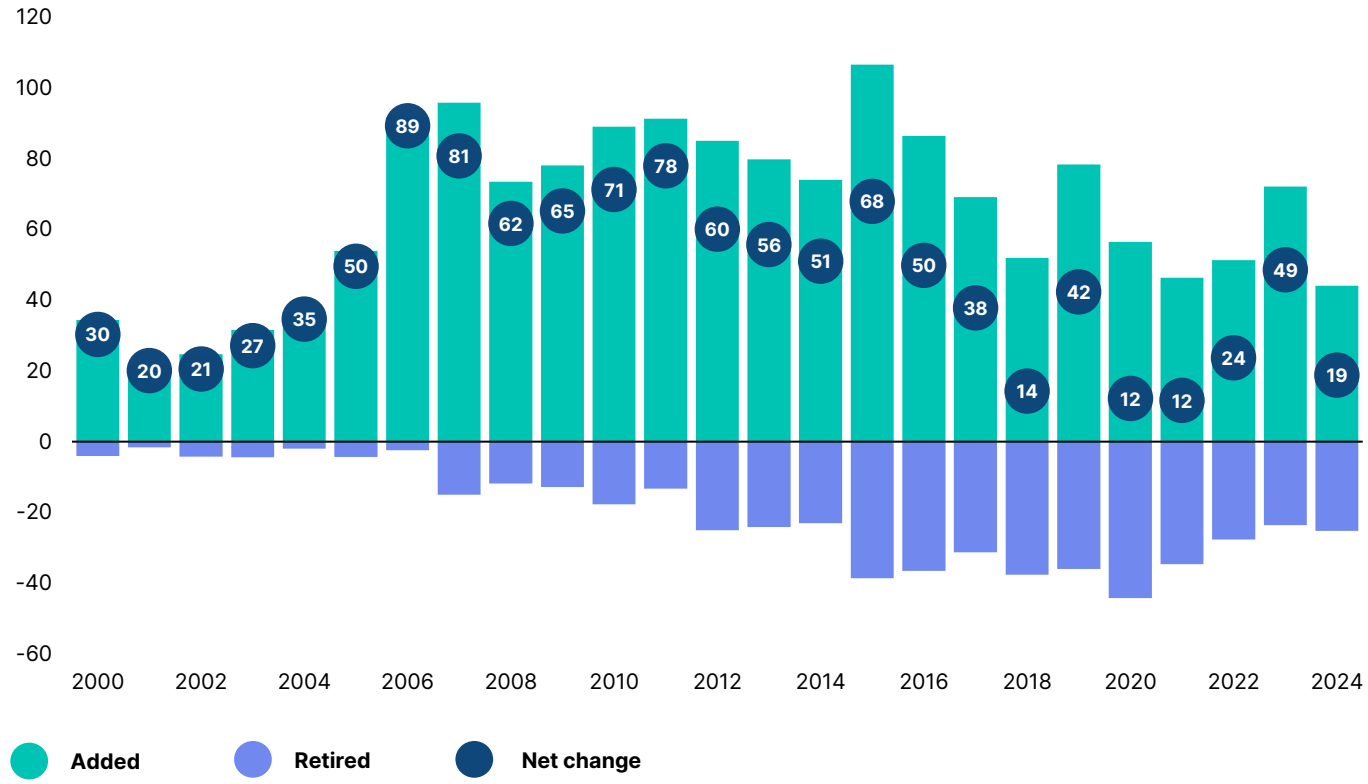


Source: MSCI ESG Research, based on data from Electricity Maps (www.electricitymaps.com) indicating most-recent 90-day average as of March 31, 2025. Note that ratios in the table do not always add up to 100% because the data contains a small share of energy sources marked as unknown. According to Electricity Maps, fossil fuels represent most of such sources.

What about coal retirement?

- Coal-fired power is the single largest contributor to global GHG emissions (about 44% of the total) and the largest source of electricity generation in the world, accounting for just over one-third (35%) of total power generation in 2024.
- New coal capacity continues to outpace the phasing out of coal. Net coal capacity worldwide has increased every year — to 19 gigawatts globally in 2024 — despite the early retirement of coal-fired power plants, country and corporate climate commitments, policy guidance, cost pressures, and the availability of alternative sources of energy.

Annual change in operating coal-fired capacity (GW)



Source: Global Energy Monitor, data as of January 2025.

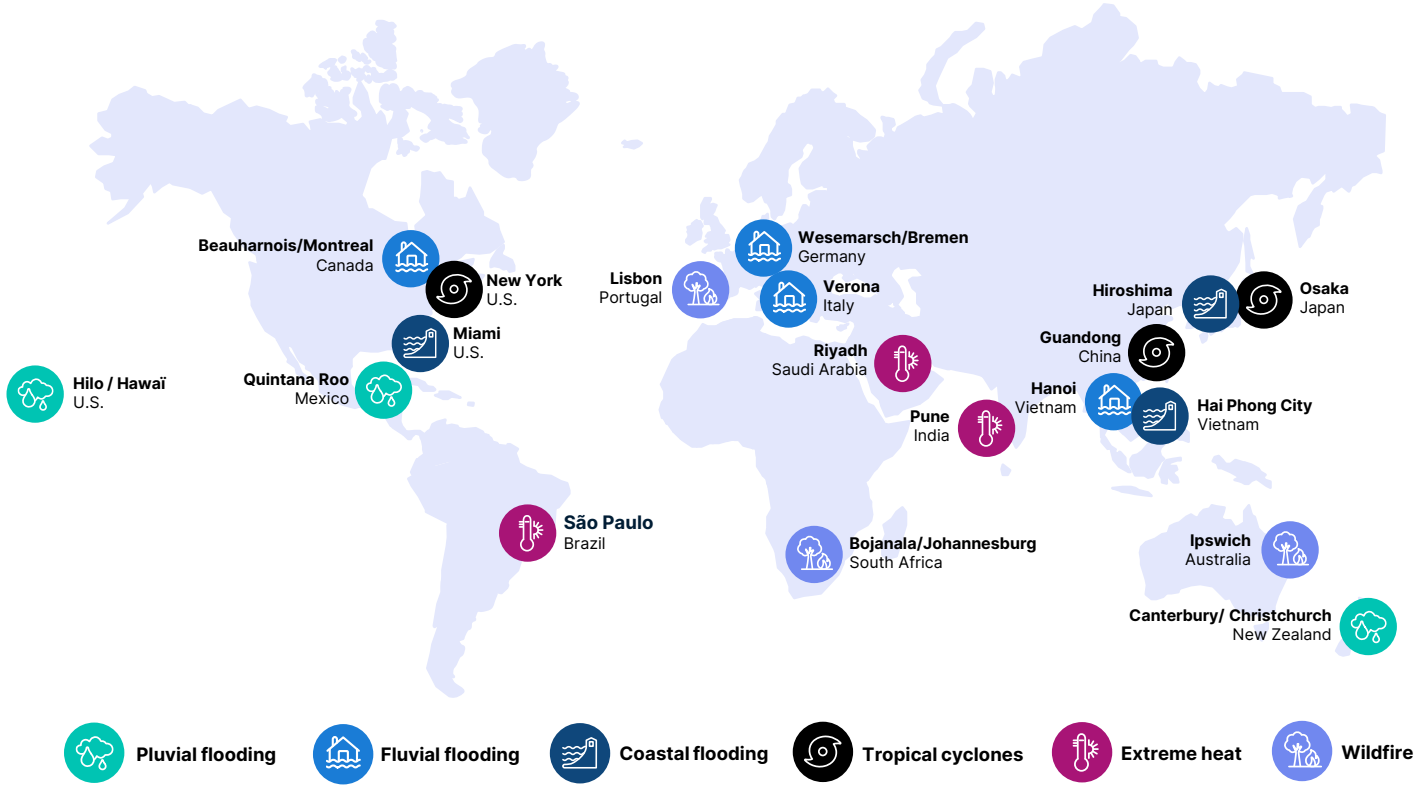
MSCI Sustainability Institute

Physical risk & nature

Coordinates of concern

- Investors overwhelmingly say that physical climate change is either having or will have a significant impact on the economy. Flooding, extreme heat, and wildfires all figure prominently among investors' concerns.
- The places shown at right represent areas where factories, warehouses, offices and other facilities belonging to listed companies are in the top quartile of exposure to the hazards identified, based on a review of more than one million asset locations globally.
- While the places shown may not all be in economic hubs, they may mark a point along a supply route, a port or agricultural region, or locus of other economic activity that can cause physical risk to surface in corporate supply chains. Where risks are in smaller cities, we name the closest metro area.

Areas of physical climate risk to facilities of listed companies

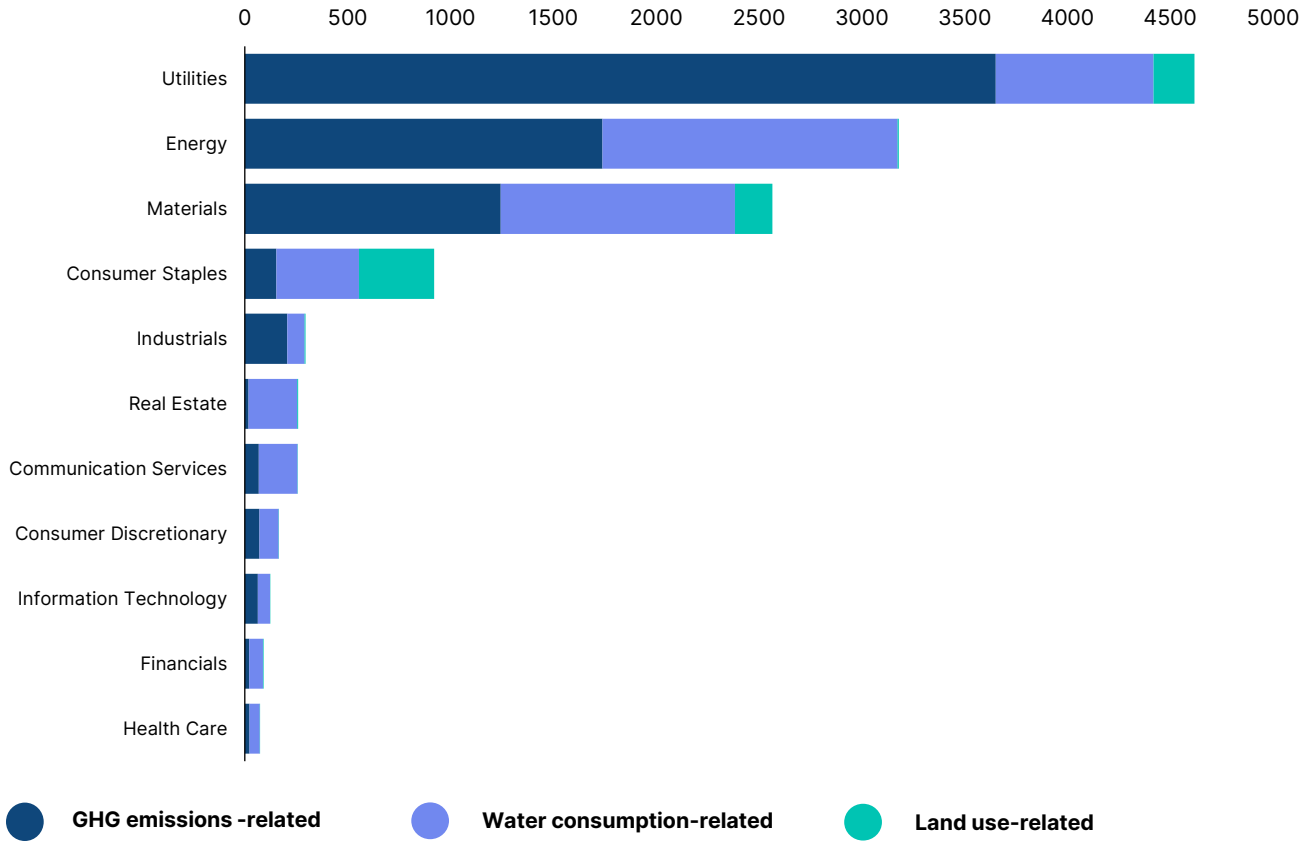


Source: MSCI ESG Research, data as of March 31, 2025, based on MSCI Geospatial Asset Intelligence. For each of the 14 physical hazards covered by MSCI Climate Risk Center's Physical Risk model, we assess the hazard exposure of over 2M corporate asset locations. The map highlights cities that exhibit exposure to physical hazards in the top quartile compared to the reference dataset (>= 75) for pluvial flooding, fluvial flooding, coastal flooding, tropical cyclones, extreme heat and wildfire.

Quantifying biodiversity loss

- Biodiversity loss exacerbates climate change by reducing nature's ability to absorb GHG emissions and degrading ecosystems that protect against extreme heat and reduce the impact of severe weather. Investors increasingly aim to assess the impacts that nature-related risks may have on their business, as well as how their business activities may be contribution to nature loss.
- The chart at right shows the potential contribution to global species extinction of the world's listed companies in 11 industry sectors based on a metric known as potentially disappeared fraction (PDF) of species. A company's PDF represents the number of species that are expected to disappear globally due to location-specific pressures (land use, GHG emissions and water consumption) on nature exerted by the company. PDF is a long-term estimation model, not an actual observation of current impacts.
- Companies in the utilities sector, for example, have an average PDF of 4,619, meaning that the current activities of the average listed utility, if extended over the next 100 years, could contribute to the extinction of over 4,600 species globally, essentially through water consumption (PDF of 768) and carbon emissions (PDF of 3,652).
- Companies in the utilities, energy and materials sectors typically contribute to global species extinction due to their carbon- and water-intensive businesses. Companies in the food and agriculture industry, part of the consumer staples sector, contribute to the high pressure on species that comes from land use.

Potential contribution to species loss (average global species loss)

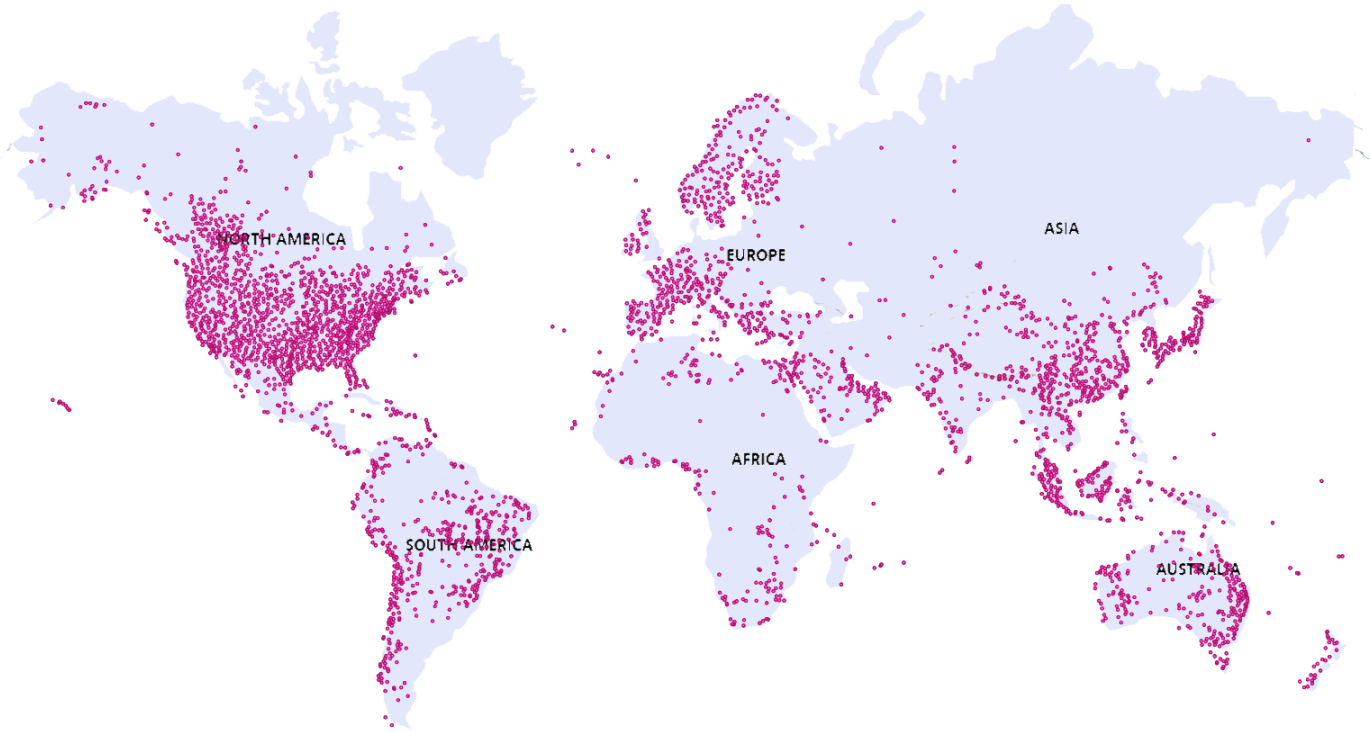


Source: MSCI ESG Research, data as of March 31, 2025.

Locating potential impacts on nature

- The impacts that economic activities have on nature are inherently local. Investors increasingly use geospatial data and tools to locate the assets of portfolio companies (think factories, warehouses or office buildings, for example), which they map to locations known to be sensitive to nature-related risks, including those in which land use and water consumption tend to have higher impacts on biodiversity.
- The map at right displays each of the more than 34,000 assets owned by listed companies that are in a biodiversity-sensitive area. Just over one-fifth (22%) of listed companies operate at least three assets in a biodiversity-sensitive area, as of March 31, 2025. (We use a threshold of three for a reasonable indication of exposure.)
- Shown globally as they are at right, the tens of thousands of assets located in biodiversity sensitive areas tend to cluster where the companies that own them are listed, hence the constellations of red dots in North America, Europe, the Asia-Pacific region and parts of Latin America. It doesn't mean an absence of sensitive areas elsewhere; simply that corporate assets tend to be located where the companies that own then are. For their part, investors would zoom in much more closely to see the possible impacts of their investments.

Listed companies' assets located in biodiversity-sensitive areas



one of 34,293 listed-company assets in a biodiversity sensitive area

Source: MSCI ESG Research, data as of March 31, 2025. Note that operations in a biodiversity-sensitive area does not, by itself, mean that a company is impacting biodiversity in that area adversely.

Key terms

Biodiversity: Short for biological diversity, is the diversity within and among species and ecosystems.

Carbon credit: A unit representing the avoidance or removal of 1 ton of CO2e, created by an activity or set of activities in relation to a counterfactual baseline that considers what emissions would be but for the activity or activities.

Carbon dioxide equivalent (C02e): Greenhouse gas emissions with the same global warming potential as 1 metric ton of carbon.

Carbon emissions revenue intensity: Greenhouse gas emissions in metric tons that a company emits to generate every USD 1 million of revenue.

Carbon engineering: Carbon credit projects that remove and store carbon dioxide emissions from the atmosphere and into materials that do not create or increase biomass carbon stocks.

Financed emissions: Greenhouse gas emissions associated with investments, loans and insurance.

GICS®: The global industry classification standard jointly developed by MSCI Inc. and S&P Global Market Intelligence. The GICS structure comprises 11 sectors, 24 industry groups, 69 industries and 158 subindustries.

Gigaton (Gt): 1 billion tons (of emissions).

Implied Temperature Rise: A forward-looking climate impact metric that estimates the increase in average global temperature that would occur this century if the economy were to overshoot or undershoot the global carbon budget by the same amount as the company or investment portfolio in question.

Megaton (Mt): 1 million tons (of emissions).

MSCI ACWI Investable Market Index: Captures large-, mid- and small-cap listed companies across 23 developed-market and 27 emerging-market countries. With 8,406 constituents, the index covers approximately 99% of the global equity investment opportunity set, as of March 31, 2025.

Nature: Includes biodiversity and the geology, water, climate and other inanimate components of Earth.

Physical risk: Represents harm to people or property that may result from severe weather, extreme heat and other climate-related events.

Remaining emissions budget: A company's future GHG emissions budget, in tons of CO2e, for limiting warming this century to 1.5°C or 2°C above preindustrial levels.

Renewable energy: The installation of new power generation capacity that uses carbon-free energy sources.

Science Based Targets initiative: A nonprofit organization established by CDP, the U.N. Global Compact, the World Resources Institute, the U.N. and the World Wildlife Foundation to assess corporate climate targets.

Scope 1 emissions: Companies' direct greenhouse gas emissions in tons of CO2e.

Scope 2 emissions: Companies' greenhouse gas emissions from electricity use in tons of C02e.

Scope 3 emissions: Companies' indirect greenhouse gas emissions in tons of CO2e from their upstream supply chain, emissions inherent in products and services or emissions from portfolio companies.

Target comprehensiveness: Percentage of companies' Scopes 1, 2 and 3 emissions covered by emissions reporting or target setting.

Transition risk: Financial risk that may result from the shift to a low-carbon economy.

Acknowledgements

This report was prepared under the direction of Linda-Eling Lee, head of the MSCI Sustainability Institute, and Sylvain Vanston of MSCI ESG Research and an Institute fellow for transition finance initiatives.

Invaluable input came from **Tanguy Séné** of MSCI's Climate Risk Center and an Institute fellow for transition finance, who developed the datasets and contributed to analysis.

The report benefited from analysis and input from:

Utkarsh Akhouri (carbon markets)
Umar Ashfaq (energy)
Nicholas Baldwin (carbon markets)
Theresa Bodner (nature finance)
David Bokern (emissions, transition finance)
Thierry Corti (nature risk)
Chris Cote (energy)
Lorenz Dolder (geospatial)
Lisa Eichler (nature and geospatial)
Kishan Gangadia (funds)
James Griffiths (targets)
Patric Kellerman (physical risk)
Arne Klug (nature risk)
Alexander Koch (nature risk)
Jamie Lambert (carbon markets)
Julius Lautz (energy)
Mathew Lee (energy)
Jascha Lehman (physical risk)
Anja Ludzuweit (regulation)
Rumi Mahmood (green finance)
Elchin Mammadov (energy)
Mehta Meghna (green bonds)
Seokhee Moon (data analysis)
Fatima Ocadiz (geospatial)
Rebeca Oprisan (geospatial)
Jamie Saunders (carbon markets)
Alexander Schober (green bonds)
Manish Shakdwipee (energy)
Katie Towey (physical risk)
Simone Ruiz Vergote (regulation)
Kenji Watanabe (targets, disclosures)
Abdulla Zaid (private capital)
William Zimmern (carbon markets)

Brian Browdie edited the report, **Mariela Martinez** and **James Wrighton** designed it, and **Caitlin Williams** managed the production.

About

About the MSCI Sustainability Institute

We're on a mission to advance knowledge, research and discovery that addresses global sustainability challenges. Our mission mirrors our belief that capital markets can and must contribute to a better future for all of us.

We aim to foster alignment of data, analysis, policy, and practice. We do this by drawing upon MSCI's experience and expertise in the investment industry to curate data and analysis, support scholarship and advance knowledge that helps practitioners, academics and policymakers fine-tune their approaches for maximum effectiveness.

For more information and to engage with us, visit msci-institute.com

About MSCI ESG Research Products and Services

MSCI ESG Research products and services are provided by MSCI ESG Research LLC, and are designed to provide in-depth research, ratings and analysis of environmental, social and governance-related business practices to companies worldwide. ESG ratings, data and analysis from MSCI ESG Research LLC. are also used in the construction of the MSCI ESG Indexes. MSCI ESG Research LLC is a Registered Investment Adviser under the Investment Advisers Act of 1940 and a subsidiary of MSCI Inc.

To learn more, please visit www.msci.com

Notice & Disclaimer

This document and all of the information contained in it, including without limitation all text, data, graphs, charts (collectively, the "Information") is the property of MSCI Inc. or its subsidiaries (collectively, "MSCI"), or MSCI's licensors, direct or indirect suppliers or any third party involved in making or compiling any Information (collectively, with MSCI, the "Information Providers") and is provided for informational purposes only. The Information may not be modified, reverse-engineered, reproduced or redisseminated in whole or in part without prior written permission from MSCI. All rights in the Information are reserved by MSCI and/or its Information Providers.

The Information may not be used to create derivative works or to verify or correct other data or information. For example (but without limitation), the Information may not be used to create indexes, databases, risk models, analytics, software, or in connection with the issuing, offering, sponsoring, managing or marketing of any securities, portfolios, financial products or other investment vehicles utilizing or based on, linked to, tracking or otherwise derived from the Information or any other MSCI data, information, products or services.

The user of the Information assumes the entire risk of any use it may make or permit to be made of the Information. NONE OF THE INFORMATION PROVIDERS MAKES ANY EXPRESS OR IMPLIED WARRANTIES OR REPRESENTATIONS WITH RESPECT TO THE INFORMATION (OR THE RESULTS TO BE OBTAINED BY THE USE THEREOF), AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EACH INFORMATION PROVIDER EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES (INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF ORIGINALITY, ACCURACY, TIMELINESS, NON-INFRINGEMENT, COMPLETENESS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY OF THE INFORMATION.

Without limiting any of the foregoing and to the maximum extent permitted by applicable law, in no event shall any Information Provider have any liability regarding any of the Information for any direct, indirect, special, punitive, consequential (including lost profits) or any other damages even if notified of the possibility of such damages. The foregoing shall not exclude or limit any liability that may not by applicable law be excluded or limited, including without limitation (as applicable), any liability for death or personal injury to the extent that such injury results from the negligence or willful default of itself, its servants, agents or sub-contractors.

Information containing any historical information, data or analysis should not be taken as an indication or guarantee of any future performance, analysis, forecast or prediction. Past performance does not guarantee future results.

The Information may include "Signals," defined as quantitative attributes or the product of methods or formulas that describe or are derived from calculations using historical data. Neither these Signals nor any description of historical data are intended to provide investment advice or a recommendation to make (or refrain from making) any investment decision or asset allocation and should not be relied upon as such. Signals are inherently backward-looking because of their use of historical data, and they are not intended to predict the future. The relevance, correlations and accuracy of Signals frequently will change materially.

The Information should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. All Information is impersonal and not tailored to the needs of any person, entity or group of persons.

None of the Information constitutes an offer to sell (or a solicitation of an offer to buy), any security, financial product or other investment vehicle or any trading strategy.

It is not possible to invest directly in an index. Exposure to an asset class or trading strategy or other category represented by an index is only available through third party investable instruments (if any) based on that index. MSCI does not issue, sponsor, endorse, market, offer, review or otherwise express any opinion regarding any fund, ETF, derivative or other security, investment, financial product or trading strategy that is based on, linked to or seeks to provide an investment return related to the performance of any MSCI index (collectively, "Index Linked Investments"). MSCI makes no assurance that any Index Linked Investments will accurately track index performance or provide positive investment returns. MSCI Inc. is not an investment adviser or fiduciary and MSCI makes no representation regarding the advisability of investing in any Index Linked Investments.

Index returns do not represent the results of actual trading of investible assets/securities. MSCI maintains and calculates indexes, but does not manage actual assets. The calculation of indexes and index returns may deviate from the stated methodology. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the index or Index Linked Investments. The imposition of these fees and charges would cause the performance of an Index Linked Investment to be different than the MSCI index performance.

The Information may contain back tested data. Back-tested performance is not actual performance, but is hypothetical. There are frequently material differences between back tested performance results and actual results subsequently achieved by any investment strategy.

Constituents of MSCI equity indexes are listed companies, which are included in or excluded from the indexes according to the application of the relevant index methodologies. Accordingly, constituents in MSCI equity indexes may include MSCI Inc., clients of MSCI or suppliers to MSCI. Inclusion of a security within an MSCI index is not a recommendation by MSCI to buy, sell, or hold such security, nor is it considered to be investment advice.

Data and information produced by various affiliates of MSCI Inc., including MSCI ESG Research LLC and Barra LLC, may be used in calculating certain MSCI indexes. More information can be found in the relevant index methodologies on www.msci.com.

MSCI receives compensation in connection with licensing its indexes to third parties. MSCI Inc.'s revenue includes fees based on assets in Index Linked Investments. Information can be found in MSCI Inc.'s company filings on the Investor Relations section of msci.com.

MSCI ESG Research LLC is a Registered Investment Adviser under the Investment Advisers Act of 1940 and a subsidiary of MSCI Inc. Neither MSCI nor any of its products or services recommends, endorses, approves or otherwise expresses any opinion regarding any issuer, securities, financial products or instruments or trading strategies and MSCI's products or services are not a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such, provided that applicable products or services from MSCI ESG Research may constitute investment advice. MSCI ESG Research materials, including materials utilized in any MSCI ESG Indexes or other products, have not been submitted to, nor received approval from, the United States Securities and Exchange Commission or any other regulatory body. MSCI ESG and climate ratings, research and data are produced by MSCI ESG Research LLC, a subsidiary of MSCI Inc. MSCI ESG Indexes, Analytics and Real Estate are products of MSCI Inc. that utilize information from MSCI ESG Research LLC. MSCI Indexes are administered by MSCI Limited (UK).

Please note that the issuers mentioned in MSCI ESG Research materials sometimes have commercial relationships with MSCI ESG Research and/or MSCI Inc. (collectively, "MSCI") and that these relationships create potential conflicts of interest. In some cases, the issuers or their affiliates purchase research or other products or services from one or more MSCI affiliates. In other cases, MSCI ESG Research rates financial products such as mutual funds or ETFs that are managed by MSCI's clients or their affiliates, or are based on MSCI Inc. Indexes. In addition, constituents in MSCI Inc. equity indexes include companies that subscribe to MSCI products or services. In some cases, MSCI clients pay fees based in whole or part on the assets they manage. MSCI ESG Research has taken a number of steps to mitigate potential conflicts of interest and safeguard the integrity and independence of its research and ratings. More information about these conflict mitigation measures is available in our Form ADV, available at https://adviserinfo.sec.gov/firm/summary/169222.

Any use of or access to products, services or information of MSCI requires a license from MSCI. MSCI, Barra, RiskMetrics, IPD and other MSCI brands and product names are the trademarks, service marks, or registered trademarks of MSCI or its subsidiaries in the United States and other jurisdictions. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and S&P Global Market Intelligence. "Global Industry Classification Standard (GICS)" is a service mark of MSCI and S&P Global Market Intelligence.

MIFID2/MIFIR notice: MSCI ESG Research LLC does not distribute or act as an intermediary for financial instruments or structured deposits, nor does it deal on its own account, provide execution services for others or manage client accounts. No MSCI ESG Research product or service supports, promotes or is intended to support or promote any such activity. MSCI ESG Research is an independent provider of ESG data.

Privacy notice: For information about how MSCI collects and uses personal data, please refer to our Privacy Notice at https://www.msci.com/privacy-pledge.

2025_05_11_v1