

Measuring Transition Risk and Climate Action in Portfolios

How to select funds and build portfolios that are better prepared for the transition to a low-carbon economy.

Morningstar Sustainalytics

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Executive Summary

Investors are recognizing the risks and opportunities arising from climate change. As more data becomes available, investors are increasingly aiming to measure transition risks in their portfolios. Understanding transition risk and the actions that companies are taking to reduce their emissions enables investors to mitigate risk and build more resilient portfolios. This applies to asset managers as well as asset owners and fund investors.

To help investors better understand transition-related risks and climate action in portfolios, Morningstar Sustainalytics has developed the Low Carbon Transition Rating (LCTR) for companies, which includes an assessment of companies’ greenhouse gas emissions management. In this report, we present the metrics and what they reveal about the transition readiness of more than 10,000 companies and 60,000 mutual funds across the global universe. We also suggest ways in which investors can incorporate these metrics into their decisions.

Key Takeaways

- ▶ No company or fund is aligned with a net zero pathway consistent with a 1.5-degree Celsius global warming scenario. Also, only 17% of companies in our research universe, and less than 3% of mutual funds and ETFs in the Morningstar database, are on a 2-degree Celsius trajectory, aligned with the Paris Agreement.
- ▶ Significant disparities exist in climate action profiles across companies and funds, highlighting the need for investors to be discerning.
- ▶ Only about 1,400 companies in our global research universe, or 14%, are taking strong action to manage their transition risk and carbon emissions, while the majority (61%) of companies are assessed as having weak management practices.
- ▶ About 18,000 mutual funds and ETFs, or 30%, exhibit strong emission management scores or preparedness for the transition to low carbon economy, while 25% have weak management scores. The better climate action profile at fund level, compared to company level, is partly due to the funds’ overall bias towards developed countries and large-cap companies.
- ▶ Europe houses the highest proportion of companies and funds managing their transition risk and emissions effectively, whereas most companies in the US and China are not taking enough action that would result in a reduction in emissions.
- ▶ Green Bond funds show the strongest emission management scores, compared to other types of climate strategies, while Climate Transition funds show relatively better net zero pathway alignment.

Introduction

This report explores the transition readiness of about 10,000 companies and more than 60,000 mutual funds and ETFs using metrics developed by Morningstar Sustainalytics as part of its Low Carbon Transition Rating (LCTR).

The metrics used in this report, for both companies and funds, include:

- ▶ Implied temperature rise (ITR) score
- ▶ Management score
- ▶ TCFD scores (by thematic area: metrics and targets, governance, strategy, risk management)
- ▶ Value at risk

The management score and four TCFD scores can advance investors' understanding of the actions that funds and their holdings are taking to manage their transition risk and reduce their carbon emissions.

In this report, we aim to provide a holistic picture of the transition readiness of companies and the global fund universe using both sector and regional breakdowns. We also offer granular insights into the climate fund universe¹ to showcase how transition risk exposure and the emission management practices of the underlying companies vary across individual climate fund types. While our findings suggest that virtually all the companies and funds in our database are, to different extents, misaligned with a net zero pathway that is consistent with a 1.5-degree Celsius global warming scenario above preindustrial levels, investors can still identify companies and funds that are relatively better positioned for the transition to a low-carbon economy than others.

What is Transition Risk?

Climate-related risks range from the increasingly evident physical effects of global warming (physical risk) to the low-carbon economic transition (transition risk) that is necessary to mitigate the worst effects of global warming. Transition risk addresses how vulnerable a company is to the transition away from a fossil-fuel-based economy to a lower-carbon economy. Such a transition is required to meet the goals of the Paris Agreement: 1) to keep the global temperature rise this century well below 2 degrees Celsius above preindustrial levels; and 2) to pursue efforts to limit the rise in temperature to 1.5 degrees Celsius.

Specific transition risks include policy and legal regulations limiting carbon emissions, pressure on firms to align their strategies with the Paris Agreement's 2 degrees Celsius scenario, switching costs to new technologies, and changing consumer preferences.

¹ [Investing in Times of Climate Change - A Global View | Morningstar](#)

Exhibit 1 Transition Risks

Type	Climate-Related Risks	Potential Financial Impacts
Transition	Policy and Legal	
	<ul style="list-style-type: none"> ▶ Increased pricing of GHG emissions ▶ Enhanced emissions-reporting obligations ▶ Regulation of existing products and services ▶ Exposure to litigation 	<ul style="list-style-type: none"> ▶ Increased operating costs ▶ Write-offs and asset impairment ▶ Increased costs/reduced demand for products and services ▶ Fines and judgments
	Technology	
	<ul style="list-style-type: none"> ▶ Substitution of existing products and services with lower emissions options ▶ Unsuccessful investment in new technologies ▶ Costs to transition to lower emissions technology 	<ul style="list-style-type: none"> ▶ Write-offs and early retirement of existing assets ▶ Reduced demand for products and services ▶ Research & development expenditures and capital investments in new and alternative technologies
	Market	
	<ul style="list-style-type: none"> ▶ Changing customer behavior ▶ Uncertainty in market signals ▶ Increased cost of raw materials 	<ul style="list-style-type: none"> ▶ Reduced demand for products and services ▶ Increased production costs due to changing input prices (e.g., energy, water) and output requirements (e.g., waste treatment) ▶ Abrupt, unexpected shifts in energy costs ▶ Decreased revenues ▶ Re-pricing of assets (e.g., fossil-fuel reserves, land valuations, securities valuations)
	Reputation	
	<ul style="list-style-type: none"> ▶ Shifts in consumer preferences ▶ Stigmatization of sector ▶ Increased stakeholder concern or negative stakeholder feedback 	<ul style="list-style-type: none"> ▶ Reduced revenue from decreased demand ▶ Reduced revenue from decreased production capacity (e.g., delayed planning approvals, supply chain interruptions) ▶ Reduced revenue from negative impacts on workforce management and planning (e.g., employee attraction and retention) ▶ Reduction in capital availability

Source: TCFD, Final Report, Recommendations of the Task Force on Climate-Related Financial Disclosures, p. 10, <https://www.fsb-tcf.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf>

Although understanding both physical risk and transition risk is important, investors are increasingly aiming to measure transition risk in their portfolios. Global reporting frameworks provided by organizations such as the [Task Force on Climate-Related Financial Disclosures \(TCFD\)](#) and the [International Sustainability Standards Board \(ISSB\)](#) recommend that asset managers and asset owners report on the carbon emissions, physical risks, and transition risks associated with their portfolios. These disclosures are viewed as a step toward the development of helpful climate-related risk metrics.

Using Portfolio LCTR Metrics

Fund investors can use LCTR datapoints in several ways. The scores can be used to set a baseline for ongoing monitoring of the transition risk exposure and emission management of an investor's portfolio holdings. Portfolio scores can be compared with category averages and benchmarks to determine whether funds are above or below the category average or benchmark exposure. Portfolio implied temperature rise, management and TCFD scores can be used to identify and evaluate lower transition risk alternatives or funds that invest in companies that better manage their emissions, allowing fund investors to lower overall climate risk in their portfolios.

For asset managers, portfolio transition metrics can be used to set a baseline for ongoing monitoring of their funds' transition risk exposures. Asset managers can also use management and TCFD scores to identify companies in high emitting sectors that are taking the right steps to reduce their emissions,

even if their current trajectories are not aligned to net zero. Managers that have or are considering carbon-reduction targets can use the portfolio scores over time to evaluate their progress. Moreover, the portfolio scores give asset managers an ongoing comparison with their peers and with benchmarks. Finally, asset managers can also use the portfolio scores to communicate with interested stakeholders about transition risk and any efforts they are making to reduce that risk.

The Low Carbon Transition Rating

The LCTR for Companies

The Low Carbon Transition Rating^{2,3}, or LCTR, is a science-based and forward-looking assessment of a company's current alignment to a net zero pathway that limits global warming to 1.5°C above preindustrial levels. It is based on the principle that each company is expected to limit its fair share budget of emissions. A company's LCTR is expressed as an Implied Temperature Rise, or ITR, that indicates how close a company is to operating within its net zero (1.5°C) budget. It also signifies the expected level of global warming if the global economy had the same proportion of emissions misaligned to the net zero budget of the company. Within the LCTR, the ITR is a performance-based signal that assesses a company's emissions trajectories based on both the strength of its targets as well as the quality of its management's actions and investments. This is in contrast to an ambition-based ITR, which assumes companies will meet their stated targets.

The LCTR leverages a two-dimensional framework that measures a company's exposure from its expected emissions, while also accounting for management actions. These ratings assess companies' progress toward their stated net zero commitments by evaluating the quality and ambition of their GHG reduction targets, as well as any demonstrated short-term investment plans, policies and programs, such as a Climate Transition Resilience Program, Product Decarbonization Strategy and GHG Emissions Reduction Policy (see Exhibit 2).

2 Morningstar Sustainalytics Research. 2023. "Morningstar Low Carbon Transition Rating Methodology."

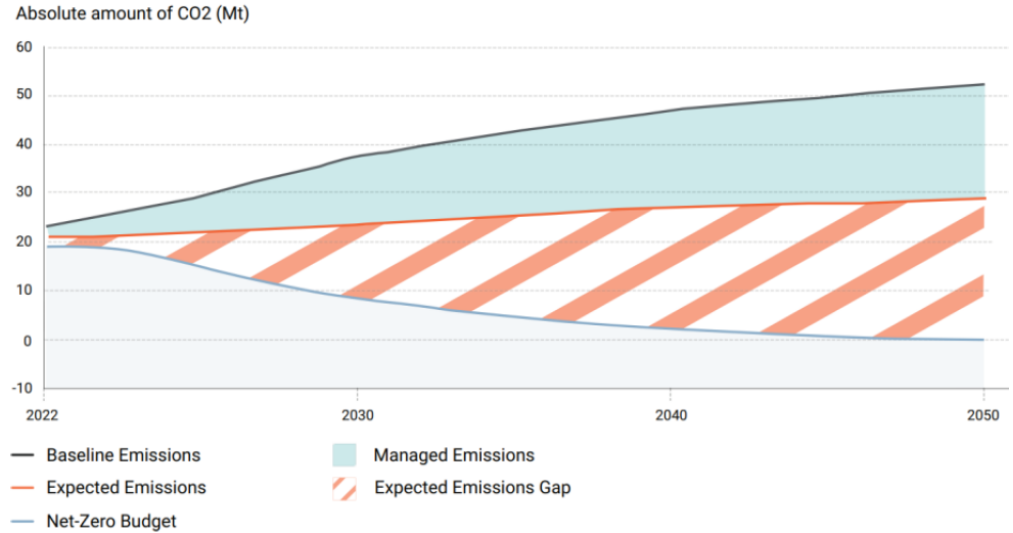
<https://connect.sustainalytics.com/hubfs/INV/Climate%20Solutions/Low%20Carbon%20Transition%20Ratings/Sustainalytics%20-%20Low%20Carbon%20Transition%20Rating%20-%20Methodology%20Abstract.pdf>

Sustainalytics evaluates each company's "fair share" budget for greenhouse gas emissions based on the company's business model and where it operates. Some companies face inherently greater exposure to carbon risk by nature of their industry or subindustry, while some types of operations (that is, coal companies) are deemed incompatible with a net zero scenario.

For more details, see Joshi, P. 2023. "A New Tool at the Table: Understanding Low Carbon Transition Risk by Industry and How Companies Are Managing It." Morningstar.

3 <https://www.sustainalytics.com/esg-research/resource/investors-esg-blog/beyond-1.5-degrees--what-the-lctr-tells-us-about-companies-managing-their-climate-risk>

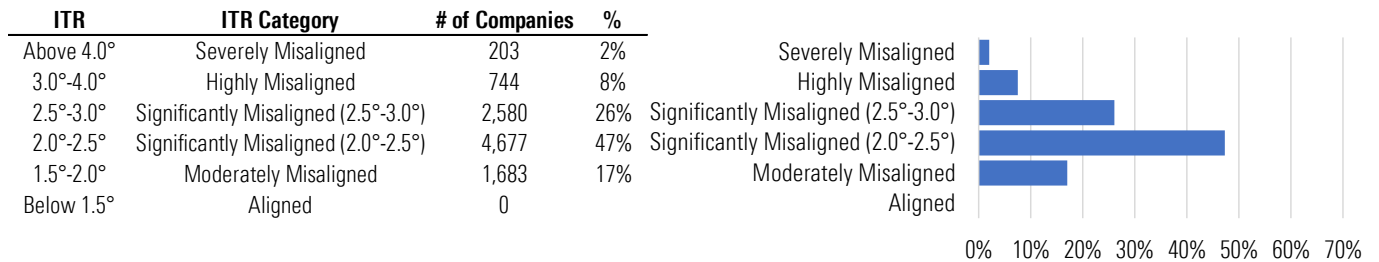
Exhibit 2 The LCTR Assesses Expected and Managed GHG Emissions



Source: Morningstar Sustainability.

The LCTR assigns companies one of five ratings, ranging from Aligned for companies with an ITR of 1.5°C or less to Severely Misaligned for companies with an ITR above 4°C⁴. Currently, no company is aligned with a 1.5°C global warming scenario, as shown in Exhibit 3. Meanwhile, nearly three-quarters (73%) of companies are Significantly Misaligned. However, the largest proportion of those (47% of the overall sample), have ITRs between 2°C and 2.5°C, while 17% of companies are only Moderately Misaligned, with ITRs between 1.5°C and 2°C. This finding suggests that nearly two-thirds of companies are either already aligned or not that far from aligning with the goal of the Paris Agreement of limiting global warming below 2°C.

Exhibit 3 LCTR Distribution Across the Global Universe of Companies



Source: Morningstar Sustainability. Data as of August 2024. Based on 9,887 companies. Companies with an ITR of 1.5°C or less are categorized as Aligned with the net zero target. Companies with an ITR between 1.5°C and 2°C are considered Moderately Misaligned, while those with an ITR between 2°C and 3°C are Significantly Misaligned. Companies between 3°C and 4°C are Highly Misaligned and those above 4°C are Severely Misaligned

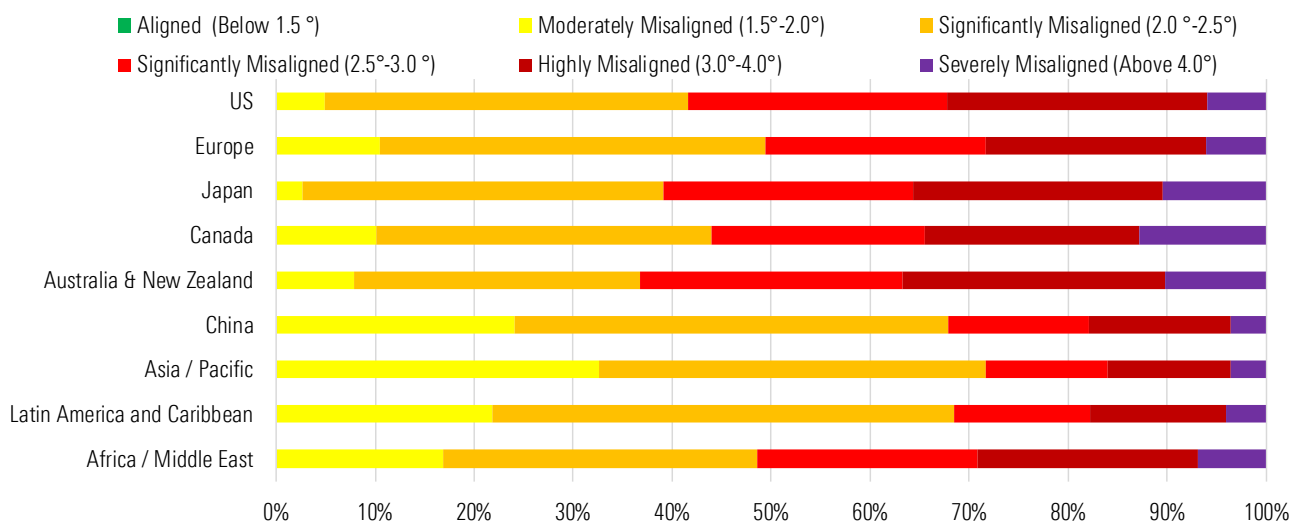
⁴ Morningstar, "Low Carbon Transition Rating paints a dour picture but can be a helpful tool for investors", at: <https://www.morningstar.com/sustainable-investing/low-carbon-transition-rating-paints-dour-picture-can-be-helpful-tool-investors>

The exhibit below, which breaks down the LCTR categories by geography, shows that developed countries tend to have a larger share of companies that are Significantly, Highly or Severely Misaligned to a net zero pathway compared with developing countries. The ITR leverages the Inevitable Policy Response Required Policy Scenario (IPR RPS) that the net zero budget companies are measured against. In this scenario, as in other net zero scenarios developed by organizations such as the [International Energy Agency \(IEA\)](#) and the [Network for Greening the Financial System \(NGFS\)](#), developed markets are allocated a greater portion of the required decarbonization (smaller carbon budgets), while emerging markets are allocated a longer runway to decarbonize (larger carbon budgets).

There are several drivers for this. First, under the principle of [Common But Differentiated Responsibilities and Respective Capabilities \(CBDR-RC\)](#) outlined in the United Nations Framework Convention on Climate Change (UNFCCC), countries have different duties and abilities to address the negative impacts of climate change. Developed countries’ historical use of fossil fuels (for example, during the Industrial Revolution) has enabled them to accumulate higher national wealth, providing more resources to now decarbonize. Conversely, developing nations have not historically contributed significantly to the amount of carbon in the atmosphere, and they are less well positioned to deploy capital investments to decarbonize.

Within developed markets, Europe houses the highest proportion of companies (almost 50%) that are only Moderately Misaligned, or with ITRs below 2.5°C. By comparison, the US and Japan house 41% and 39% of such companies, respectively. This is, as we show later in the report, partly due to the strong actions taken by European companies to manage their transition risks and emissions. Meanwhile, China and Latin America have 68% and 69% of these companies, respectively.

Exhibit 4 ITR Categories Across Global Regions



Source: Morningstar Sustainability. Data as of August 2024. Based on 9,887 companies with available LCTR datapoints.

The Low Carbon Transition Rating for Funds

In this section, we look at the distribution of fund-level ITRs to assess the choices available to investors. A fund's ITR is the asset-weighted average of ITRs of its holdings. A fund with a low ITR holds companies better aligned with a net zero pathway than a fund with a higher ITR.

As the exhibit below shows, only 2.3% of open-end funds and ETFs in Morningstar's database have ITRs below 2.0°C and are therefore Moderately Misaligned. This is a much lower proportion than the 17% of companies we found in the Moderately Misaligned category (see previous section). This could be explained by the fact that while a majority of funds in the global fund universe diversify across geographies, sector, and size, they are typically biased towards larger companies in developed markets. As shown earlier, most of these companies have ITRs above 2.0°C. Companies with ITRs below 2.0°C represent a much smaller share of fund portfolios.

The low percentage of Moderately Misaligned funds suggests that much work remains to be done for fund managers to achieve portfolios that are at least aligned with the under 2°C pledge. It is a challenging goal for managers, as they are constrained by their fiduciary duty and investment mandates. Portfolio managers are forced to prioritize financial performance over sustainability performance.

Exhibit 5 LCTR Distribution Across the Global Universe of ETFs, Open End Funds, and Closed End Funds



Source: Morningstar Direct. Data as of August 2024. Based on 56,634 ETFs and open-end funds, as well as 3,700 closed-end funds. Funds with an ITR of 1.5°C or less are categorized as Aligned with the net zero target. Funds with an ITR between 1.5°C and 2°C are considered Moderately Misaligned, while those with an ITR between 2°C and 3°C are Significantly Misaligned. Funds between 3°C and 4°C are Highly Misaligned and those above 4°C are Severely Misaligned.

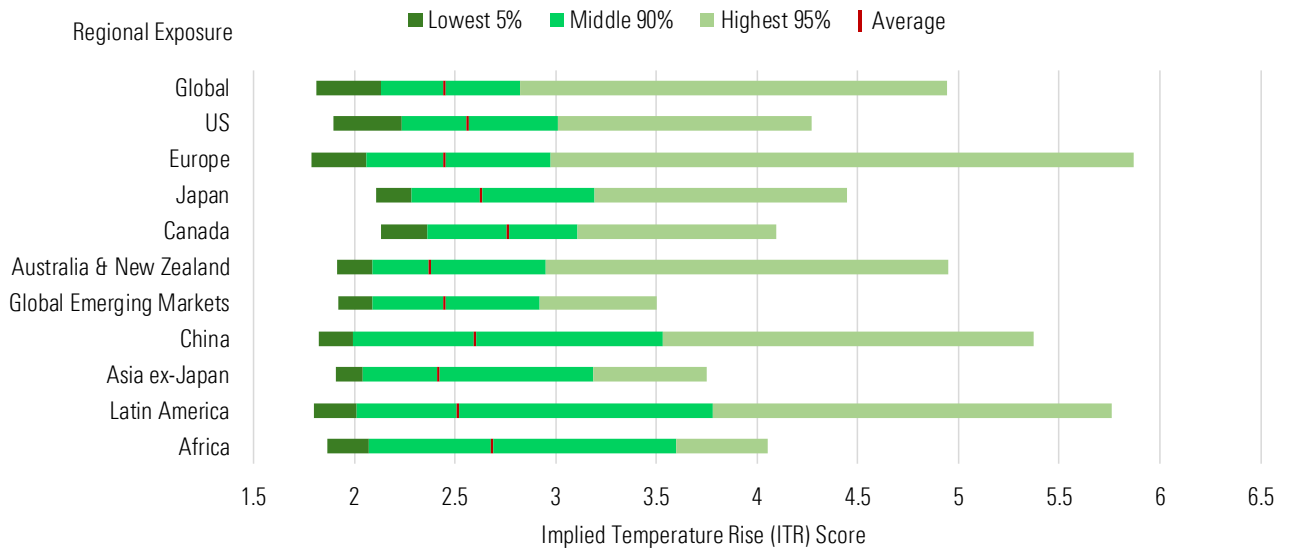
Currently, 90% of open-end funds and ETFs in Morningstar's database fund universe are Significantly Misaligned. However, 60% feature in the lower band of that category and have ITR scores between 2.0°C and 2.5°C. This result suggests that the majority of the funds in the global fund universe are on or close to the 2°C Paris Agreement-alignment trajectory. Meanwhile, Highly and Severely Misaligned funds make up 7.4% of the fund universe, compared with almost 10% of companies under Sustainalytics' coverage.

While the fund universe exhibits a narrower distribution of ITRs than our universe of covered companies, we still find significant disparities between funds across geographic exposures and within geographies.

With the exception of funds that have exposure to Europe and Australia & New Zealand, which exhibit average ITRs of 2.4°C, developed market funds tend to display higher average ITRs than developing markets. For example, US and Japan funds have average ITRs of 2.6°C and 2.7°C, respectively, while Canada exhibits the highest average ITR score of 2.8°C. Meanwhile, Global Emerging Markets funds and Asia ex-Japan funds have ITRs averaging 2.4°C. This can be explained, as previously mentioned, by the fact that developed countries, which are responsible for most of the carbon in the atmosphere and should decarbonize their economies faster than developing countries, are allocated lower carbon budgets than developing nations. Investors should also be mindful of the wide range of ITR scores within geographic exposure. For example, European funds exhibit a long-tailed dispersion of ITR scores tilted by several significant outliers at the high end.

Companies from most developing economies enjoy more generous carbon emission budgets, leading to smaller shares of Highly and Severely Misaligned ITR. The only exception is Africa and the Middle East, where Highly and Severely Misaligned businesses make up a notable proportion, given the region’s sizable energy sector.

Exhibit 6 ITR Scores Across Global Regions



Source: Morningstar Direct. Data as of August 2024. Based on 19,954 funds with available LCTR datapoints.

Assessing Climate Action

Management Score for Companies

The LCTR is different from other implied temperature rise ratings in that it is a performance ITR and is designed to assess the actions companies are taking to reduce emissions, not just their stated targets (including those set with the Science Based Targets initiative, or SBTi⁵). The LCTR also provides multiple signals that investors can leverage in their decision-making process.

One such signal is the management score, which indicates the strength of a company's management system in managing its exposure to the low carbon transition across all scopes. As of the time of writing this report, close to 10,000 companies under Sustainalytics' coverage have a score ranging from Very Weak to Very Strong. This assessment is based on a pool of over 85 indicators, including ones evaluating companies' use of an internal carbon price program to support customers' reduction of energy or water consumption, and management incentives to reduce emissions^{6,7}. Each company, on average, is covered by 20 to 30 individual indicators. Each indicator is scored based on detailed assessment criteria, which give each company a set of raw indicator scores from 0 (weak) to 100 (strong). These raw indicator scores are then weighted according to the relative subindustry weightings and distribution of emissions by scope for that individual company.

The management score is also used to calculate the ITR, to adjust the company's projected baseline emissions according to its management strength.⁸ A management score above 50 suggests that expected emissions will be lower than the baseline emissions, while a management score below 50 indicates that expected emissions will be higher than baseline emissions.

About one-quarter (24%) of companies across our global research universe of roughly 10,000 have a management score higher than 50, meaning that these companies are expected to reduce their baseline emissions. Among these, only 14% are assessed as having Strong management scores (above 55). The majority (61%) of the companies in our coverage universe are assessed as having Weak management scores (below 45), meaning that these companies are not taking enough action to manage their transition risks and reduce their emissions.

⁵ Ambitious corporate climate action - Science Based Targets Initiative

⁶ GHG emissions targets – An assessment of the company's GHG reduction targets and the extent to which they are aligned with net zero scenarios.

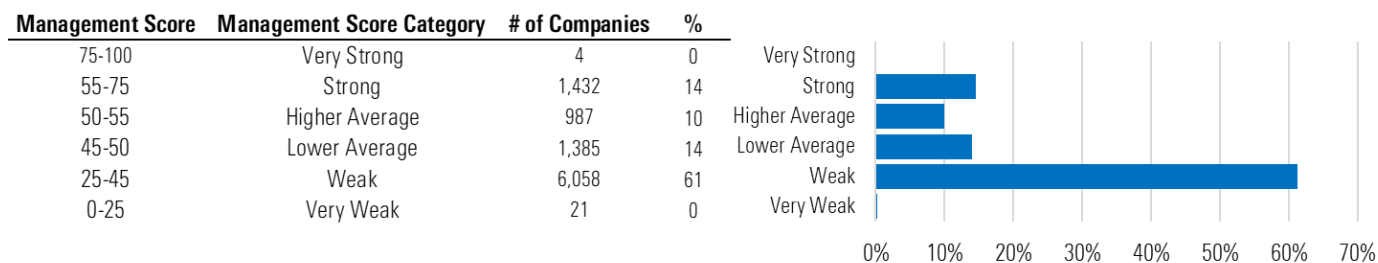
Carbon price integration – An assessment of the extent to which companies integrate carbon prices in strategic planning.

GHG performance incentive plan – An assessment of whether management incentives are linked with the achievement of emissions reduction plans.

⁷ Six Best Practices Followed by Industries Leading the Low Carbon Transition

⁸ The starting point of the adjustment is a management score, ranging between 0 and 100. The management scores reflect the difference between baseline GHG emissions and expected GHG emissions, with the following logic:

- A score of 50 implies that the company's cumulative expected emissions will be equal to its cumulative baseline expected emissions.
- If the management score is higher than 50, each point above 50 equates to a 2% reduction in cumulative expected GHG emissions as compared to cumulative baseline GHG emissions.
- Likewise, if the management score is lower than 50, each point below 50 equates to a 2% increase in cumulative expected GHG emissions as compared to cumulative baseline GHG emissions. According to this calculation, a company that is expected to manage all its baseline emissions will have a management score of 100 and a company that is expected to double its baseline emissions will have a management score of 0. Projected emissions are calculated for each scope—scope 1, scope 2, scope 3 upstream, and scope 3 downstream—by region for each company and combined to give an overall projection.

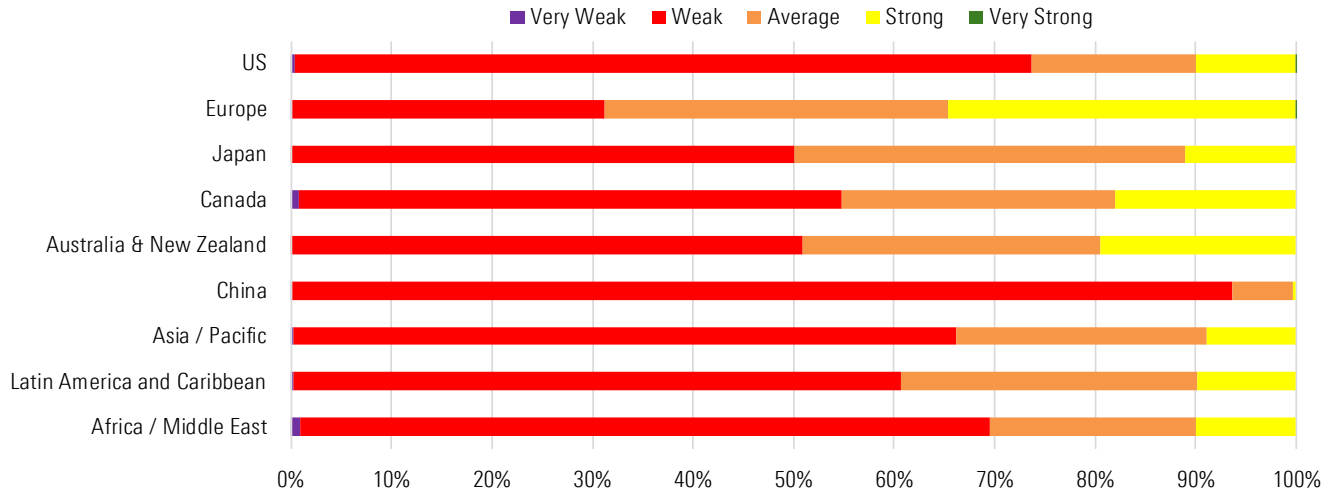
Exhibit 7 Management Score Distribution Across the Global Universe of Companies

Source: Morningstar Sustainalytics. Data as of August 2024. Based on 9,887 companies. The management score is on a scale from 0 to 100, with a higher score indicating stronger management preparedness for transition to low-carbon economy. Companies with management scores under 25 are categorized as Very Weak. Companies between 25 and 45 are categorized as Weak. Companies between 45 and 55 are categorized as Average. Companies between 55 and 75 are categorized as Very Weak. Companies over 75 are categorized as Very Strong.

Yet, looking at management scores, investors can still find companies in every geography and sector that are managing transition risks and preparing to reduce carbon emissions better than their peers. The three following exhibits highlight the variation in management scores across geographies and sectors, as well as the often-considerable variation within sectors and geographies. While the scores allow investors to compare climate action across sectors and geographies, they also allow for intragroup comparisons for investors interested in best-in-class analysis.

On a geographic level, unsurprisingly, Europe is home to the highest proportion of companies (35%) managing their transition risk in an above-average manner (i.e. with a management score over 55). Meanwhile, the vast majority of companies in China are far from taking enough action to reduce their carbon emissions, as evidenced by the very high percentage (more than 93%) of covered companies exhibiting weak management scores. The US does not fare well either, with 73% of the companies there assessed as having weak management scores.

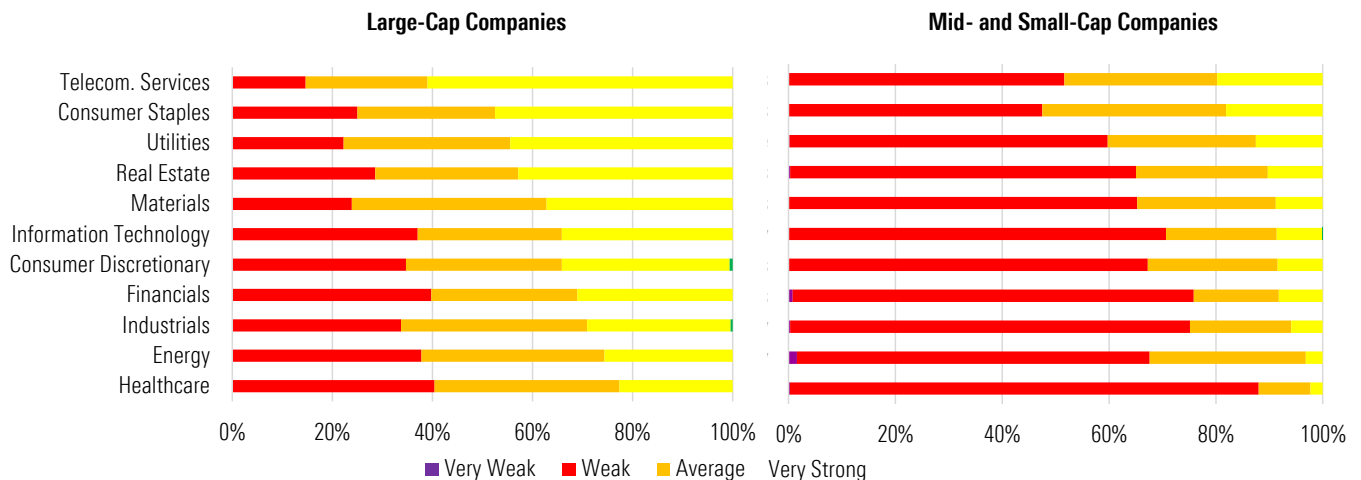
Exhibit 8 Company Management Scores by Geography



Source: Morningstar Sustainability. Data as of August 2024. Based on 9,887 companies covered by Management Score datapoints.

On a sector level, there are also wide dispersions. Telecoms Services, Consumer Staples and Utilities are the sectors with the highest proportion of companies with strong management scores. Companies in these sectors have come the furthest in terms of identifying and managing material climate risks. However, at the other end of the spectrum, only 6% of Healthcare companies are considered to be taking strong action to reduce their transition risks and carbon emissions. Even worse, close to 80% of companies in that sector have weak management practices. Companies with weak management scores are assessed as not managing their material transition risks. One example of this result is a company with high scope 3 emissions setting reduction targets only for scope 2 emissions and not taking steps to work with its tier 1 suppliers on decarbonization efforts.

Exhibit 9 Management Scores by Sector for Large-Cap Companies and for Mid- and Small-Cap Companies



Source: Morningstar Sustainability. Data as of August 2024. Based on 1,648 companies with market capitalization of over USD 10 billion and 7,257 companies with market capitalization of under USD 10 billion and covered by the GHG Emission Management Score metric.

Having said that, despite the strong management performance of some companies in high-scoring sectors, the data suggests that many others still have room to improve. Within each sector, we find a strong size bias. For example, in the Telecommunications industry, more than 60% of large companies take strong climate action, while only 19% of mid- and small-cap companies in that sector boast similarly strong management quality. Large-cap companies are inevitably subject to greater scrutiny by investors, regulators, and the public. This encourages more resources and efforts to be spent on GHG emission mitigation and disclosure, leading to a higher representation of companies with Strong management capacities across all sectors.

On average, across all sectors, 37% of large-cap companies have Strong management scores, compared to less than 10% for small and mid-cap companies.

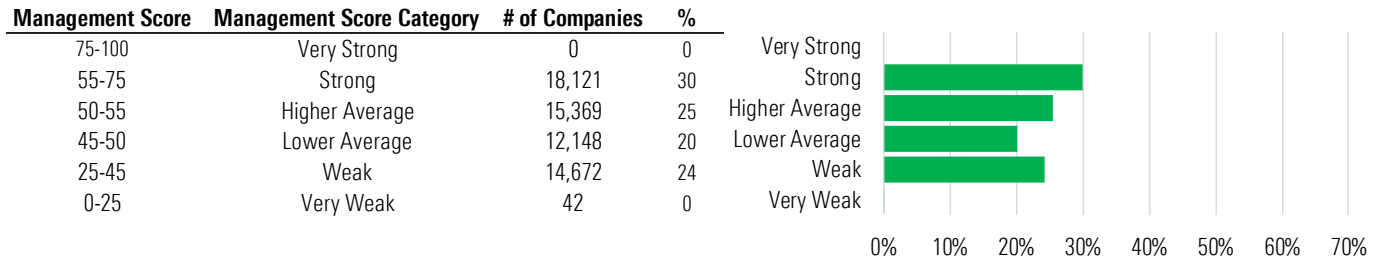
Management Score for Funds

A fund's portfolio management score is calculated as the asset-weighted average of the covered holdings' management scores within the portfolio. A fund with a higher management score invests in companies that are taking more action to reduce their carbon emissions than a fund with a lower management score.

Portfolio management scores – calculated monthly based on the most recent portfolios in Morningstar's database – can be used to compare funds with each other, with their Morningstar category average, and with their benchmarks. Because funds receive management scores on a monthly basis going forward, it is also possible to evaluate change over time and the extent to which fund managers are addressing transition risk within their portfolios.

Looking at the exhibit below, we find that the distribution of management scores across funds looks significantly different from that of companies we saw in Exhibit 7. The largest proportion of funds (30%) have Strong management scores, double the share of companies (14%) that fit into that category. On the flip side, just shy of 25% of funds have Weak management quality, compared with 61% for companies. This difference can be explained, as previously mentioned, by the fact that a majority of funds in the global fund universe diversify across geographies, sector, and size, but typically are biased towards larger companies in developed markets, the majority of which tend to have better management practices than smaller companies and companies in emerging markets. The latter represent a much smaller share of fund portfolios.

Exhibit 10 Portfolio Management Scores

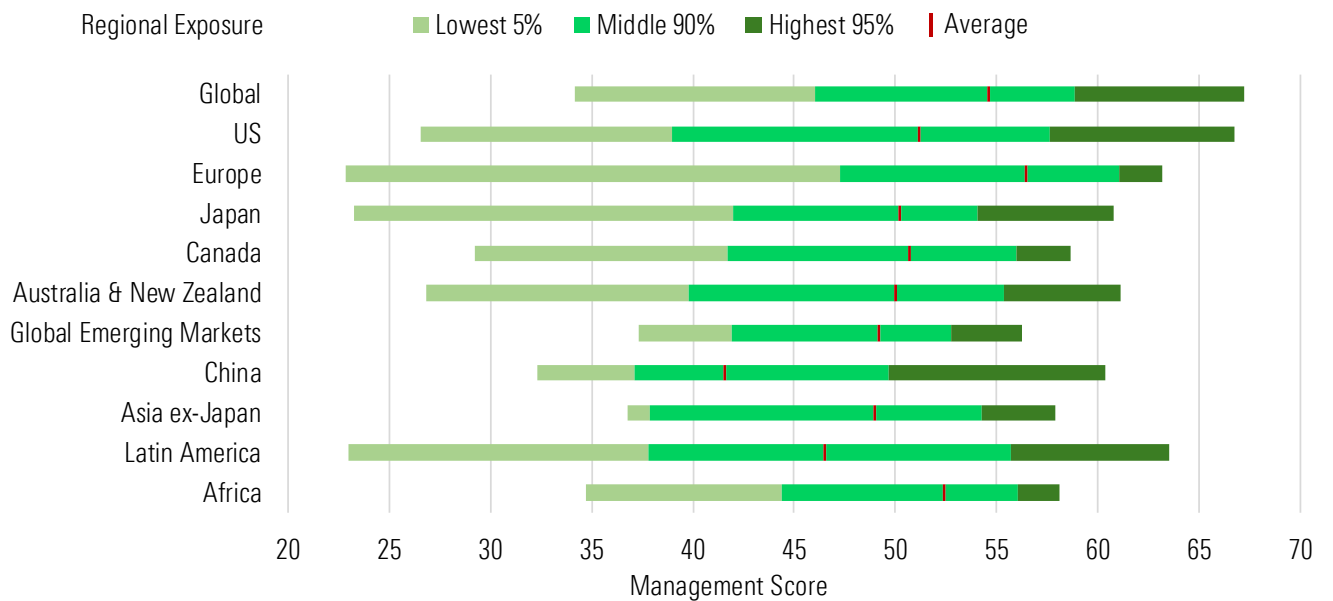


Source: Morningstar Direct. Data as of August 2024. Based on 56,754 ETFs and open-end funds, as well as 3,768 closed-end funds with available Portfolio Greenhouse Gas Emission Management Score All Scores data point.

The exhibit below shows the average management scores across a range of Morningstar global investment categories. Diversification helps keep the average fund’s management score in the Average category (between 45 and 55), while the average European equity funds lands in the Strong management category, with a score of 56, and the average Chinese equity fund exhibits a Weak management score of 42. Diversified global equity portfolios that invest primarily in developed market equity have an average management score of almost 55.

Latin America exhibits a long-tailed dispersion of management scores, dragged by several significant outliers at the lower end. This leads to a lower average management score of 46, compared to 49 for peers in both Global Emerging Markets and Asia ex-Japan.

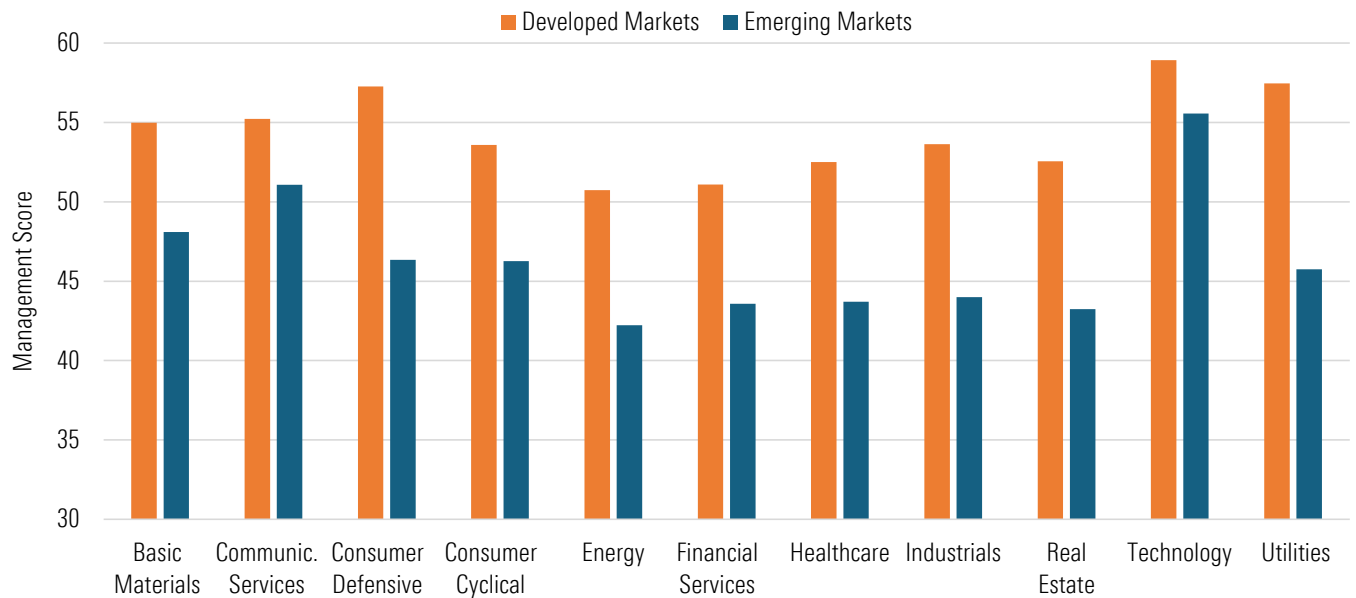
Exhibit 11 Management Scores Across Global Regions



Source: Morningstar Direct. Data as of August 2024. Based on 19,954 funds from 11 Morningstar’s global categories with available Portfolio Greenhouse Gas Emission Management Score All Scores data point.

The exhibit below shows the management scores of various sectors using Morningstar sector indexes, split into developed markets and emerging markets. While the score allows investors to make management quality comparisons across sectors, it also allows for intragroup comparisons for investors interested in best-in-class analysis. Overall, we see a notable gap in transition risk and emission management capacities between developed and developing economies across almost all sectors.

Exhibit 12 Management Scores Across Morningstar Sector Indexes



Source: Morningstar Direct. Morningstar Indexes. Data as of August 2024.

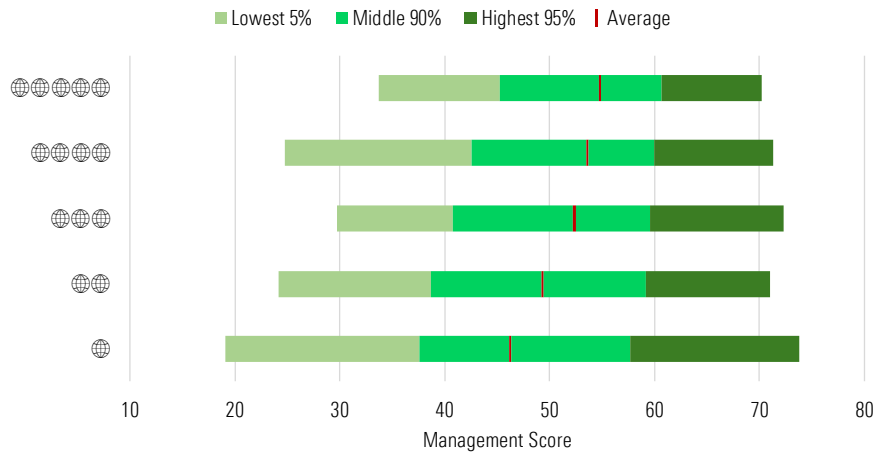
It is worth noting that this exhibit shows different results from Exhibit 12. Because they are market cap weighted, sector indexes’ overall scores are biased towards their largest constituents. Looking at developed markets, we see that most sector indexes have Average to Strong management scores, ranging between 50 and 60. The highest scores are registered by the Technology (59), Utilities (58) and Consumer Defensive (57) sectors, while the lowest are exhibited by Energy (51) and Financial Services (51). In emerging markets, indexes with exposure to the Financial Services and Real Estate sectors have the lowest scores.

Morningstar Sustainability Rating for Funds

Using the Morningstar Sustainability Rating for funds, which is a peer group relative measure of ESG risk, we find that funds earning a High (five globes) sustainability rating tend to hold companies that are managing their transition risk better than funds that have lower sustainability ratings. This is evidenced by the higher average management score of 56, compared with scores of 54 and 53 for funds that have Above Average (four globes) and Average (three globes) sustainability ratings, respectively.

This somewhat positive correlation between emission management and ESG risk makes sense. A company that manages its overall ESG risk well should also have the right governance, policies, programs, and investments in place that will help it transition better to a low-carbon world.

Exhibit 13 Management Scores Across Morningstar Sustainability Ratings for Funds



Source: Morningstar Direct. Data as of August 2024. Based on 45,669 funds covered by Morningstar Sustainability Rating and Portfolio Greenhouse Emission Management Score All Scopes data points.

Value at Risk

The Low Carbon Transition Value at Risk (LCT-VaR) is a signal that demonstrates the potential loss in value that an issuer may experience due to the risk posed by the transition to a low carbon economy between now and 2050. LCT-VaR considers the most material transition risks to generate a dollar value impact that shows the potential value impact of not transitioning to a low carbon economy. It is based on both the future projected carbon pricing impact on expected emissions, and for companies in the Oil & Gas sector, the impact of changes in market demand. Thus, the LCT-VaR provides a forward-looking metric that demonstrates how such transition risk may impact the future value of a company⁹.

While many companies with high ITRs (high misalignment to net zero) also have a high LCT-VaR, it is also possible that some companies have a high ITR with a relatively low LCT-VaR. This may be due to the scale of a company’s emissions. A company with high relative misalignment, but low absolute amounts of emissions, may have a lower LCT-VaR due to it producing fewer excess emissions. It can also be due to the nuances of different carbon pricing schemes in different regions. The regions in which a company operates are crucial, as some areas have stricter pricing schemes that are likely to continue, whereas other regions have few to no carbon pricing schemes. Additionally, companies with strong financials might face less risk, as they can better absorb the costs associated with policy changes.

Value at Risk for Funds

⁹ The LCT-VaR is calculated across three different transition pathways - the Inevitable Policy Response Required Policy Scenario (IPR RPS), Inevitable Policy Response Forecast Policy Scenario (IPR FPS), and the International Energy Agency Net Zero by 2050 (IEA NZE). IPR RPS and IEA NZE represent "orderly" transition scenarios that assume governments will introduce ambitious climate policies immediately and gradually to meet the goals of a global temperature rise of less than 1.5°C. The IPR FPS represents a "disorderly" transition scenario that assumes government climate policies will be uncoordinated and delayed, leading to a more chaotic policy environment. The assumptions in the IPR FPS are likely to lead to a global temperature rise of around 1.8 °C.

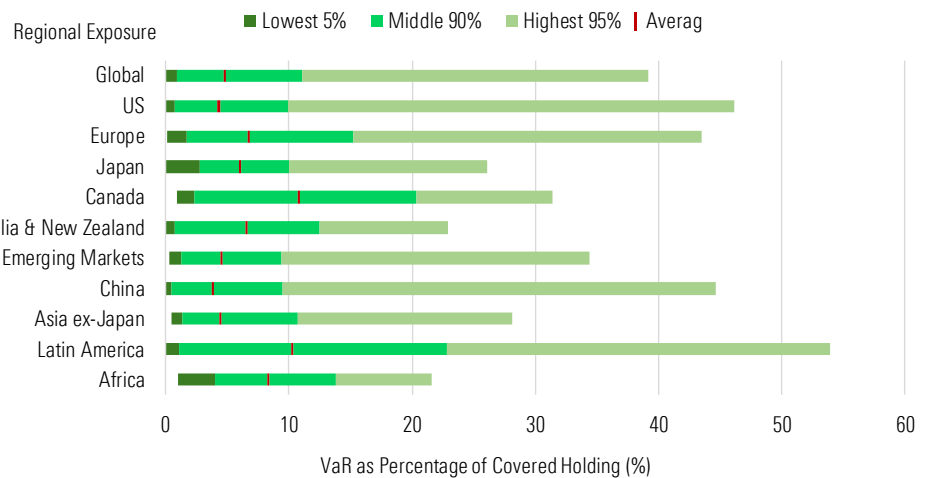
For funds, the LCT-VaR is expressed as a percentage of the portfolios’ covered holdings, in US dollars for a cumulative to 2050 time horizon, stemming from both policy and market risks.¹⁰ For the purposes of this analysis, the LCT-VaR assumes an orderly transition scenario under the Inevitable Policy Response (IPR) Net Zero pathway.

As shown below, there is great dispersion of Values at Risk for funds across regional exposures and also within regional exposures, highlighting the importance of looking into the data and understanding the drivers of risk.

Despite the wide dispersions, average value at risk across the board is more consistent, ranging from 3.7% for Chinese equity funds to 10.7% for Canadian ones. The low VaR of the Chinese equity funds may come as a surprise, given the country’s status as the largest emitter of carbon dioxide gas in the world. This mostly has to do with the country’s relatively low emissions gap, thanks to its more generous emissions budget as a developing country, as well as its lower carbon price projections compared to most developed economies.

Meanwhile, Canada and Latin America have the highest average VaR. This is in part due to the high representation of the Energy sector in these geographies. As of August 2024, funds in the Canadian and Latin American categories have average equity exposure to Energy stocks of 14% and 8%, respectively, compared with the global average of 3.3%. Currently, Oil and Gas is the only sector for which the LCT-VaR is calculated as the sum of policy and market risk impacts. Market risk impacts will be added to other sectors’ VaR in future.

Exhibit 14 Portfolio Low Carbon Transition Value at Risk Across Global Regions (%)



Source: Morningstar Direct. Data as of August 2024. Based on 19,574 open end funds and ETFs with available LCT Overall Value at Risk Percent of Covered Holding Value IPR Net Zero 2050 USD data point.

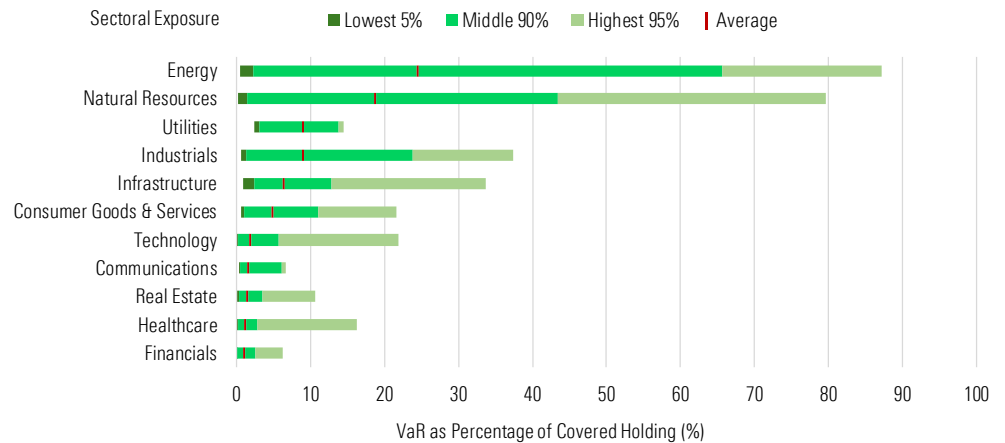
¹⁰ The data field in Morningstar Direct is "Low Carbon Transition Overall Value at Risk Percent of Covered Holding Value IPR Net Zero 2050 USD".

At the sector level, as expected, we find that Energy sector funds face the highest average VaR (24.4%), followed by those focused on the Natural Resources (18.6%), Utilities (8.8%) and Industrials (8.8%) sectors.

Meanwhile, the Energy and Natural Resources sectors feature high VaR outliers and greater dispersion, suggesting a wider range of business exposures to climate-related risks. For example, the high end of the VaR of the Energy sector consists mostly of portfolios investing in companies that are engaged mainly in exploration, extraction and production or supply of crude oil and natural gas, such as Canoe Energy Income Portfolio Class (VaR of 84%) and Invesco Energy Exploration & Production ETF (VaR of 68%). In contrast, low VaRs are found mostly among funds involved in energy efficiency as well as renewable generation, including Robeco Smart Energy (3%) and Franklin Templeton SinoAm Global Clean Energy ETF (1.9%). The former targets companies that enable the electrification and decarbonization of the energy value chain, including renewable technologies, smart grids, energy storage, and energy-efficiency solutions. For all the sectors mentioned above, a significant proportion of VaR is derived from policy risks where related regulatory actions will increase costs through carbon pricing mechanisms.

As previously noted, Oil and Gas is the only sector for which the LCT-VaR is calculated as the sum of policy and market risk impacts. Market risk impacts will be added to other sectors' VaR in future.

Exhibit 15 LCT-VaR by Sector

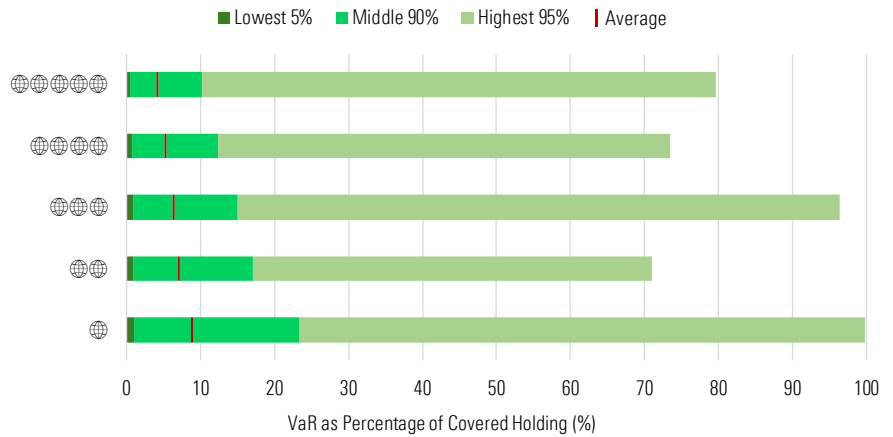


Source: Morningstar Direct. Data as of August 2024. Based on 3,325 funds from the selected sectors with available LCT Overall Value at Risk Percent of Covered Holding Value IPR Net Zero 2050 USD data point.

Using the Morningstar Sustainability Rating, we find that funds earning a High (five globes) rating also show lower LCT-VaR in general than funds with lower ratings. In addition to the better management score shown earlier, the lower average VaR of the funds with five globes can also be explained by their lower exposure to fossil fuel, thermal coal power generation, as well as oil and gas production. As of

August 2024, funds earning High and Above ratings had an average fossil fuel involvement of 5% and 7%, compared to 11% and 16% for funds with Below Average and Low ratings, respectively.¹¹

Exhibit 16 VaR as Percentage of Covered Holdings by Morningstar Sustainability Rating



Source: Morningstar Direct. Data as of August 2024. Based on 44,822 funds covered by Morningstar Sustainability Rating and LCT Overall Value at Risk Percent of Covered Holding Value IPR Net Zero 2050 USD data points.

Case Study: Assessing Climate Funds

In this section, we focus on a selected universe of climate-focused funds. As of August 2024, there were 1,592 funds globally, representing USD 535 billion of assets under management. Mutual funds with a climate-related mandate represent a wide and growing range of strategies that aim to meet varying investor objectives and preferences, from decarbonizing portfolios to investing in climate solutions.

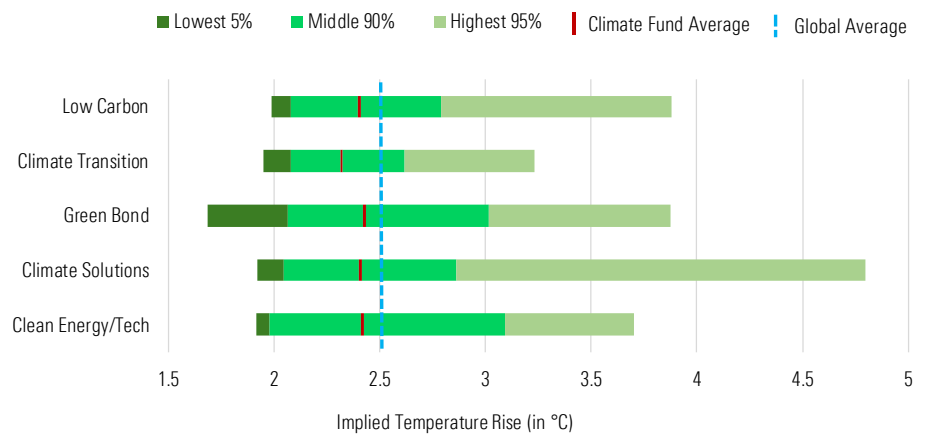
These are two broad objectives, but in practice, there are many ways of achieving them. We have identified five types to climate funds: Low Carbon, Climate Transition, Green Bond, Climate Solutions, and Clean Energy/Tech. For each of these five climate fund categories, we apply the metrics previously mentioned, which provide insights into the transition risk and climate action profile of these funds: implied temperature rise score, management score, and two of the four themes of TCFD recommendations (governance, strategy, risk management, and metrics and targets). Fund scores were calculated in August 2024, based on the most recent portfolios in Morningstar’s database.

The exhibit below shows that the five climate fund types have similar average implied temperature rise scores of 2.3°C and 2.4°C, all below the global average of 2.5°C. This is in line with the finding that 60% of funds in the global fund universe are assessed as Significantly Misaligned, with ITR scores between 2°C and 2.5°C.

¹¹ The data used here is Fossil Fuel Percentage of Covered Portfolio Involved. It represents the percentage of the covered portfolio that is exposed to corporations that make any revenue (>0%) from fossil fuels. Companies involved in fossil fuels may derive revenue from one or more of the following activities: thermal coal extraction, thermal coal power generation, oil and gas production, oil and gas power generation, and oil and gas products and services. A lower percentage is optimal.

Nonetheless, Climate Transition strategies exhibit a slightly lower average ITR score (2.3°C) than their climate peers. Climate Transition funds are typically broad, well-diversified funds that select or tilt toward companies that consider climate change in their business strategy and therefore are better prepared for the transition to a low-carbon economy. Also included in this category are passive funds tracking EU Paris-aligned benchmarks (EU PAB), or EU climate-transition benchmarks (EU CTB). These benchmarks are designed to account for both risk mitigation and opportunity-seeking, while generally replicating the broad market and matching the transition to a climate-resilient economy.

Exhibit 17 Implied Temperature Rise Scores Across Climate Fund Types



Source: Morningstar Direct. Data as of August 2024. Based on 1,397 climate funds with available LCTR data point.

Below, we list the best and worst performing climate funds measured by ITR score. The dominance of Climate Solutions strategies in both tables is unsurprising, given the wide dispersion of ITR scores of such funds shown above.

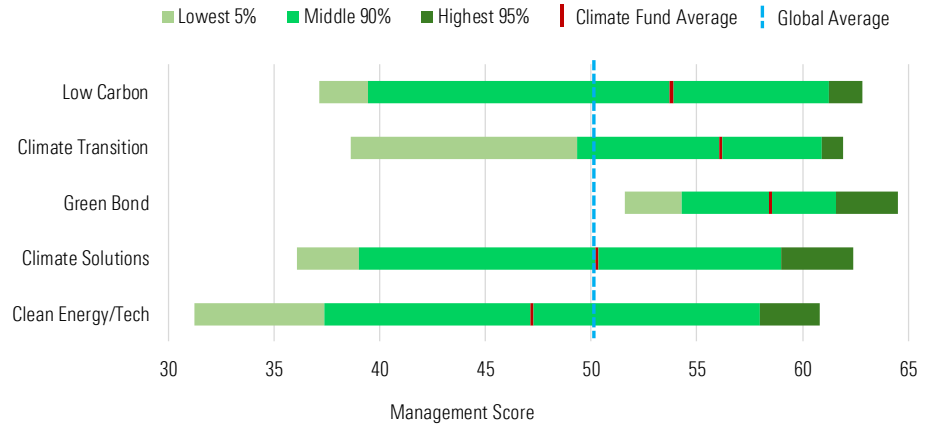
Exhibit 18 Top 10 and Bottom 10 Climate Funds by Implied Temperature Rise

Fund Legal Name	ITR Score	Climate Fund Type	Global Category	Domicile	Fund Size (USD Mil)
Top 10					
Edmond de Rothschild Fund Climate Bonds	1.7	Green Bond	EM Fixed Income	Luxembourg	35.1
BNP Paribas Funds Energy Transition	1.9	Climate Solutions	Energy Sector Equity	Luxembourg	914.2
Lyxor MSCI New Energy ESG Filtered (DR) ETF	1.9	Clean Energy/Tech	Energy Sector Equity	France	865.3
ENETIA Energy Transition Fund	1.9	Clean Energy/Tech	Energy Sector Equity	Switzerland	128.6
FOS Focus Green Bonds	1.9	Green Bond	Europe Fixed Income	Germany	32.7
Fidelity Clean Energy ETF	1.9	Clean Energy/Tech	Energy Sector Equity	Ireland	10.5
Mansartis Ternativ ISR	1.9	Climate Solutions	Global Equity Large Cap	France	10.6
iShares Breakthrough Environmental Solutions ETF	1.9	Climate Solutions	Technology Sector Equity	United States	3.7
Global X Wind Energy ETF	1.9	Clean Energy/Tech	Energy Sector Equity	Ireland	3.2
Asset Plus Futuristic Power Supply and Mobility RMF	1.9	Climate Solutions	Global Equity Large Cap	Thailand	1.6
Bottom 10					
Green Investment Partners Equity Fund	4.8	Climate Solutions	Global Equity Large Cap	Ireland	14.8
Northern Trust Quality Low Vol Low Carbon World Fund	3.9	Low Carbon	Global Equity Large Cap	Ireland	434.1
Murphy&Spitz Green Bonds Fonds	3.9	Green Bond	Cautious Allocation	Germany	4.3
Truvalue New Matera&Energy Eq	3.7	Clean Energy/Tech	Greater China Equity	China	27.2
Global X Bloomberg MSCI Asia Ex Japan Green Bond ETF	3.6	Green Bond	Asia Fixed Income	Hong Kong	7.7
KB KBSTAR Global Hydrogen Economy Indxx	3.5	Climate Solutions	Energy Sector Equity	South Korea	8.5
KSM Active Energy IL	3.5	Clean Energy/Tech	Energy Sector Equity	Israel	2.5
Mondrian Global Green Bond Fund	3.4	Green Bond	Global Fixed Income	Ireland	2.5
HuaShang New Energy Vehicle Alloc	3.3	Climate Solutions	Aggressive Allocation	China	68.7
Hennessy Energy Transition Fund	3.3	Climate Solutions	Energy Sector Equity	United States	15.5

Source: Morningstar Direct. Data as of August 2024. Based on 1,397 climate funds with available Portfolio Greenhouse Gas Emission Management Score All Scopes data point.

Meanwhile, the exhibit below shows that Green Bond funds have the highest average emission management score, at 58, while Clean Energy/Tech funds have the lowest, at 47. This should not come as a surprise as issuers of green bonds issue these instruments to finance their transition, so it is fair to expect these issuers to be more advanced in their transition journey. Issuers of green bonds must meet stringent eligibility criteria that ensure bond proceeds are allocated to environmentally impactful projects. These criteria are often aligned with globally recognized standards, such as the Green Bond Principles, which mandate the reduction of greenhouse gas emissions, among other requirements. Additionally, many green bond issuers operate in high-emitting sectors, such as Utilities, which are subject to significant investor and regulatory scrutiny, and force these companies to transition faster.

Exhibit 19 Management Scores Across Climate Fund Types



Source: Morningstar Direct. Data as of August 2024. Based on 1,397 climate funds with available Portfolio Greenhouse Gas Emission Management Score All Scopes data point.

On the other end, Clean Energy/Tech and Climate Solutions funds exhibit lower management scores, as they target companies focused on offering products that contribute to the transition to a low-carbon economy. These companies tend to be less focused on improving their manufacturing processes and reducing their carbon emissions, or they may be operating in hard-to-abate sectors where there is currently no alternative to manufacturing goods essential to the transition in a less carbon-intensive way.

Indeed, the top performers of emission management are concentrated mostly in Green Bond and Low Carbon funds, whereas those with poor management performance tend to be found among Chinese Climate Solutions and Clean Energy/Tech strategies, as shown below.

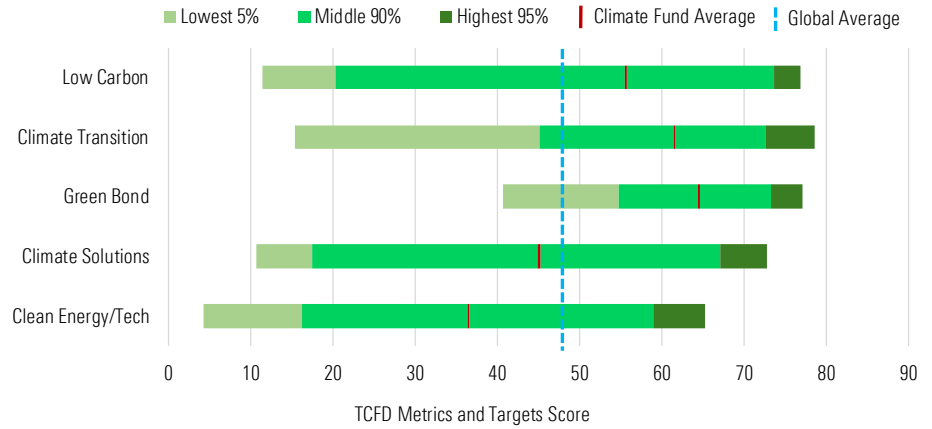
Exhibit 20 Top 10 and Bottom 10 Climate Funds by Management Score

Fund Legal Name	Management Score	Climate Fund Type	Global Category	Domicile	Fund Size (USD Mil)
Top 10					
Green Bonds Investments	64	Green Bond	Europe Fixed Income	France	86.4
HSBC Europe Ex UK Sustainable Equity ETF	63	Low Carbon	Europe Equity Large Cap	Ireland	59.5
Mondrian Global Green Bond Fund	63	Green Bond	Global Fixed Income	Ireland	2.5
Autofocus Low Carbon	62	Low Carbon	Capital Protected	France	265.8
Ofi Invest ESG Equity Climate Change	62	Low Carbon	Europe Equity Large Cap	France	261.3
Federal Global Green Bonds	62	Green Bond	Global Fixed Income	France	47.5
BRED Green Bonds	62	Green Bond	Europe Fixed Income	France	43.6
BNP Paribas Easy Low Carbon 100 Eurozone PAB	62	Climate Transition	Europe Equity Large Cap	Luxembourg	22.9
Rivertree Bond - Euro Green Bonds	62	Green Bond	Europe Fixed Income	Luxembourg	19.4
BPI Impacto Clima Obrigações	62	Climate Solutions	Europe Fixed Income	Portugal	14.2
Bottom 10					
KSM Active Energy IL	35	Clean Energy/Tech	Energy Sector Equity	Israel	2.5
HuaShang New Energy Vehicle Alloc	36	Climate Solutions	Aggressive Allocation	China	68.7
Fullgoal CSI Green Power ETF	36	Clean Energy/Tech	Greater China Equity	China	17.9
ChinaAMC CSI Green Power ETF	36	Clean Energy/Tech	Greater China Equity	China	11.8
E Fund CSI Green Power ETF	36	Clean Energy/Tech	Greater China Equity	China	10.8
GF CSI Fully Electronic Power ETF	37	Clean Energy/Tech	Greater China Equity	China	328.3
ChinaAMC Energy-Conservation & Envir. Protection Fund	37	Climate Solutions	Greater China Equity	China	42.6
Huatai-PB CSI Fully Electronic Power ETF	37	Clean Energy/Tech	Greater China Equity	China	35.7
Bosera CSI All Share Electric Utilities ETF	37	Climate Solutions	Greater China Equity	China	20.6
Yinhua CSI All Share Electric Utilts ETF	37	Climate Solutions	Greater China Equity	China	6.0

Source: Morningstar Direct. Data as of August 2024. Based on 1,397 climate funds with available Portfolio Greenhouse Gas Emission Management Score All Scopes datapoint.

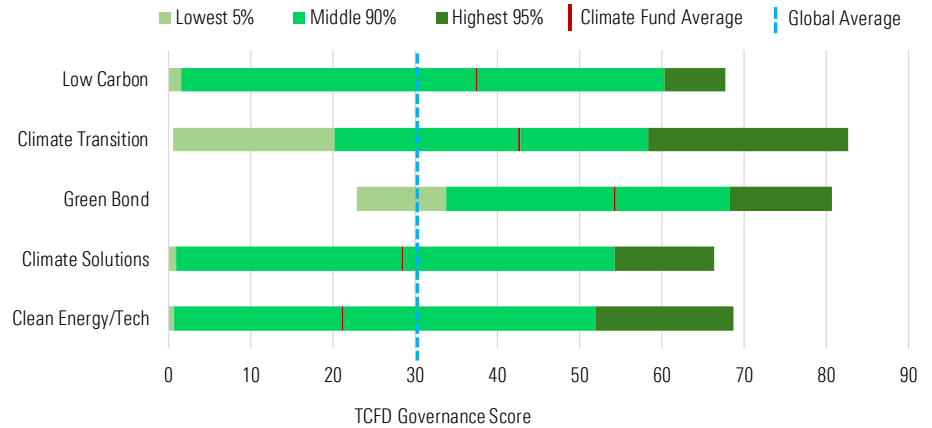
Differences in management scores across climate funds can be observed below, particularly by looking at two key TCFD indicators: metrics and targets, and governance. Here again, Green Bond and Climate Transition funds score the highest, while Clean Energy/Tech and Climate Solutions funds score the lowest.

Exhibit 21 TCFD Metrics and Targets Score Across Climate Fund Types



Source: Morningstar Direct. Data as of August 2024. Based on 1,401 climate funds with available Portfolio TCFD Metrics and Targets Score data point.

Exhibit 22 TCFD Governance Score Across Climate Fund Types



Source: Morningstar Direct. Data as of August 2024. Based on 1,401 climate funds with available Portfolio TCFD Governance Score data point.

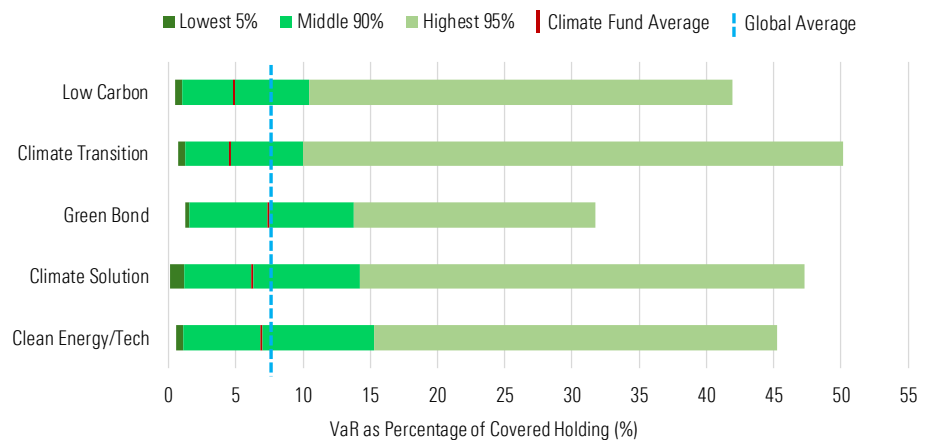
It is worth noting that the TCFD scores are higher for metrics and targets than for governance. This is because the first step in a company’s journey on climate disclosure is metrics and targets – it is relatively easy to report on. It gets more difficult to incorporate change in policies (governance), so the governance scores tend to be lower, on average.

That said, looking at TCFD governance, we find wide dispersions of management quality, including within each climate fund group. Climate Transition funds, in particular, show significant variability in scores due to the diverse stages of transition that companies are in, the challenges they face in shifting their business models, and the effectiveness of their strategies in reaching climate targets. This broader score range indicates that while some investments are successfully advancing toward their climate objectives, others are still struggling to make meaningful progress.

On the other hand, Green Bond funds tend to have more concentrated and higher scores, reflecting their focus on companies that are more closely aligned with established climate frameworks. The narrower score distribution in this category suggests that these funds invest in companies that are more consistent in setting targets and acting on these targets. (See the Appendix for the two remaining TCFD indicators: Strategy and Risk Management.)

Examining our climate fund universe through the lens of VaRs, we see that Green Bond strategies exhibit the highest average LCT VaRs. This could be explained by the relatively high exposure of these funds to traditional Utilities companies that are looking to finance infrastructure upgrades and transition away from their coal-fired electricity generation activities. Low Carbon and Climate Transition strategies show relatively lower VaR, in general, given the widely adopted targets related to carbon emissions reduction.

Exhibit 23 LCT VaR as Percentage of Covered Holding Across Climate Fund Types

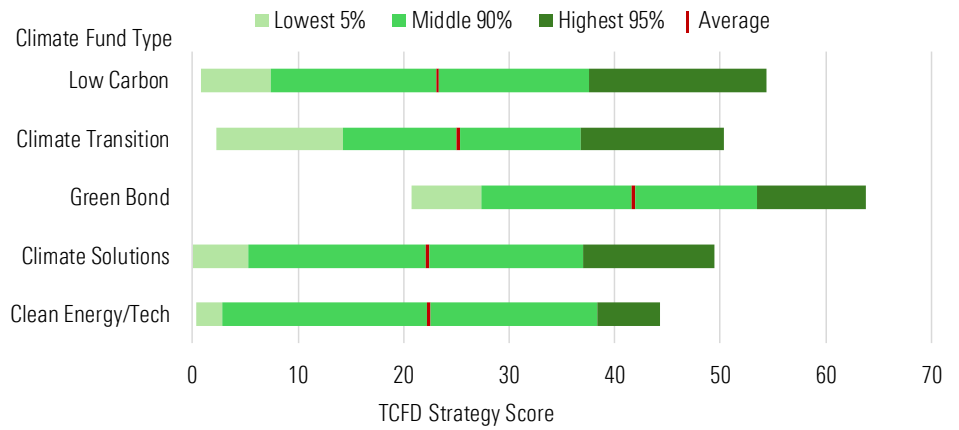


Source: Morningstar Direct. Data as of August 2024. Based on 1,388 climate funds covered by LCT Overall Value at Risk Percent of Covered Holding Value IPR Net Zero 2050 USD data points.



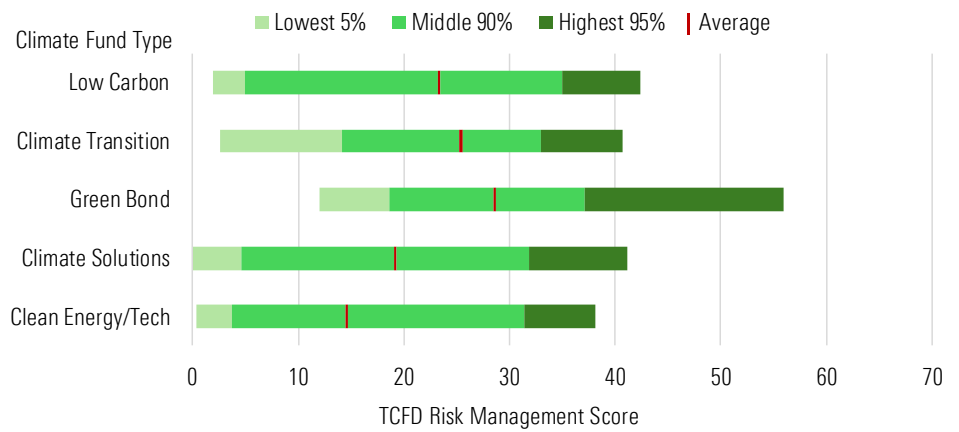
Appendix

Exhibit 24 TCFD Strategy Score Across Climate Fund Types



Source: Morningstar Direct. Data as of August 2024. Based on 1,593 climate funds.

Exhibit 25 TCFD Risk Management Score Across Climate Fund Types



Source: Morningstar Direct. Data as of August 2024. Based on 1,593 climate funds.

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