# Investing in Times of Climate Change: 2023 in Review

## Climate Fund Assets Hit New Highs Despite Lower Inflows.

Morningstar Manager Research

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# Key Takeaways

### Assets in Climate Funds Climb to $540 billion

- Assets in mutual funds and ETFs with a climate-related mandate globally rose by 16% in 2023 to $540 billion, driven by continued inflows, product development, and market appreciation.
- Europe accounted for 84% of these assets, while China and the United States ranked far behind, with market shares of 7% and 6%, respectively.

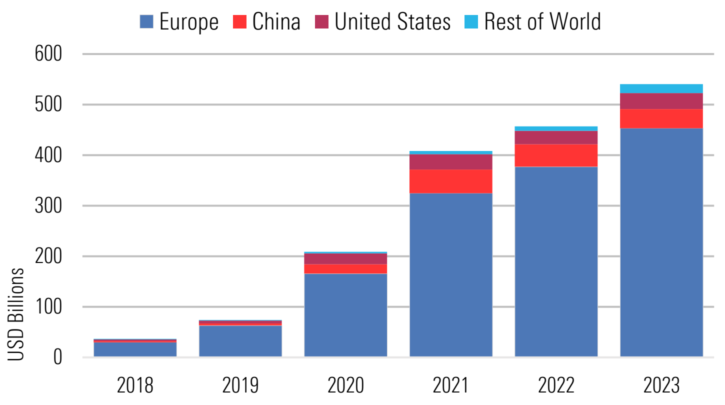
### Climate Transition Strategies Grow by 25%

- Climate Transition strategies, which tilt toward companies that are better prepared for the transition to a low-carbon economy, grew by 25% in 2023 to nearly $210 billion, globally.
- Clean Energy/Tech fund assets slid by 23% to $58 billion, mainly due to high interest rates, inflation, and falling valuations in renewable energy stocks.

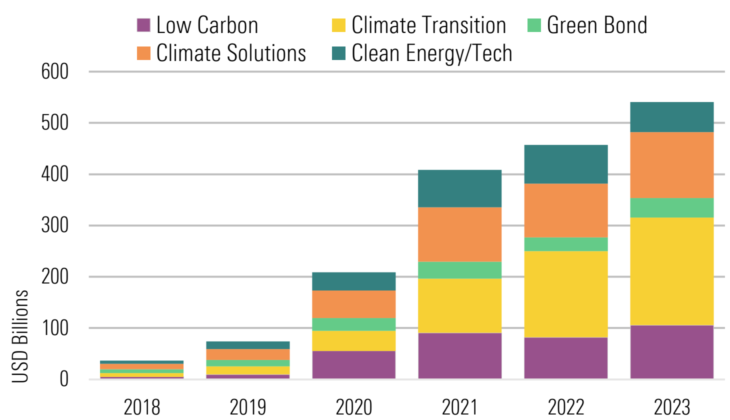
### Global Flows Were Lower—Yet Positive—in 2023

- Flows into climate funds amounted to $40 billion globally in 2023, accounting for more than half of the total flows into the overall fund universe, which netted $75 billion.
- Still, the $40 billion inflows into climate funds last year represented the lowest levels in four years, mostly due to the redemptions from Climate Solutions and Clean Energy/Tech strategies, which were penalised by high interest rates and sticky inflation.

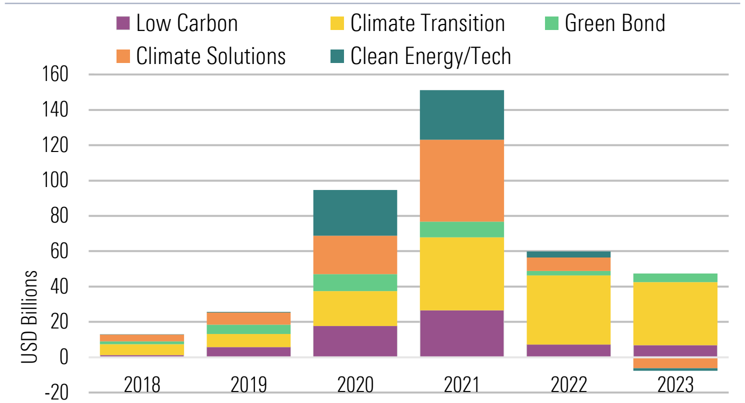
### Climate Funds by Region




### Climate Funds by Category




### Global Flows Into Climate Funds



# Key Takeaways

### The Unstoppable Rise of Passive Climate Funds

- In Europe, passive funds accounted for 56% of the climate fund assets, but 87% of the flows in 2023.
- The proliferation of passive climate funds has been helped by the continued innovation in indexing, improved ESG and climate data quality, and in Europe, by the 2019 Regulation on the EU Climate Transition Benchmarks.

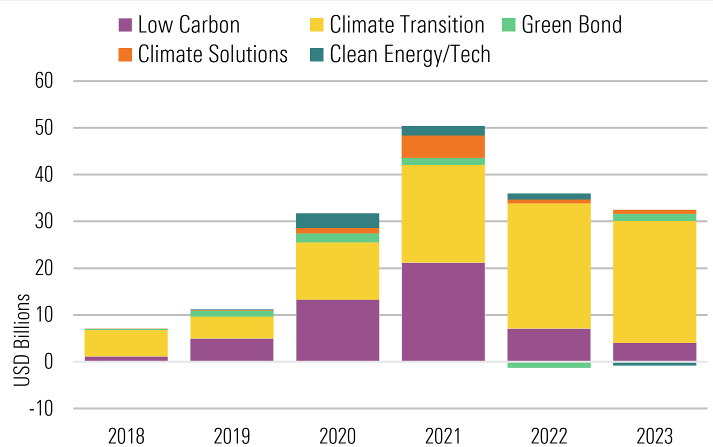
### PAB and CTB-Tracking Funds hit $155 billion

- Funds tracking EU Paris-aligned benchmarks, or PAB, or climate-transition benchmarks, or CTB, hit $155 billion at the end of 2023, up 50% compared with a year earlier.
- While investors outside of Europe are warming up to Climate Transition strategies, they continue to favor Climate Solutions and Clean Energy/Tech funds.

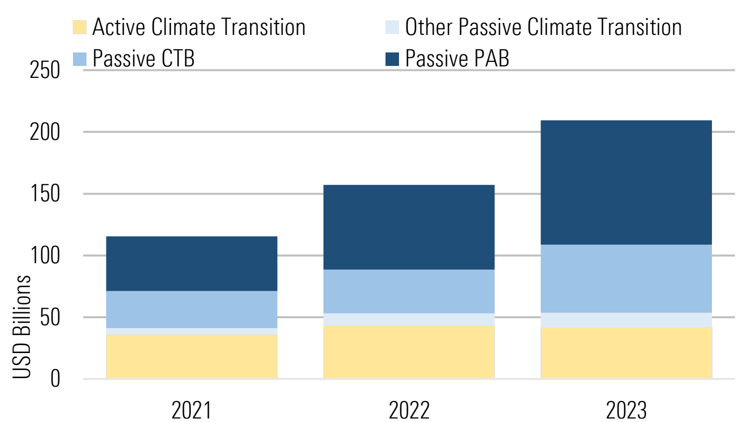
### Energy Transition and Electric Vehicles/Smart Mobility are the Most Prominent Climate Solutions Themes

- Energy Transition and Electric Vehicles/Smart Mobility remain the most prominent single themes, with $47 billion of combined fund assets.
- Funds investing in Mixed Climate Solutions continued to dominate that category, taking up almost half of the assets, despite bleeding $5.5 billion last year.
- Of all other subcategories, only Energy Transition, Infrastructure, and Transition Materials registered net inflows, though very small.

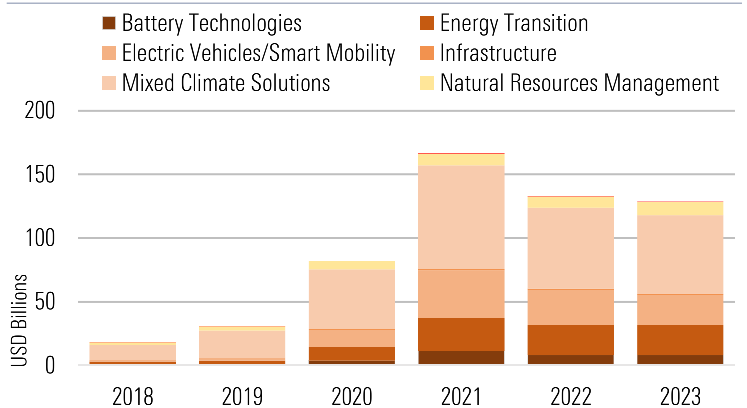
### Flows Into Passive Climate Funds




### Assets in Climate Transition Funds




### Assets in Climate Solutions Funds Subcategories



# Key Takeaways

### Low Carbon and Climate Transition Funds Tilt Toward Companies With Stronger Emission Management

- Low Carbon and Climate Transition funds invest in, or tilt toward, companies that tend to manage their emissions better than those held by Climate Solutions and Clean Energy/Tech funds. This is reflected in the higher average emission-management score of the former two categories relative to the latter two.
- Actively managed Climate Transition funds exhibit higher average emission-management scores than direct peers.

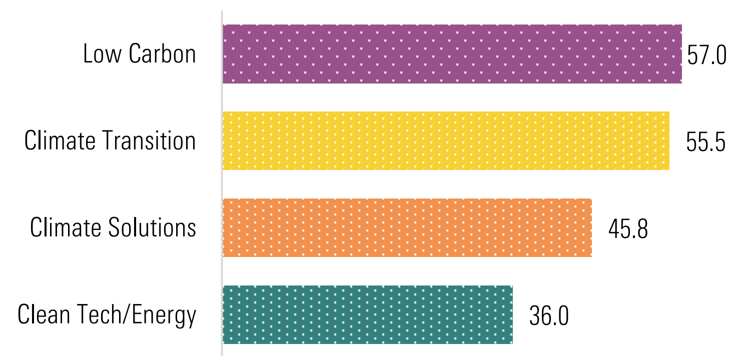
### Climate Solutions Funds Exhibit High-Carbon Intensity

- Funds offering exposure to climate solutions tend to exhibit high-carbon intensity. They tend to invest in transitioning companies that operate in high-emitting sectors, such as utilities, energy, and industrials, and that are developing solutions to help reduce their own emissions and those of others.

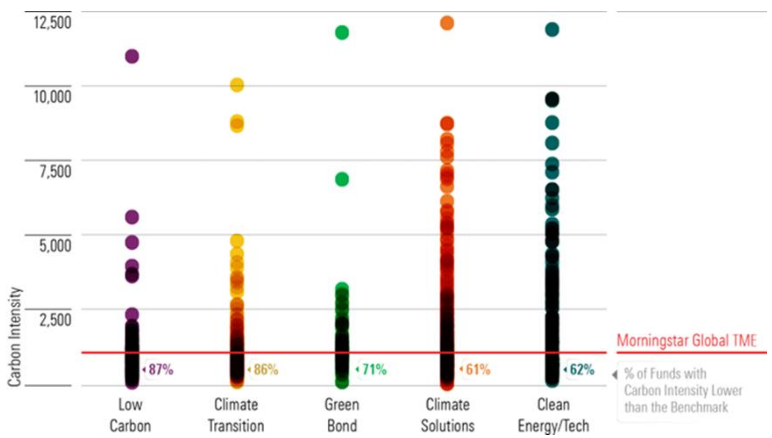
### Climate Funds Aim to Meet Various Investor Needs

- The five climate fund groupings we have identified 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.
- The choice of one type over another largely depends on an investor's investment goals, risk appetite, and preferences. Each type of fund has a different role to play in an investor's portfolio.

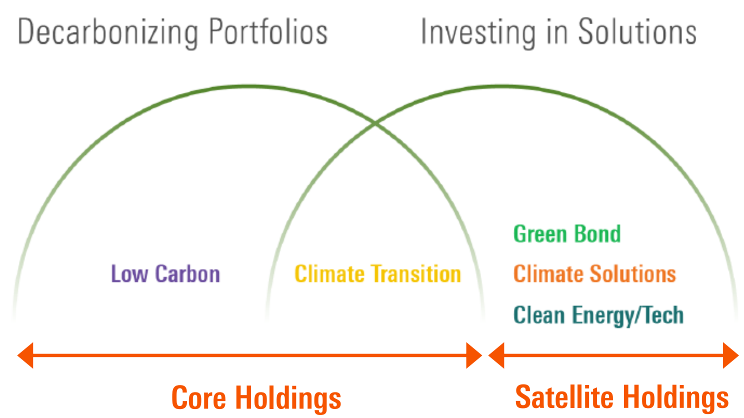
### Average Emission Management




### Carbon Intensity Scope 1, 2, & 3 Versus Global Index




### How Climate Funds Fit Into an Investor's Portfolio



# The Global Climate Funds Landscape

# Introduction

In this fifth annual edition of ***Investing in Times of Climate Change***, we provide an update on the rapidly evolving global landscape of climate funds as of Dec. 2023.

Climate change is considered one of the top systemic risks for investment portfolios. Some investments will be disadvantaged in the transition to a low-carbon economy because of changes in regulation, technology, and consumer behavior, among other factors. If mitigation efforts don't accelerate as temperatures keep rising and extreme weather events such as flooding or hurricanes become more frequent, investments will face higher physical risks.

At the same time, more investors are seeking to capitalize on opportunities and invest in companies that develop innovative solutions to mitigate climate change or adapt to it, such as clean energy, electric vehicles, carbon capture and storage, and flood defenses. Getting the world on track for net zero emissions by 2050 requires clean energy transition-related investment to accelerate from $1.1 trillion in 2022 to around $4 trillion annually by 2030, according to the International Energy Agency.

The menu of options for climate-focused investors across the globe has ballooned in the past five years. We identified more than 1,500 mutual funds and ETFs with a climate-related mandate globally as of December 2023, compared with fewer than 200 in 2018.

Global demand for climate funds continued climbing too, with assets under management clocking in at $540 billion at the end of 2023, driven by continued inflows, product development, and market appreciation.

The strongest appetite came from Europe. Investors also clamored for climate transition funds, which invest in companies better prepared for a low-carbon world. Those gains came even as demand slackened for sustainable funds broadly.

Climate-related funds now account for almost 20% of the global ESG and sustainable funds market, and represent a wide range of strategies, from decarbonizing portfolios to investing in climate-related solutions.

In this report, we provide an update on the wide range of climate funds available, which we subdivide into five mutually exclusive categories: Low Carbon, Climate Transition, Green Bond, Climate Solutions, and Clean Energy/Tech. We examine the continued growth in assets, flows, and products in each grouping. We analyze these funds through the lens of Morningstar Sustainalytics' carbon metrics, including involvement in fossil fuels and carbon solutions. We also look at their most common holdings and assess their level of alignment to a 1.5°C world using Sustainalytics' new Low Carbon Transition Rating metrics. We examine their emission management quality. Finally, we discuss how each type of climate strategy, given its unique risk/reward characteristics, can fit into an investor's portfolio.

The purpose of this report is to help climate-focused investors navigate the expanding array of strategies available to them.

# Global Climate Fund Assets Reach New Height With Continued European Dominance

- As of December 2023, we identified 1,506 climate-related funds globally, up from 1,206 a year earlier.

**How we define the climate funds universe:***

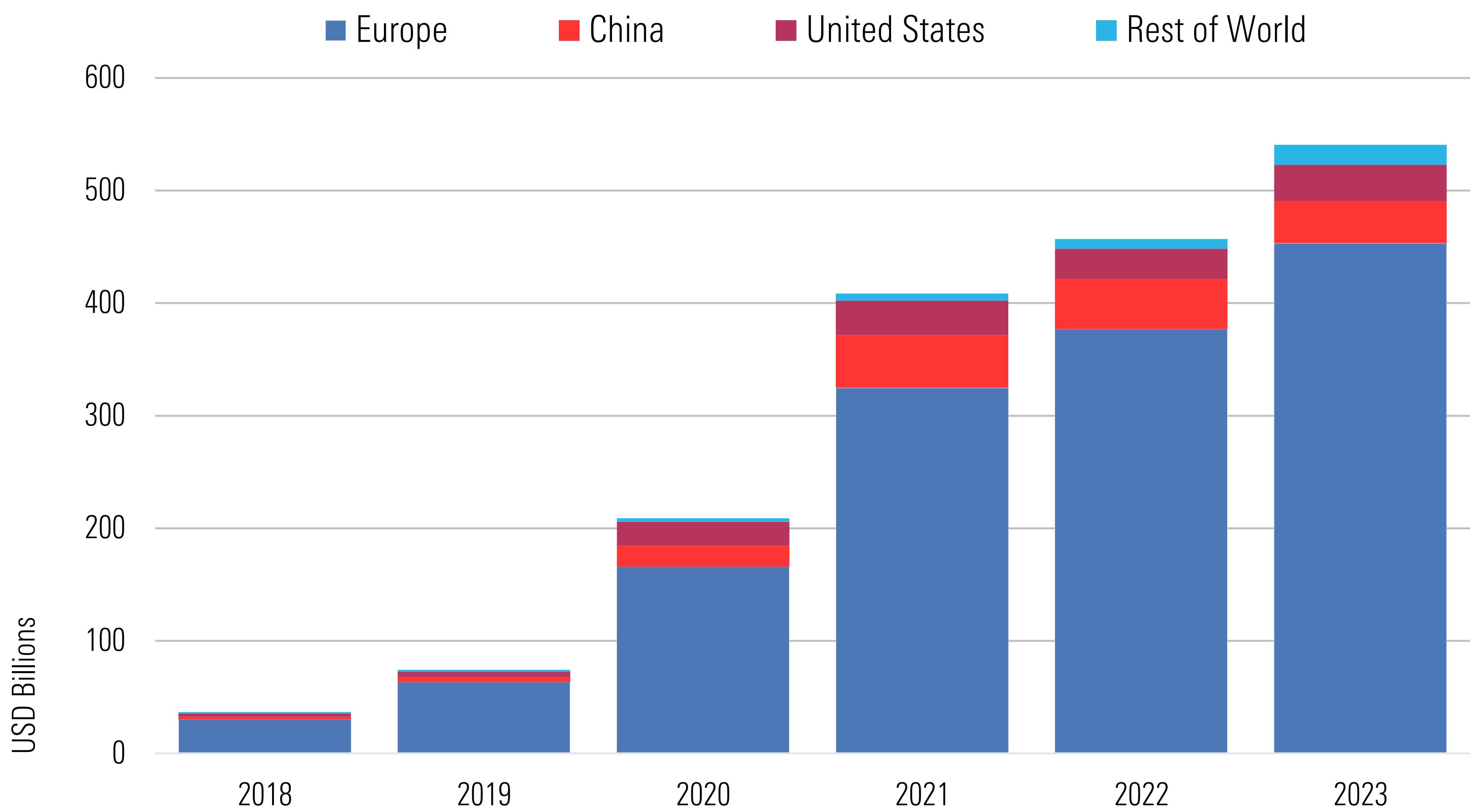
The climate funds universe encompasses open-end funds and exchange-traded funds that have investment strategies related to the climate-change theme.

To identify these funds, we used a range of key terms in their names (or index names in the case of passive funds). Key terms include obvious words such as "climate," "carbon," "transition," and "green," but also words related to themes and sectors linked to climate change solutions such as "renewable energy," "electric vehicles," and "batteries."

- Total assets in climate funds grew by 16% last year to USD 540 billion, driven by continued inflows, product development, and market appreciation.

- Unsurprisingly given its greater and continued commitment to a climate agenda, Europe remains the main contributor, accounting for 58% and 84% of the global universe in terms of number and assets, respectively. China and the United States rank far behind at second and third, with market shares of 7% and 6%, respectively, in terms of assets.

**Global Assets in Climate Funds (By Region)**

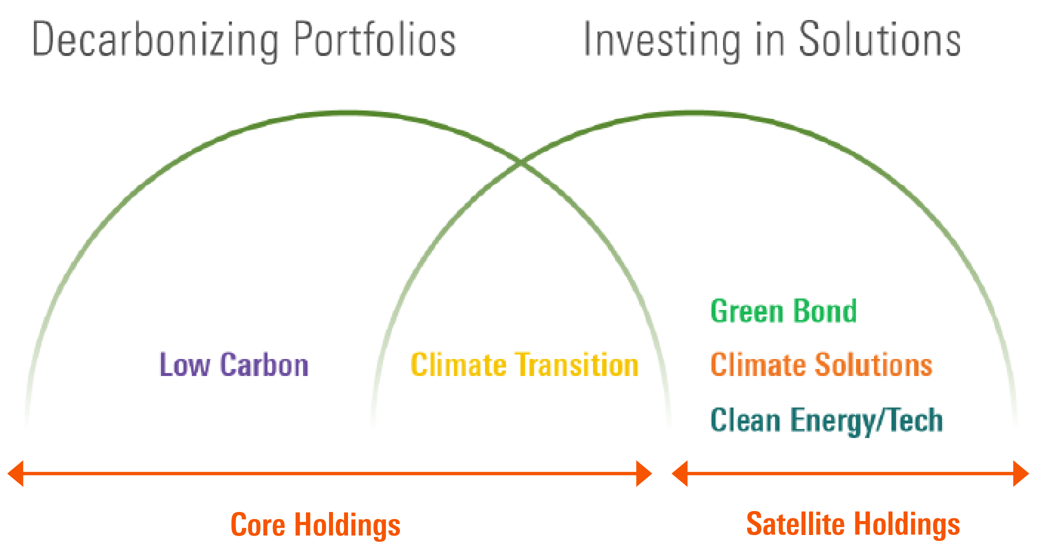



Source: Morningstar Direct. Morningstar Research. Data as of December 2023.

*See Appendix for more details. The list of funds included in this report is available upon request. Please email ManagerResearchServices@morningstar.com

# The Universe of Climate Funds: From Decarbonizing Portfolios to Investing in Climate Solutions*

- 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.




**Low Carbon**
Invest in companies with low-carbon footprints

**Climate Transition**
Invest in or tilt toward companies that will transition better to a low-carbon economy

**Green Bond**
Invest in bonds that finance projects facilitating the transition

**Climate Solutions**
Invest in companies whose products & services contribute to the transition

**Clean Energy/Tech**
Invest in companies whose products contribute to or facilitate the energy transition

*See Appendix for more details.
The list of funds included in this report is available upon request. Please email ESG-GlobalManagerResearch@morningstar.com

# Climate Transition Strategies Grow by 25% in 2023

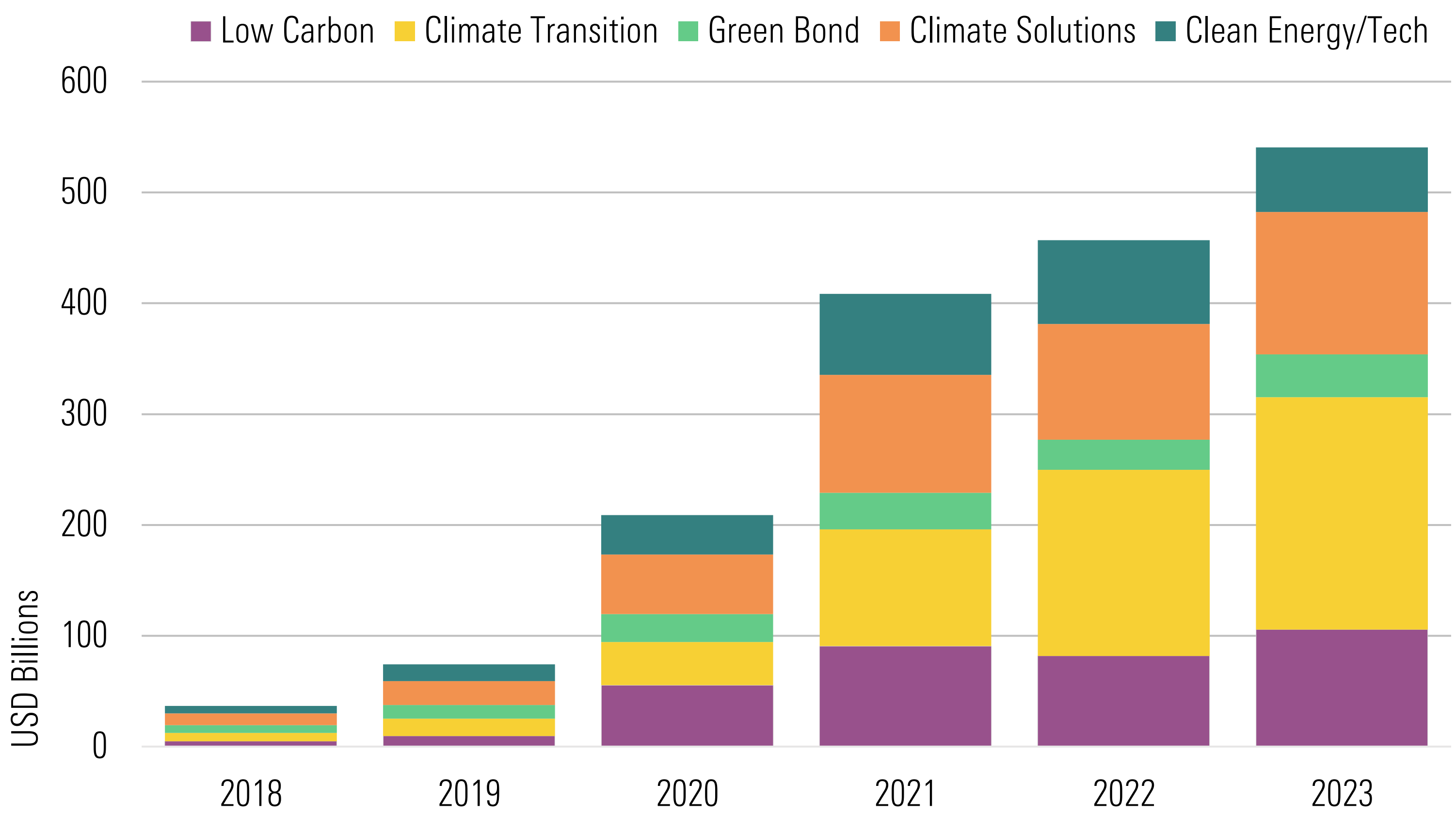
- Climate Transition funds have grown in the past couple of years to become the largest climate fund category with USD 210 billion in assets, up 25% in the last year. Climate Transition funds invest in or tilt towards companies that will transition better to a low-carbon economy.

- Climate Solutions funds reached USD 128 billion, up 23%, while Clean Energy/Tech funds registered a decrease of 23% in assets.

- Low Carbon fund assets rose by 29% in 2023 to USD 106 billion.

- The standout performer was the Green Bond fund category, nearly doubling its asset size with an impressive 41% surge, though its share remained relatively small. Issuers across industries, particularly those in hard-to-abate sectors, continue seeking finance for capital intensive, decarbonization projects as part of their climate transition plans.

**Global Assets in Climate Funds (By Category)**




Source: Morningstar Direct. Morningstar Research. Data as of December 2023.

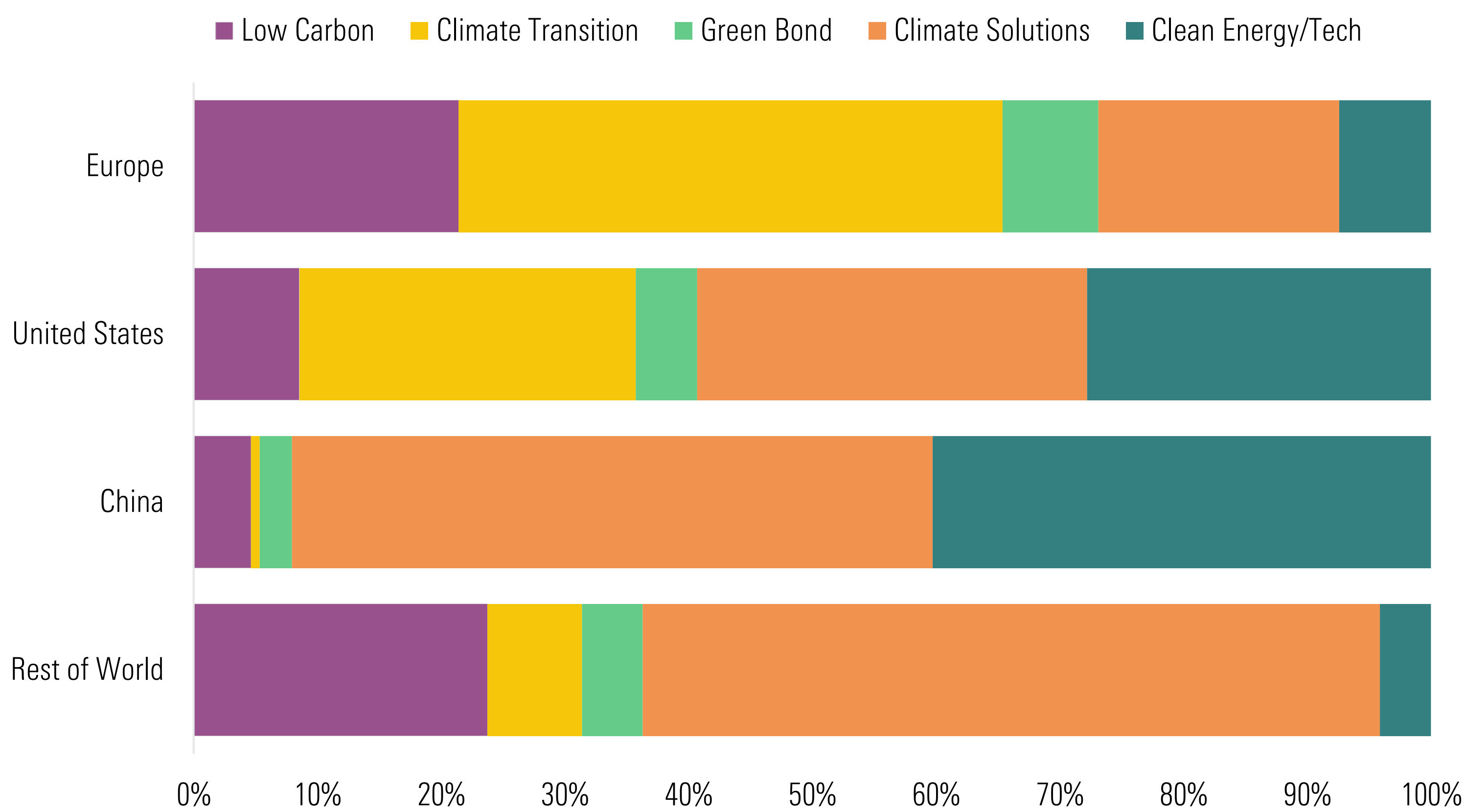
# Regional Breakdown Shows Different Investor Preferences

- In relative terms, European investors tend to favor decarbonization strategies (Low Carbon) and funds focused on both risk and opportunities (Climate Transition). The latter accounts for 45% of European climate fund assets compared with 18% and 8% for Climate Solutions and Clean Energy/Tech funds, respectively.

- The growth of Climate Transition strategies in recent years reflects European investors' increased desire to decarbonize their entire portfolios, starting with the substitution of existing core holdings by strategies that should fare better as the world transitions to a low-carbon economy.

- While US investors are slowly warming up to Climate Transition funds at the expense of strategies exclusively focused on climate-related opportunities (Clean Energy/Tech and Climate Solutions), Chinese investors continue to show a strong bias toward these.

**Regional Breakdown of Climate Funds by Climate Category**




Source: Morningstar Direct. Morningstar Research. Data as of December 2023.

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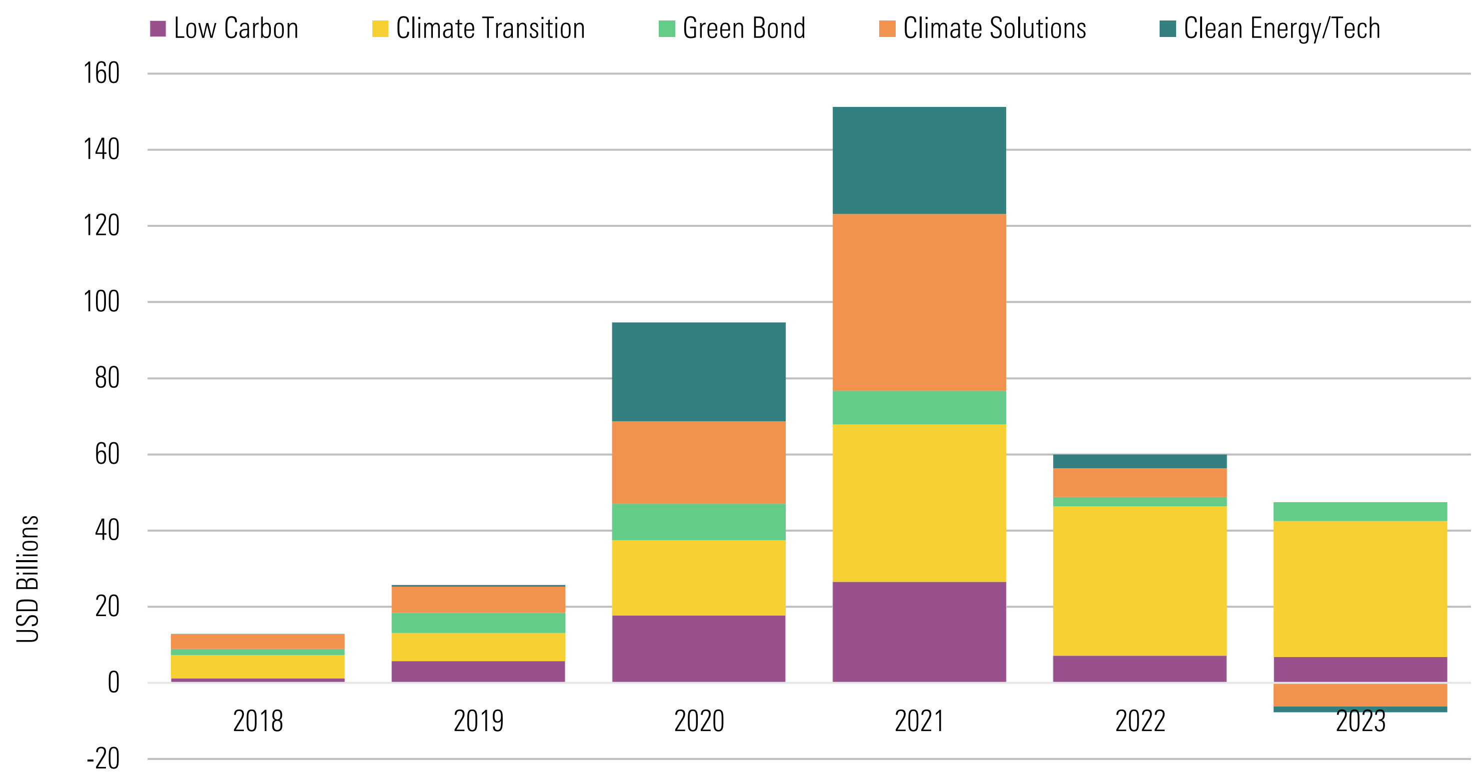
# Global Flows Were Lower—Yet Positive—in 2023; Climate Solutions and Clean Energy/Tech Funds Registered Outflows

- Flows into climate funds amounted to USD 40 billion globally in 2023, their lowest levels in four years. Yet, these flows accounted for two thirds of the total sustainable fund inflows last year, which amounted to USD 62 billion. Also, flows into climate funds represented more than half of the total flows into the overall fund universe, which netted USD 75 billion last year.

- The lower annual net flows into climate funds were echoed by a declining organic growth rate. Calculated as net flows relative to total assets at the start of a period, the organic growth rate for the climate fund universe decelerated to 9%, compared with 15% in the previous year. However, it surpassed the 0.2% for the global fund universe over the same period.

- The decline in climate fund flows last year can be mostly attributed to the substantial redemptions from Climate Solutions and Clean Energy/Tech strategies, which were plagued by high interest rates and sticky high inflation.

**Annual Flows Into Global Climate Funds**




Source: Morningstar Direct. Morningstar Research. Data as of December 2023.

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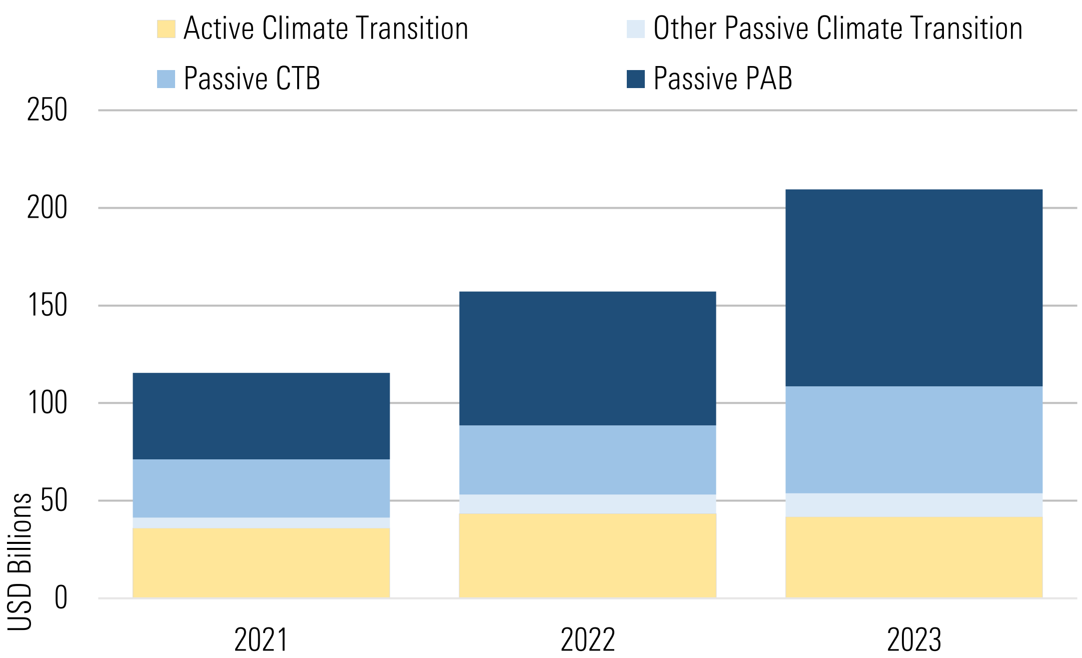
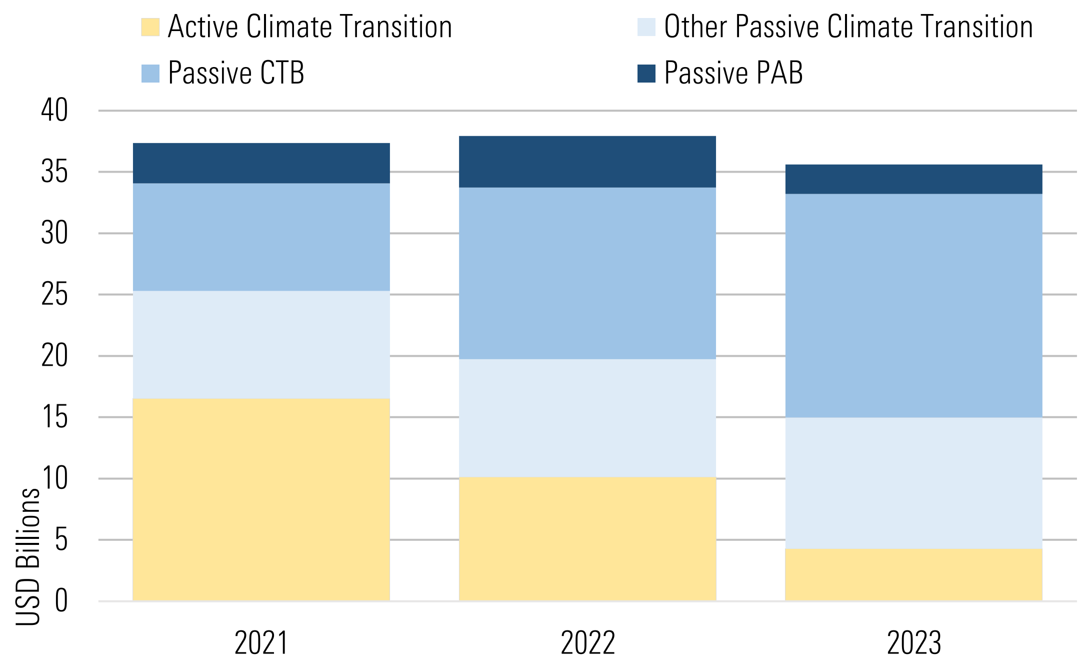
# Unpacking Climate Transition Funds – Passive PAB and CTB Funds Reach $155 Billion

- Passive funds tracking Paris-aligned and climate transition benchmarks dominate the Climate Transition funds category, reaching USD 155 billion in assets at the end of 2023, up 50% compared with a year earlier.
- Many of these are repurposed funds. They used to track a plain-vanilla or an ESG index and they switched to a PAB or CTB index at some point in the past three years.
- The two subcategories that attracted the most money in 2023 are Passive CTB and Other Passive Climate Transition funds, with net inflows of USD 18.2 billion and USD 10.7 billion, respectively.
- On the other hand, actively managed Climate Transition funds registered lower inflows at USD 4.3 billion, down from USD 10.2 billion a year earlier. Passive PAB funds experienced declining inflows at USD 2.4 billion, from USD 4.2 billion. The underperformance of PAB strategies in 2022 due to their large underweight in energy may have deterred some investors.

### Assets in Climate Transition Funds Subcategories*




### Flows Into Climate Transition Funds Subcategories

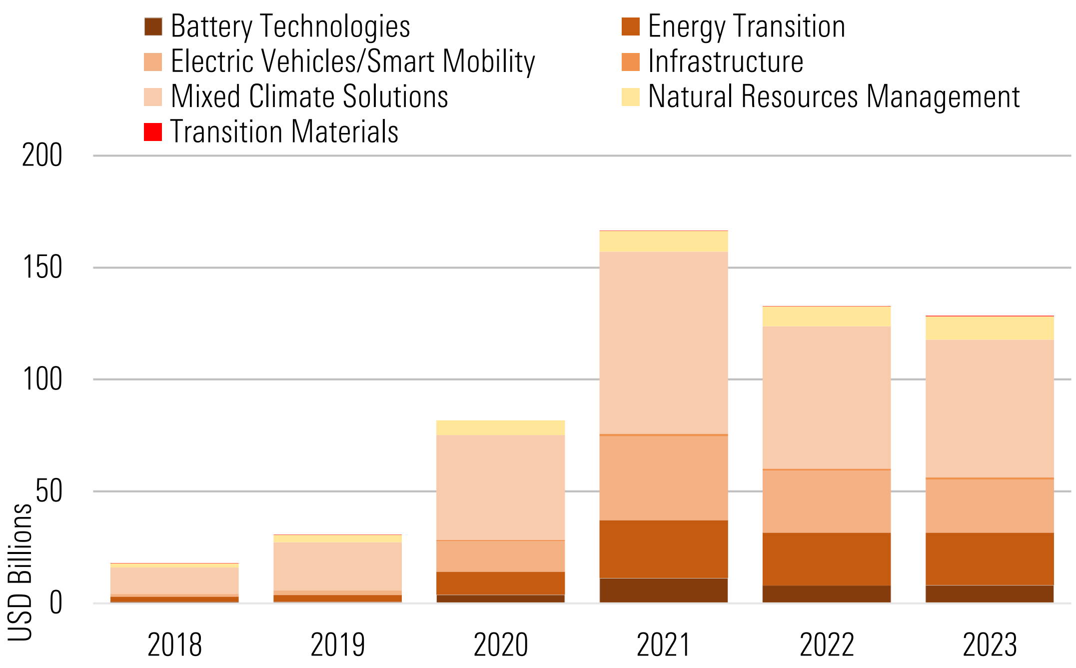



* **Passive CTB**: Funds that track an EU climate-transition benchmark; **Passive PAB**: Funds that track an EU Paris-aligned benchmark. **Other Passive Climate Transition**: Funds that track a climate index that is neither a PAB nor a CTB. **Active Climate Transition**: Actively managed funds that invest in companies that contribute to the global decarbonization (by being aligned/aligning with the Paris Agreement or providing solutions).

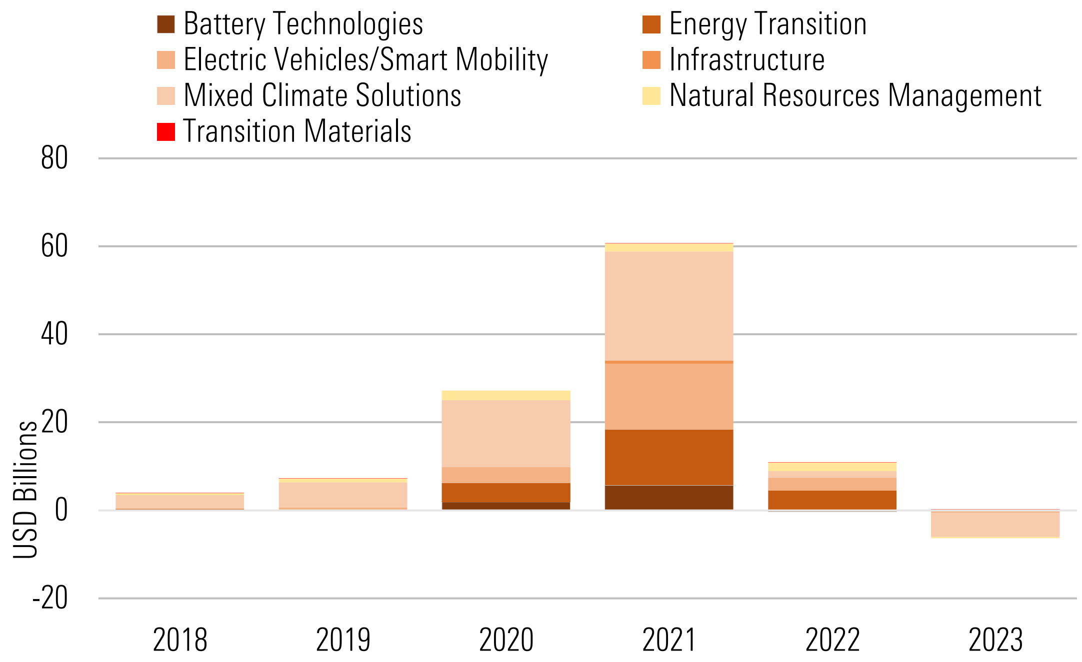
# Focus on Climate Solutions Funds Subcategories*

- Energy Transition and Electric Vehicles/Smart Mobility remain the most prominent single themes within the Climate Solutions funds category, with USD 47 billion of assets at the end of 2023, while products investing in Mixed Climate Solutions continued to dominate that category, taking up almost half of the assets.
- Of all Climate Solutions funds subcategories, only Energy Transition, Infrastructure, and Transition Materials registered net inflows last year, but these were very low. All others experienced small outflows, while Mixed Climate Solutions funds bled USD 5.5 billion.
- This stands in stark contrast to previous years, especially 2021, when investments in Energy Transition, Electric Vehicles/Smart Mobility, and Mixed Climate Solutions strategies peaked at USD 12.6 billion, USD 15 billion, and USD 25 billion, respectively.

**Assets in Climate Solutions Funds Subcategories**




**Flows Into Climate Solutions Funds Subcategories**



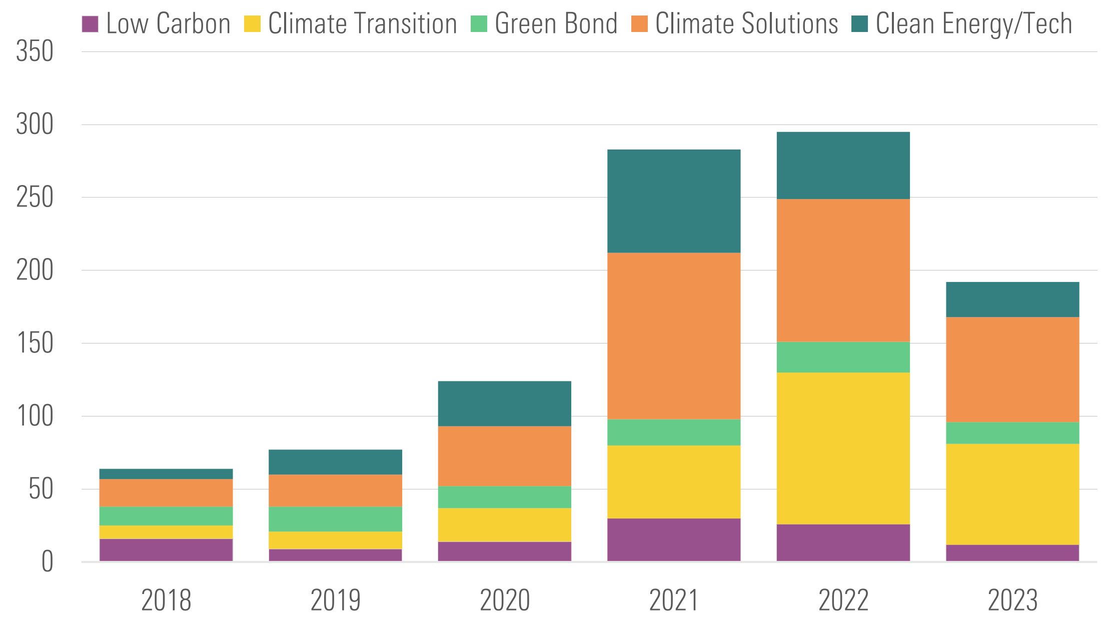

- See Appendix for the detailed definition of Climate Solutions funds subcategories

Source: Morningstar Direct. Manager Research. Data as of December 2023.

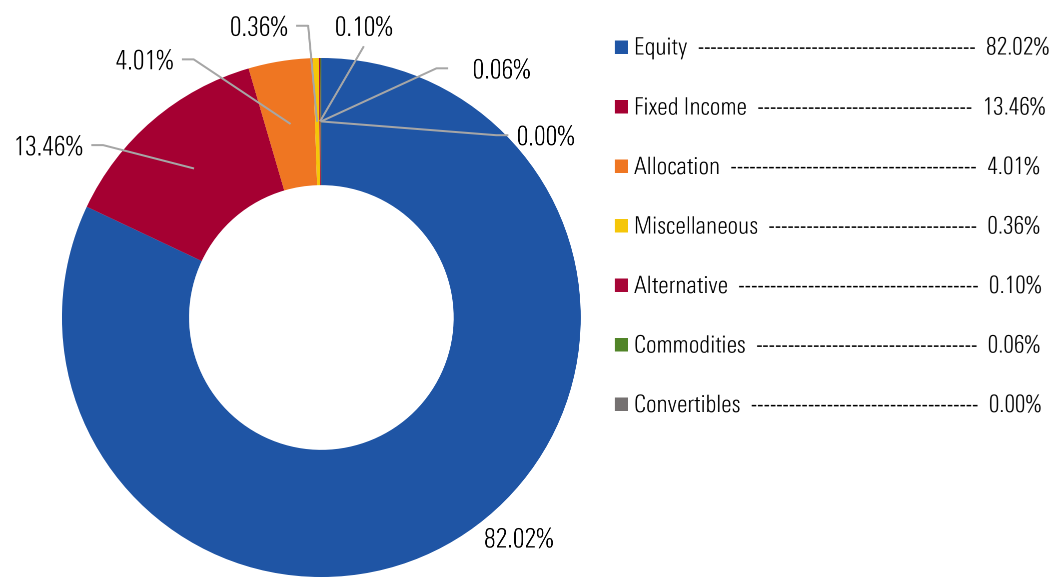
# Product Development Faces New Trough, While Equities Remain Overwhelmingly Represented

- New climate strategies of all types continued hitting the shelves in 2023, driven by investor demand and asset managers' net zero commitments.
- Launches, however, tumbled to 193, from 320 in the previous year. The marked slowdown was in line with the trend observed in the broader market and can be attributed largely to the uncertain economic and industrial outlook.
- As in the past, Climate Transition and Climate Solutions funds took up most of the new offerings.
- As is customary with sustainable funds, equity strategies dominate the climate funds universe, representing 82% of climate-offering assets as of December 2023. Fixed-income products expanded to over 13.5% (from 12% in 2022).
- Out of the 1,048 equity funds, almost one fifth (202) offer global exposure, with more than half (118) focused on large-cap companies. Out of the 268 fixed-income strategies, about half (106) provide global exposure.

### Global Launches of Climate Funds by Climate Category




### Asset Class Breakdown of Global Climate Funds




Source: Morningstar Direct. Morningstar Research. Data as of December 2023.

# The European Climate Funds Landscape

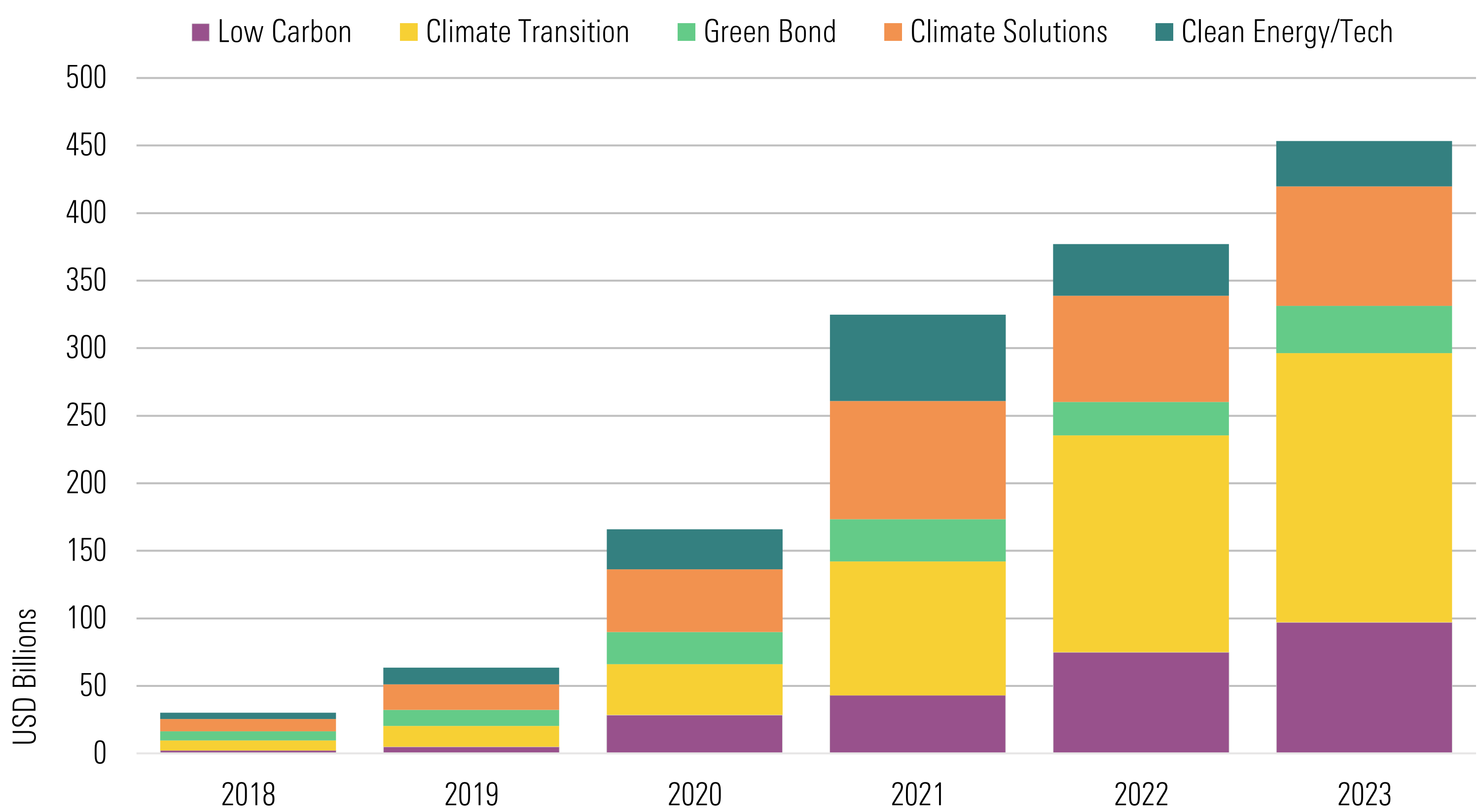
# Assets in European Climate Funds Climb to New Highs

- Assets of Europe-domiciled climate funds grew by 20% in 2023 to a new peak at USD 453 billion, representing 875 out of the 1,506 climate funds identified globally. This is despite the looming recession risk and continued geopolitical tensions.

- The most significant asset growth was observed among Green Bond strategies, which collectively expanded by 42% to USD 35 billion. Meanwhile, Low Carbon and Climate Transition strategies experienced growth of 30% and 24%, respectively. By contrast, clean energy/tech stood out as the sole category to experience a decline, with a 12% loss compared with 2022.

- Along with the unwaning demand to finance capital-intensive decarbonization projects, regulatory advancements remained a key driver for the development of Green Bond strategies. In November 2023, the EU Council adopted the European Green Bond Standard, marking the last major step for the establishment of a new European Green Bonds Label, which aims to address greenwashing and helps advance the sustainable finance market in the EU. The new regulation also includes voluntary disclosure guidelines for other environmentally sustainable bonds and sustainability-linked bonds issued in the EU.

**Assets in European Climate Funds**




Source: Morningstar Direct. Manager Research. Data as of December 2023.

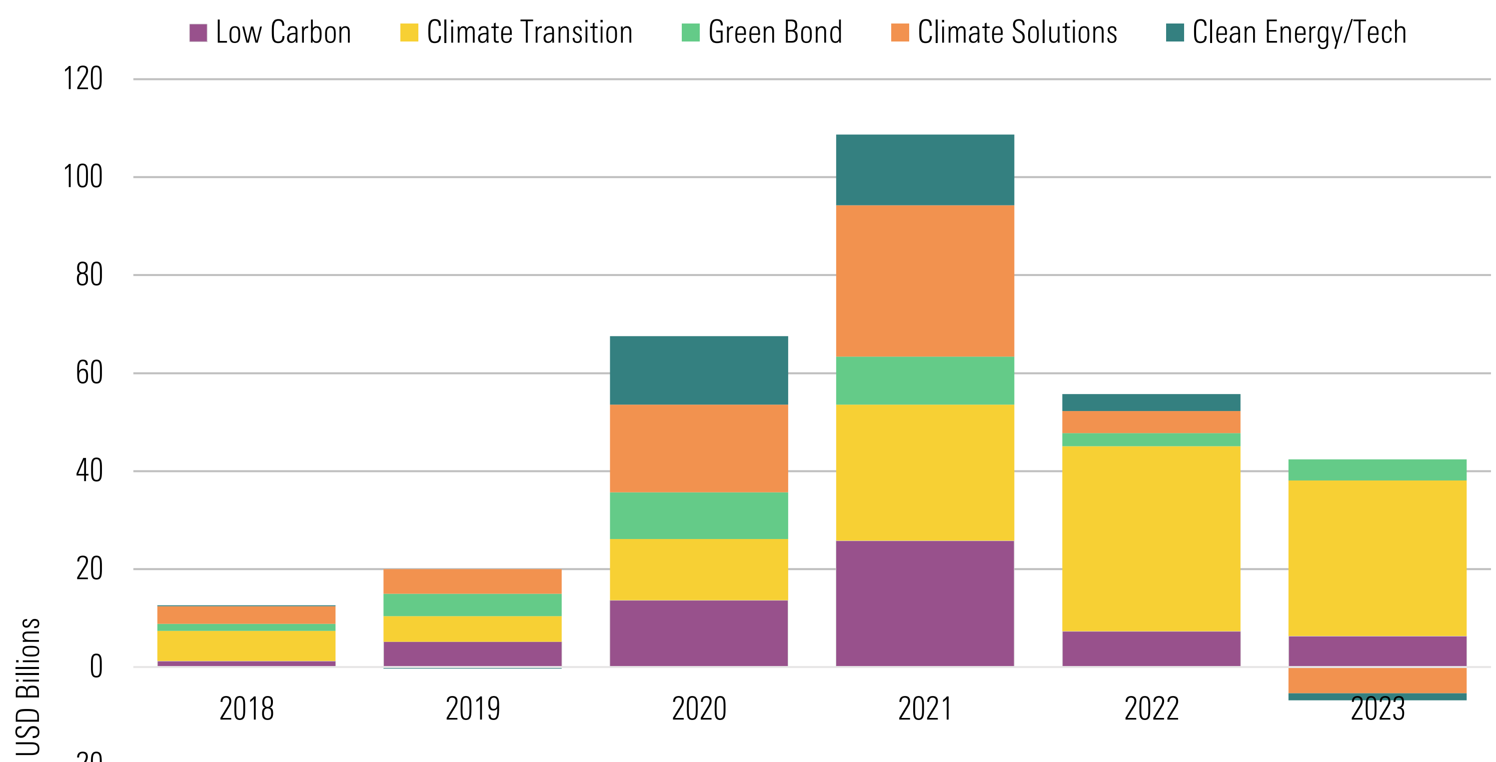
# Climate Transition Funds Show Resilience and Are Attracting Most of the New Money

- Over the full year 2023, climate funds in the European universe declined to USD 35 billion compared with the previous year's USD 57 billion. These subscriptions still represented almost half of the total inflows into sustainable funds in 2023.

- By comparison, European sustainable funds collected USD 74 billion last year, while traditional funds registered outflows of USD 30 billion.

- The decline in climate fund inflows last year can be attributed mostly to the substantial redemptions from Climate Solutions and Clean Energy/Tech strategies, and to a lesser extent the decelerated flows into the Climate Transition category over the second half of 2023.

**Annual Flows of European Climate Funds**




Source: Morningstar Direct. Manager Research. Data as of December 2023.

# Climate Transition Funds Top the Flow Leader Table

**2023 Flow Leaders & Laggards European Climate Funds**

| Name | Climate Category | Net Flows (USD, Mil) | AUM (USD, Mil) |
|---|---|---|---|
| BlackRock Climate Transition World Equity Fund | Climate Transition | 5,347 | 11,924 |
| iShares MSCI USA ESG Enhanced ETF | Climate Transition | 5,297 | 14,741 |
| Mercer Passive Sustainable Global Equity CCF | Climate Transition | 1,829 | 3,667 |
| iShares MSCI Europe ESG Enhanced ETF | Climate Transition | 1,762 | 4,874 |
| iShares MSCI EM ESG Enhanced ETF | Climate Transition | 1,449 | 4,074 |
| iShares Green Bond Index Fund (IE) | Green Bond | -1,705 | 1,518 |
| Pictet Global Environmental Opportunities | Climate Solutions | -1,061 | 8,183 |
| Amundi Index MSCI North America | Climate Transition | -823 | 1,941 |
| UBS MSCI ACWI Socially Responsible ETF | Low Carbon | -776 | 2,507 |
| UBS Equities Global Climate Aware II | Climate Transition | -665 | 1,313 |

- With an annual net inflow of over USD 5.3 billion, **BlackRock Climate Transition World Equity Fund** topped the flow leaderboard. The fund applies a proprietary Climate Transition Scoring Methodology which evaluates and scores the "transition readiness" of companies in terms of (a) energy production, (b) carbon efficient technology, (c) energy management, (d) water management band, and (e) waste management, combined with industry-specific materiality weighting.

- **iShares MSCI USA ESG Enhanced ETF** came in a close second, boasting a sizable AUM of 14.7 billion USD and impressive annual net flows in 2023 of USD 5.3 billion. This fund tracks an index that uses an optimization process to exceed the 7% decarbonization target and other minimum standards required for an EU Climate Transition Benchmark while maximizing issuers' ESG ratings.

- The five best-selling climate funds in 2023 were climate transition strategy, four of which were offered by BlackRock.

- Among the major flow laggards, **iShares Green Bond Index Fund** registered the largest annual outflow of USD 1.7 billion, though the flow performance of the green-bond category proved resilient against the economic headwinds including persistent high inflation rates and risks of recession.

- In a distant second is **Pictet Global Environmental Opportunities,** which lost USD 1.1 billion. Sitting in the climate solutions category, this active strategy favors companies operating in services, infrastructures, technologies, and resources with products and services that maximize resource efficiency and help diminish pollution.

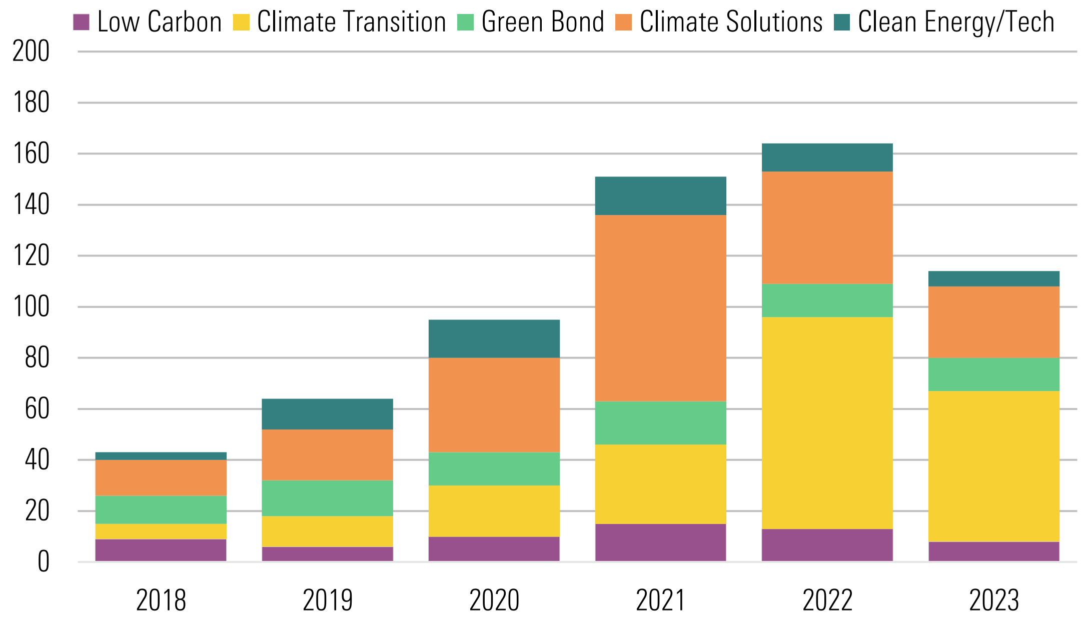
- We also see two climate transition strategies among the flow laggards including **Amundi Index MSCI North America** and **UBS Equities Global Climate Aware II**.

Source: Morningstar Direct. Manager Research. Data as of December 2023.

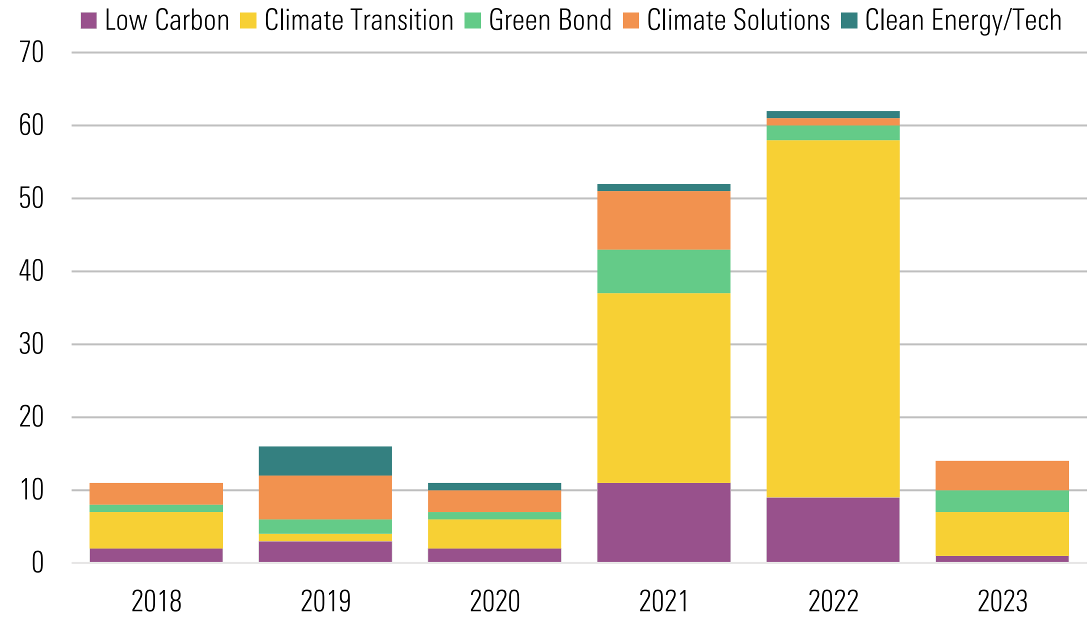
# Fund Launches and Rebranding Subdued

- In line with the broader fund universe, product development of European climate funds experienced a slowdown, with the number of new launches reaching a historical low of 115 in 2023, compared with 169 one year prior. The deceleration in product development was mostly evident for the climate solution category where new launches almost halved. Climate Transition strategies took up over half of the new launches, followed by Climate Solutions funds (27) and Green Bond funds (13).
- Rebranding and repurposing activity also subdued after cracking up a record high of 66 in 2022, which consisted mostly of passive products converted to Paris-aligned or climate transition strategies.
- Repurposing a traditional strategy or tweaking a sustainable one into a climate-flavored product typically involves reducing the portfolio's allocation to the most carbon-intensive companies and/or increasing exposure to more climate-friendly securities.

**Number of European Climate Fund Launches**




**Number of European Rebranded/Repurposed Climate Funds**

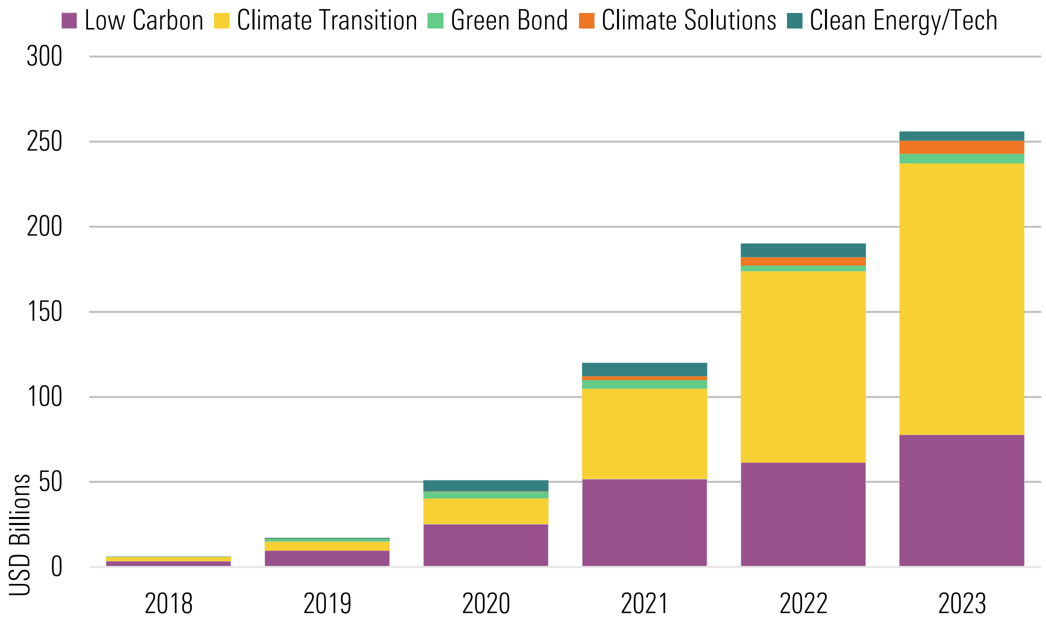



Source: Morningstar Direct. Manager Research. Data as of December 2023.

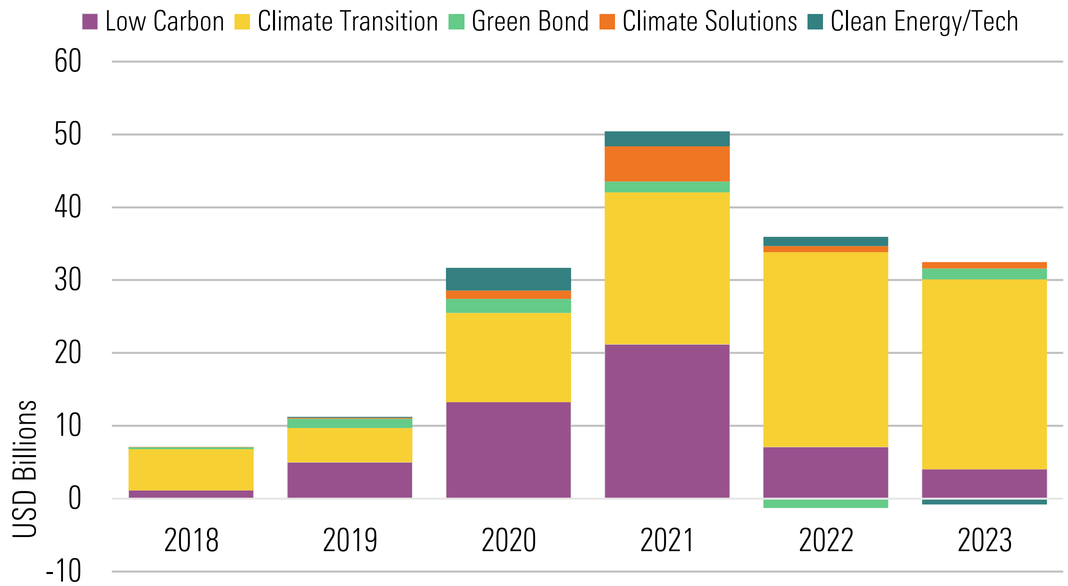
# The Unstoppable Rise of Passive Climate Strategies

- In Europe, index funds and ETFs with a climate flavor pocketed almost the entirety (91%) of the region's overall climate funds' inflows in 2023. Climate Transition funds pocketed over USD 26 billion, which took up over four fifths of the entire inflows into the passive European climate strategies.
- Passive funds with a climate flavor totaled USD 256 billion at the end of 2023, expanding by 36% from 2022 and by 113% in the last three years.
- Passive strategies comprise 56% of the total assets in climate funds. Their proliferation can be explained by the continued innovation in indexing and improved ESG data quality.
- The Climate Transition grouping boasts the highest share (62%) in passive climate strategies, driven by the Regulation on the EU Climate Transition Benchmarks in 2019.
- Plagued mostly by high interest rates and inflation, passive Clean Energy/Tech experienced the most significant asset losses, plummeting by 30%.

**Assets in European Passive Climate Funds**




**Flows in European Passive Climate Funds**




Source: Morningstar Direct. Manager Research. Data as of December 2023.

# SFDR: One Third of Climate Funds Classified as Article 9

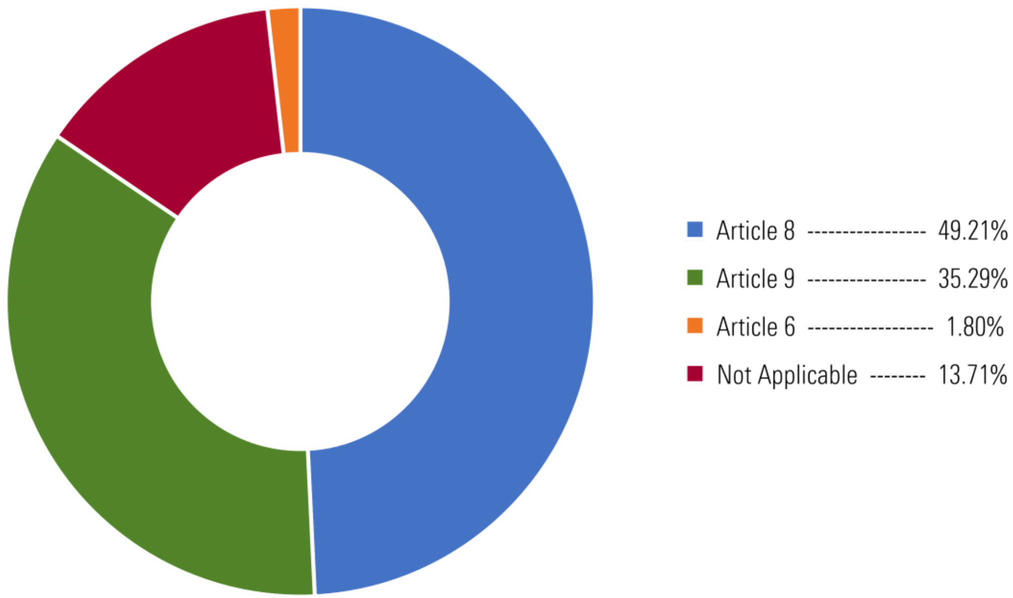
- Following the reclassification wave of Paris-aligned and climate-transition passive funds from Article 9 to Article 8 between late 2022 and early 2023, the market share of Article 9 climate funds dropped to about one third (35% or USD 159 billion) as of December 2023

- Article 8 funds now account for half of the European climate fund universe (USD 226 billion) compared with 16% and USD 52 billion at the end of 2021.

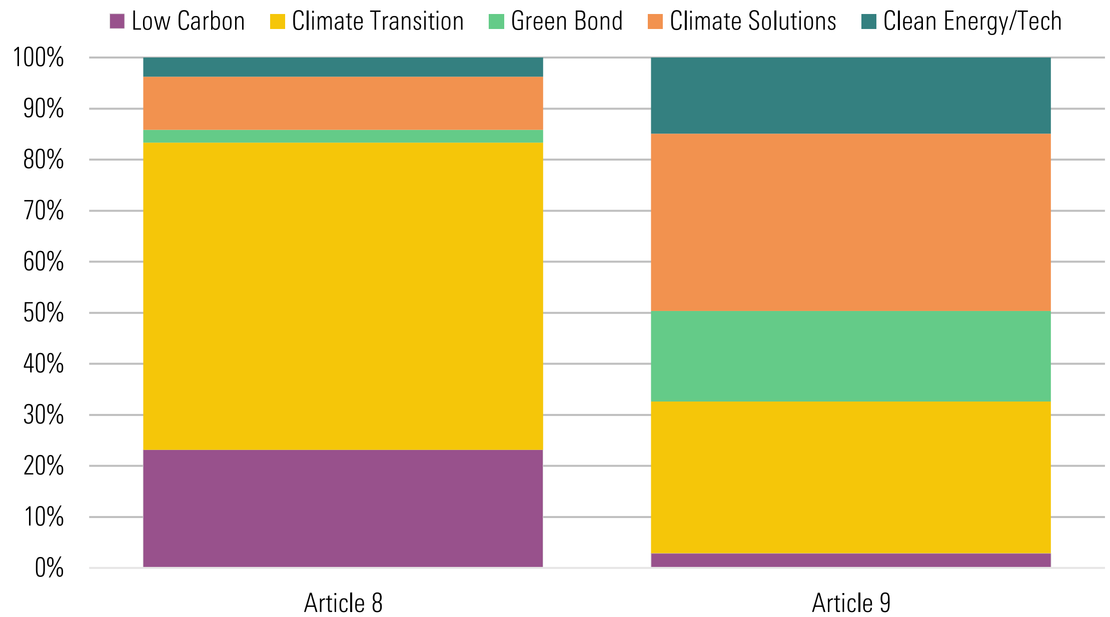
- The Article 9 climate fund group consists of a balanced distribution of strategies among which Climate Solutions and Climate Transition emerge as the dominant groupings (35% and 30%, respectively), followed by Green Bond (18%), and Clean Energy/Tech (15%).

- Climate Transition remains the largest climate fund grouping in the Article 8 category, housing 60% of the assets, followed by Low Carbon (23%).

### European Climate Funds Broken Down by SFDR Fund Type




### European Climate Funds by SFDR Type




Source: Morningstar Direct. Manager Research. Data as of December 2023.

# The Chinese Climate Funds Landscape

# Economic Challenges Weigh on Chinese Climate Funds Despite Policy Supports

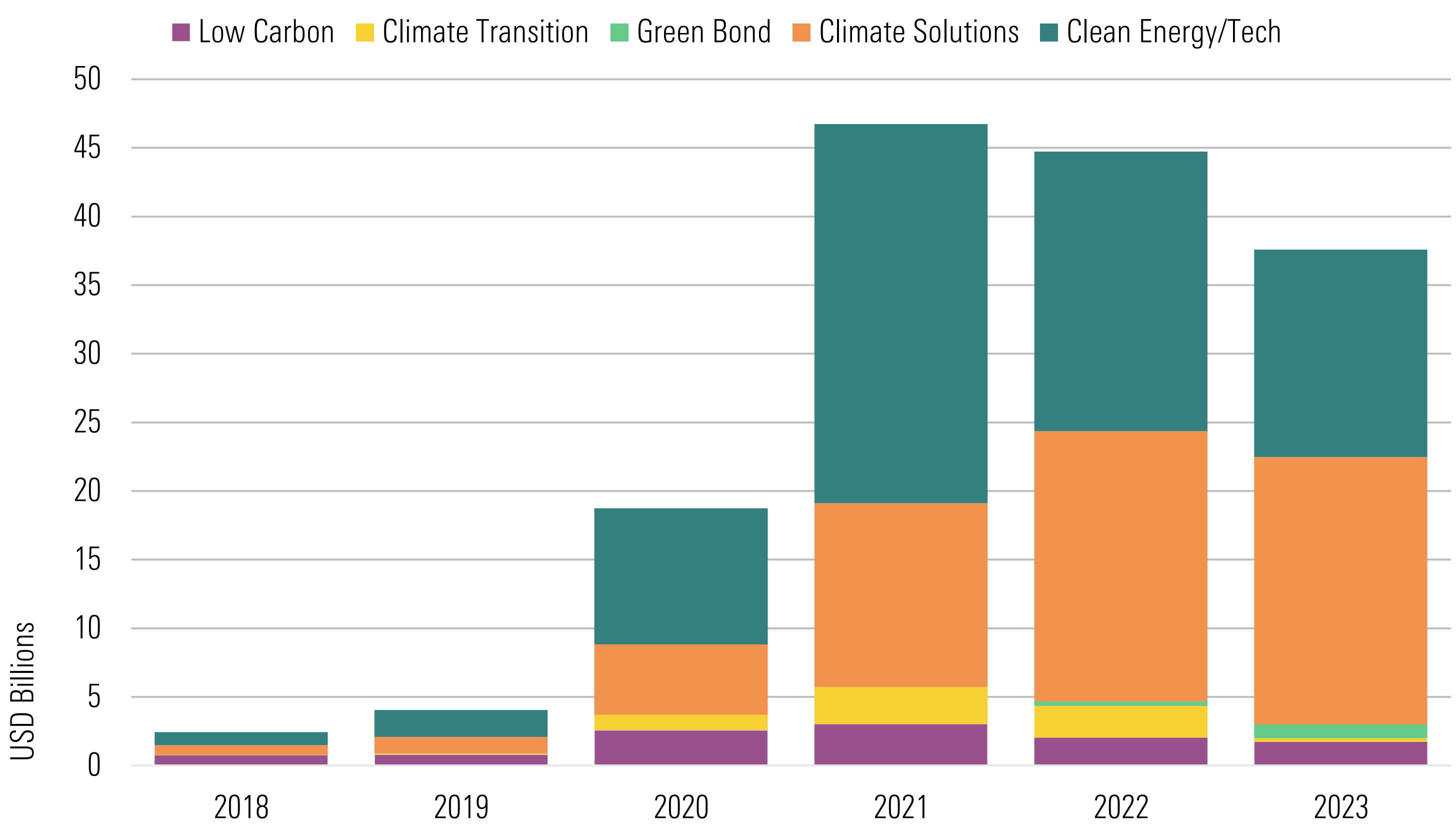
- Assets of China-domiciled climate funds shrank by 20% to USD 39 billion in 2023 amidst a range of economic challenges dragging the country's outlook.

- As in the past, Climate Solutions and Clean Energy/Tech funds towered over other climate strategies, taking up almost 90% of the assets in the Chinese universe. Low Carbon and Climate Transition strategies remained less favored.

- Under the central leadership's unshaken commitment to the "double carbon" goal, numerous fiscal incentives have mushroomed at the provincial and municipal levels, including monetary rewards for companies realizing annual carbon emission-reduction targets, subsidies for R&D projects contributing to energy-efficiency improvement and carbon neutrality, and reduction of purchase tax of new electric vehicles.

- Along with the policy supports, the dominance of the Climate Solution and Clean Energy/Tech categories was also boosted by a handful of sizable passive strategies tracking the CSI New Energy Index and CSI Guo Xin Central SOE New Energy Index. Launched in August 2023, the latter consists of 50 large state-owned enterprises that serve as the driving forces of energy transition and national energy security under the direct supervision of the Chinese state council.

**Assets in Chinese Climate Funds**

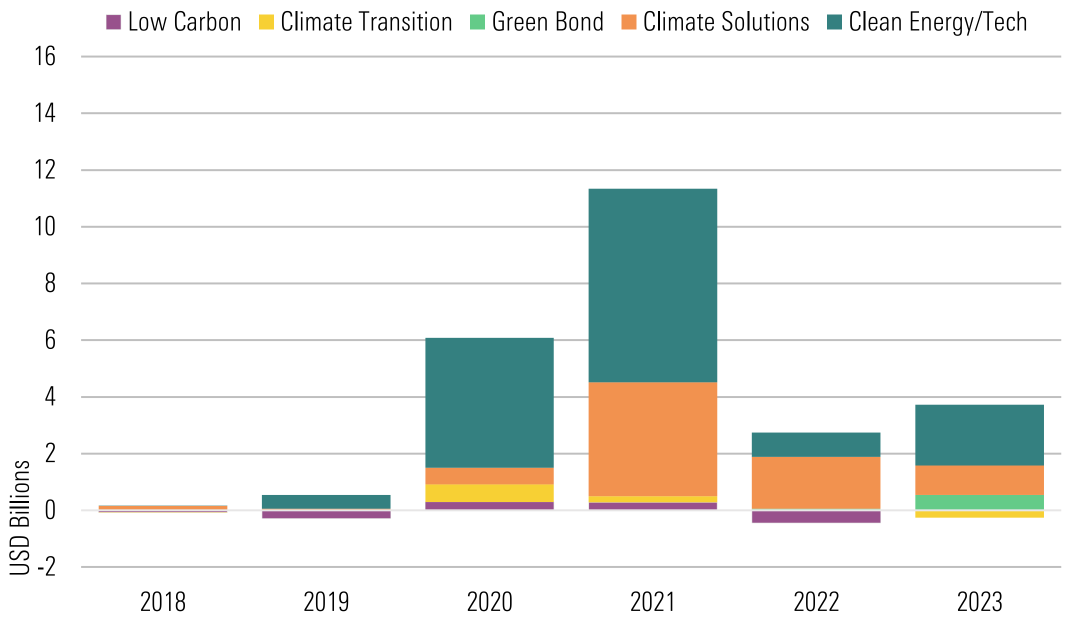



Source: Morningstar Direct. Manager Research. Data as of December 2023.

# The Deceleration of Flows and Product Launches Continues

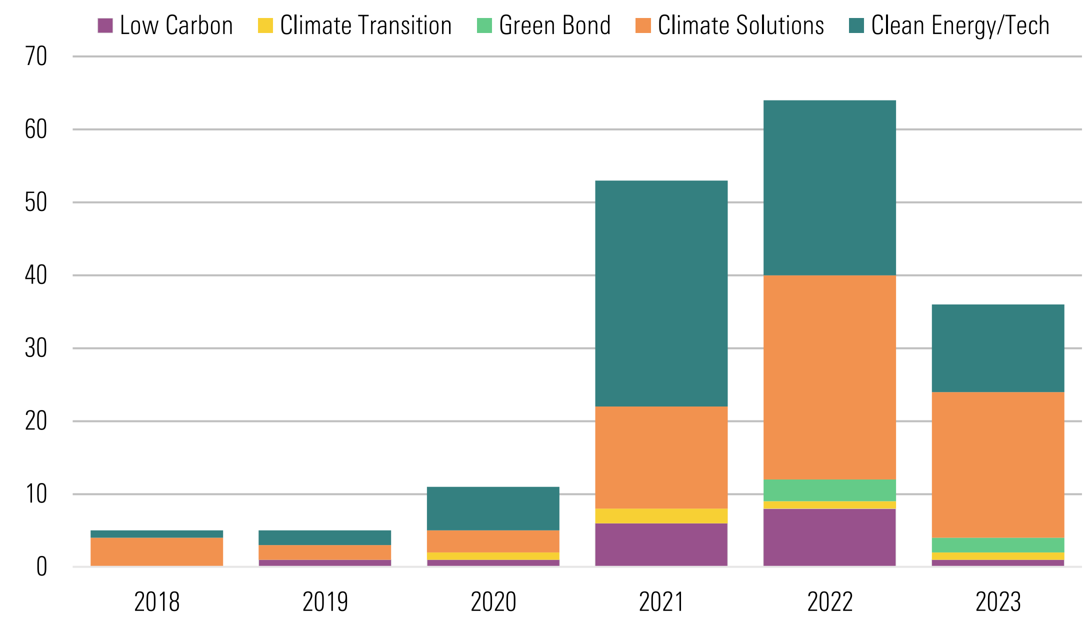
- In 2023, Chinese climate funds attracted USD 3.4 billion of net new money, a pickup from 2022 driven mostly by clean energy/tech strategies whose flows more than doubled from the previous year.
- Flows into Chinese climate funds tend to exhibit greater volatility, as new subscriptions are often driven by the speculative behavior of local retail investors.
- Clean Energy/Tech and Climate Solutions gathered almost the entirety of the new money. Meanwhile, inflow to Green Bonds saw exponential growth though its share remains rather trivial.

### Annual Flows Into Chinese Climate Funds




- In line with the decelerated pace of product development observed in the broader fund universe, climate fund launches in China plunged further to 36 in 2023.
- Climate Solutions funds (18) continue to dominate the product development activity, followed by Clean Energy/Tech funds (12). Aided by subsidies and driven by policy mandate, clean energy technologies and materials, electric vehicles, storage technologies, decarbonization technologies, and circular economy feature prominently in new thematic strategies labeled "carbon neutrality" or "deep low carbon."

### Launches of Chinese Climate Funds




Source: Morningstar Direct. Manager Research. Data as of December 2023.

# Divergent Flow Attraction Amidst Climate Solutions and Clean Energy/Tech Dominance

**2023 Flow Leaders & Laggards Chinese Climate Funds**

| Name | Climate Category | AUM (USD, Bil) | Net Flows (USD, Mil) |
|---|---|---|---|
| ChinaAMC CSI New Energy Car Industry ETF | Climate Solutions | 1.18 | 449 |
| E Fund pro-environment Allocation | Climate Solutions | 0.71 | 353 |
| Penghua New Energy Vehicle Mixed Securities | Climate Solutions | 0.28 | 348 |
| E Fund CSI SEEE CARBON NEUTRAL ETF | Climate Solutions | 0.21 | 330 |
| Huatai-PB CSI Photovoltaic Industry ETF | Clean Energy/Tech | 1.61 | 327 |
| ABC-CA New Energy Theme Hybrid Fund | Clean Energy/Tech | 1.50 | -720 |
| ICBCCS Green Energy Car Theme Allocation | Climate Solutions | 0.56 | -517 |
| AIFMC Green Invest Fund | Climate Solutions | 0.68 | -356 |
| ChinaAMC New Energy Fund | Clean Energy/Tech | 1.78 | -336 |
| Fullgoal Low Carbon New Economy Mix | Low Carbon | 0.22 | -315 |

**The Largest Chinese Climate Funds**

| Name | Climate Category | AUM (USD, Bil) |
|---|---|---|
| ChinaAMC New Energy Fund | Clean Energy/Tech | 1.78 |
| Huatai-PB CSI Photovoltaic Industry ETF | Clean Energy/Tech | 1.61 |
| Orient Secs Green Energy Car Allocation | Climate Solutions | 1.52 |
| ABC-CA New Energy Theme Hybrid Fund | Clean Energy/Tech | 1.50 |
| China Universal New Energy Car Ind Index LOF | Climate Solutions | 1.40 |
| TianHong CSI Photovoltaic Industry Index | Clean Energy/Tech | 1.36 |
| ChinaAMC CSI New Energy Car Industry ETF | Climate Solutions | 1.18 |
| Fullgoal China Secs new energy vehicles | Climate Solutions | 1.17 |
| Cinda New Energy Industry Stock Fund | Clean Energy/Tech | 1.13 |
| China Southern CSI New Energy ETF | Clean Energy/Tech | 0.91 |

- As with the fund universe, Climate Solutions ((six) and Clean Energy/Tech (three) strategies dominated the flow leaders and laggards. **China Southern CSI New Energy ETF** showed up as a newcomer in the largest climate fund list. The Clean Energy/Tech strategy tracks the Chinese Securities New Energy Index, which covers four specific themes related to renewable energy generation, application, storage, and transactive systems.

- In comparison, **ChinaAMC New Energy Fund**, which topped the list on the exhibit to the left, focuses mostly on renewable energy generation and resource exploitation, including solar, photovoltaics, wind, nuclear, hydroelectricity, shale gas, hydrogen, and geothermal energy.

- This year’s most noticeable regulatory advancement related to China's green and climate finance is a consultation paper issued in April by the Hong Kong Stock Exchange under which mandatory disclosure of climate-related risk metrics that are in accordance with the International Sustainability Standards Board should begin in January 2024.

- In July 2023, China's National Financial Regulatory Administration, or NFRA, issued a draft on easing rules on foreign investment in asset-management businesses as part of efforts to attract overseas investors. The NFRA proposes to allow multinationals to directly initiate the establishment of foreign-funded financial companies including asset-management companies.

- An example is **Neuberger Berman China Green Bond,** which was launched onshore solely by Neuberger Berman in September after gaining approval from the China Securities Regulatory Commission, or CSRC, for independent fund business operation.

# The US Climate Funds Landscape

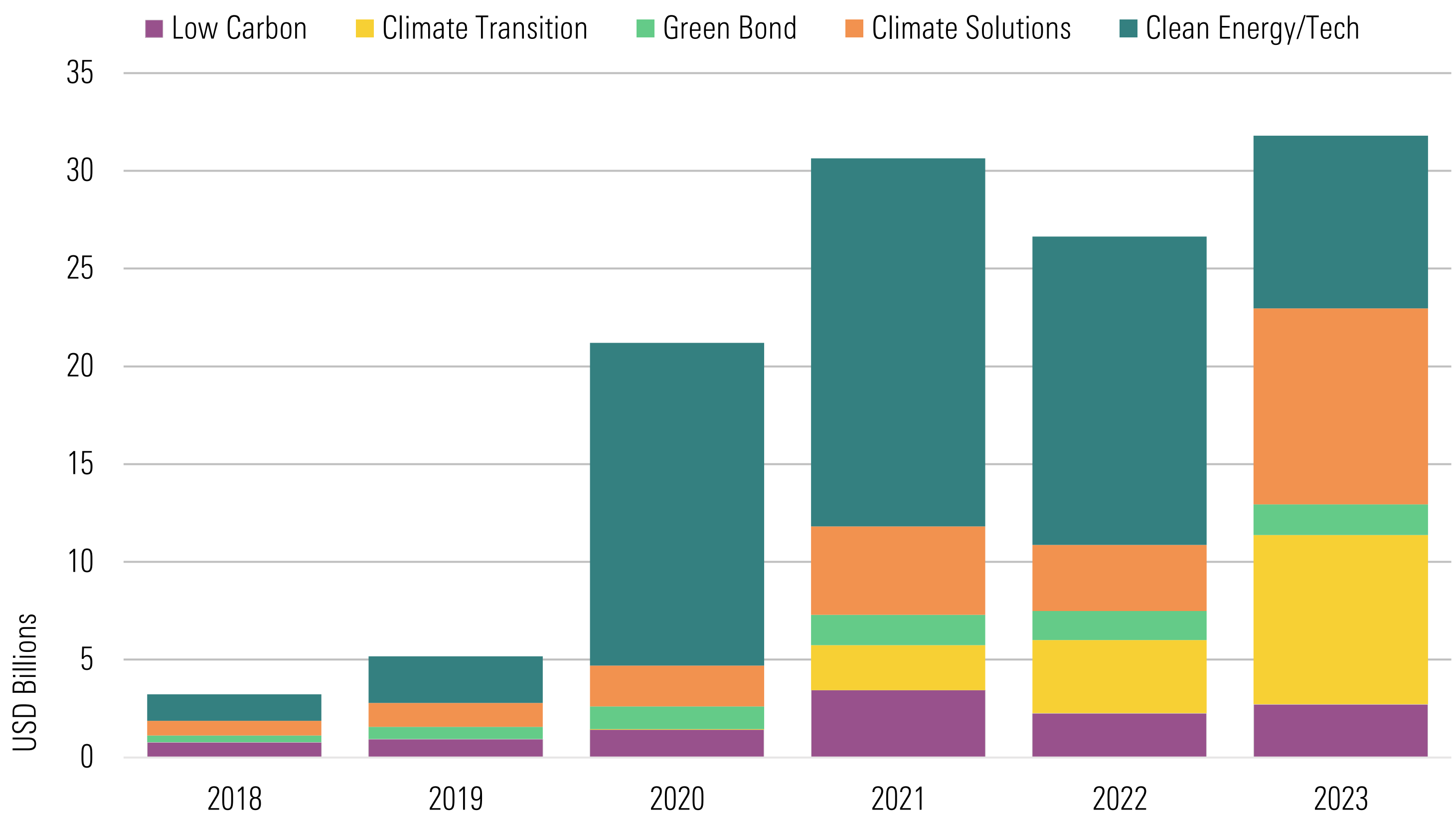
# The US Climate Fund Market Remains Subdued, but Climate Transition Funds Gain Popularity

- In stark contrast with Europe, assets in US climate funds increased marginally (by 0.6%) over 2023. Assets shrank in 2022 on account of the global energy crisis and rising interest rates. In this environment, renewable energy stocks suffered the most. But strong flows into Climate Transition funds and market appreciation sent assets to a new record of USD 31.9 billion at the end of 2023.

- While clean energy/tech funds remain dominant among US climate funds, they have lost assets and other categories have gained ground. As of December 2023, clean energy/tech funds accounted for almost USD 10.2 billion in assets, or 32% of the total, down from a record 78% of market share at the end of 2020. Although these funds have suffered outflows, the decline is mostly attributable to falling valuations. Clean/Energy Tech funds tend to have high exposure to growth stocks, which often suffer in a rising-rate environment.

- Meanwhile, assets in Climate Transition funds have grown a whopping 133% over the past year to reach USD 8.8 billion at the end of December. These funds netted USD 3.7 billion in flows over that time.

**Assets in US Climate Funds**




Source: Morningstar Direct. Manager Research. Data as of December 2023.

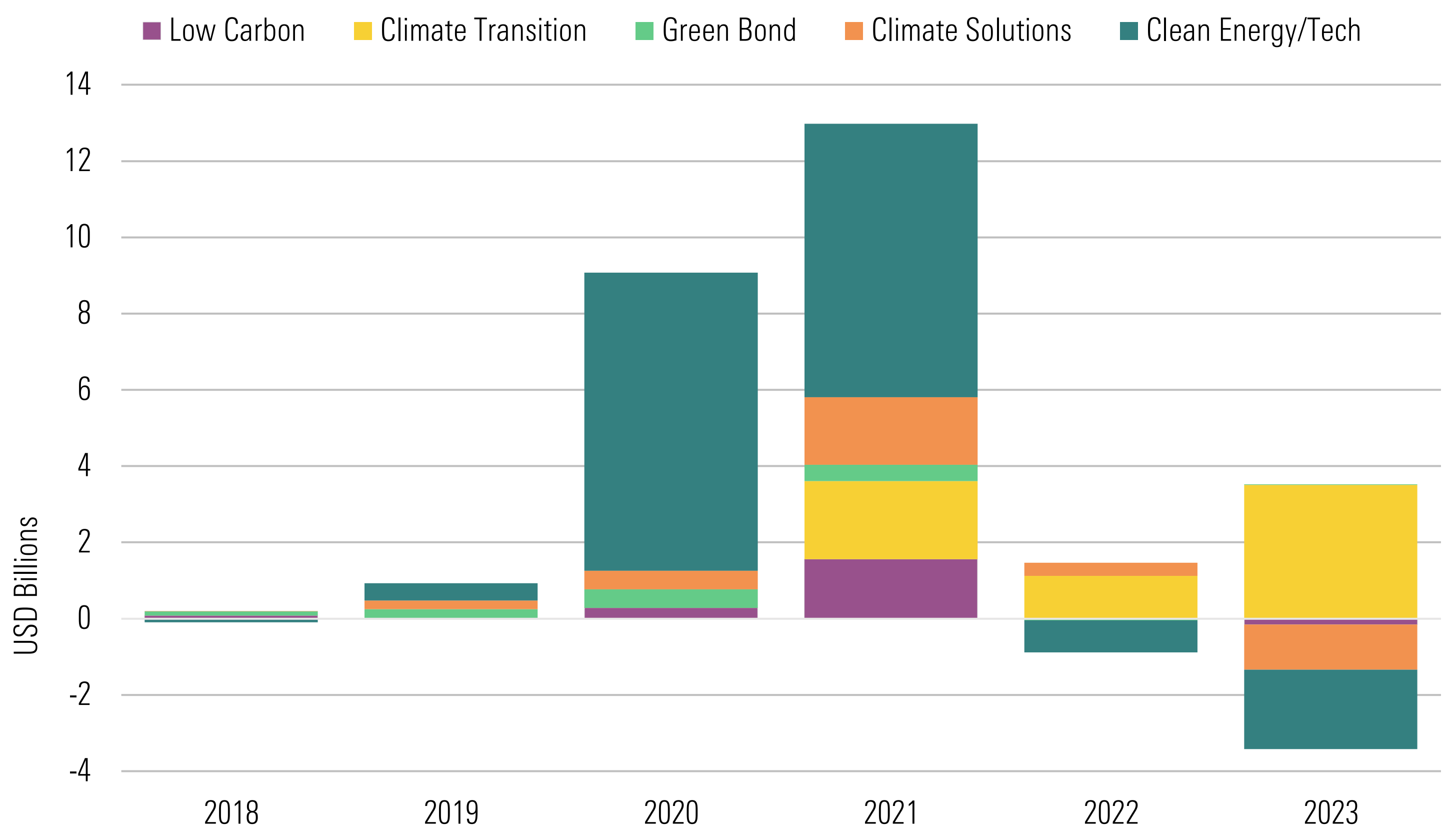
# Climate Transition Funds Attract Most of the Flows, While Clean Energy/Tech Funds Bleed Money

- Except for Climate Transition funds, attracting new money wasn't easy for US climate funds in 2023. Flows into US climate funds fell significantly compared with the segment's record USD 16 billion collection in 2021. Still, flows into climate funds were more resilient than in the rest of the US sustainable funds landscape, where 2023 annual flows sank to their lowest level in seven years, and sustainable funds shed more than USD 13 billion. Climate funds, on the other hand, gained USD 330 million in net new money in 2023.

- Climate Transition funds were the clear winners in 2023, attracting USD 3.7 billion. More than three fourths of this haul went to Xtrackers MSCI USA Climate Action Equity ETF and iShares Climate Conscious & Transition MSCI USA ETF alone. Both funds track indexes that lean into companies that are well-positioned for the transition to a low-carbon economy or that are actively engaging in the climate transition relative to peers.

- While Climate Transition funds topped the chart of flow recipients in 2023, clean energy/tech funds experienced outflows of USD 2.1 billion in 2023.

**Flows Into US Climate Funds**

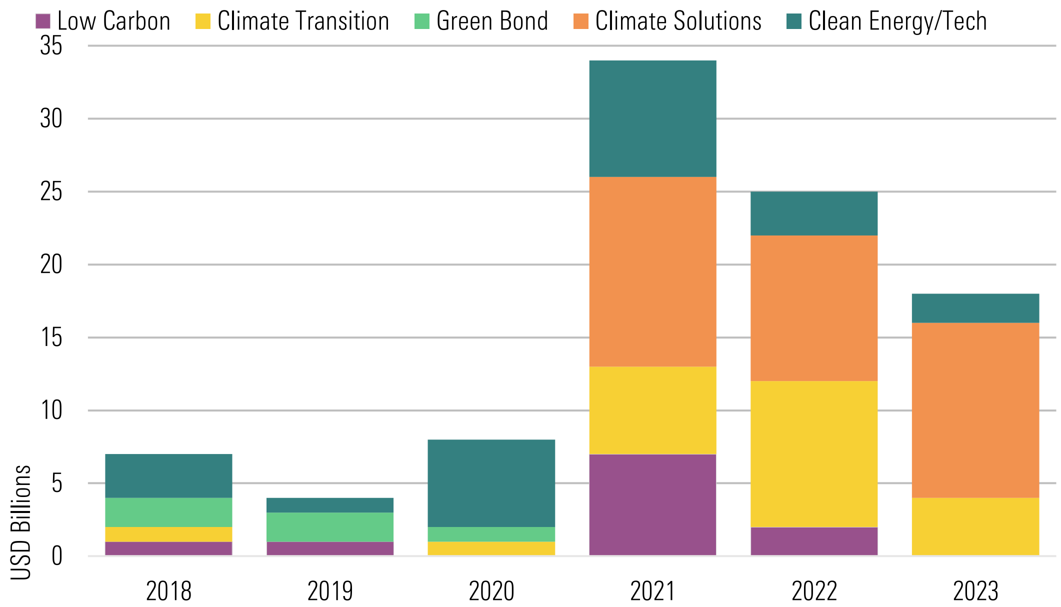



Source: Morningstar Direct. Manager Research. Data as of December 2023.

# Product Development Activity Declines

- In line with the broader fund market, product development in US climate funds has dropped since the peak in 2021. In 2023, only 18 new climate strategies were launched, roughly half of the total seen in 2021.
- More than half of new climate funds focus on climate solutions, or those companies that focus on the infrastructure necessary to support the energy transition. For instance, John Hancock Global Climate Action invests in companies defined as climate leaders and derive at least 20% of revenue from renewable energy, energy efficiency, or electric vehicles.
- New launches in 2023 bring the total number of climate funds in the US to 135. New to last year's top 10 climate funds are iShares Climate Conscious & Transition MSCI USA ETF, Xtrackers MSCI USA Climate Action Equity ETF, and iShares Paris-Aligned Climate MSCI USA ETF. The first two launched in 2023's second quarter but quickly shot up the ranks of the largest US climate funds.

## Launches of US Climate Funds




## 2023 Flow Leaders & Laggards US Climate Funds

| Name | Climate Category | Net Flows (USD, Mil) | AUM (USD, Mil) |
|---|---|---|---|
| iShares Paris-Aligned Climate MSCI USA ETF | Climate Transition | 950 | 1,539 |
| GMO Climate Change Fund | Climate Solutions | 315 | 827 |
| Xtrackers EM Carbon Reduction and Climate Improvers | Climate Transition | 166 | 812 |
| SPDR® MSCI ACWI Climate Paris Aligned ETF | Climate Transition | 146 | 260 |
| TIAA-CREF Social Choice Low Carbon Equity Fund | Low Carbon | 146 | 1,221 |
| Global X Lithium & Battery Tech ETF | Climate Solutions | -753 | 2,083 |
| First Trust NASDAQ® Clean Edge® Green Energy Index Fund | Clean Energy/Tech | -439 | 1,139 |
| iShares MSCI ACWI Low Carbon Target ETF | Low Carbon | -245 | 861 |
| Fidelity Environment and Alternative Energy Fund | Clean Energy/Tech | -218 | 517 |
| Global X Autonomous & Electric Vehicles ETF | Climate Solutions | -191 | 713 |

# The Climate Funds Landscape in the Rest of the World

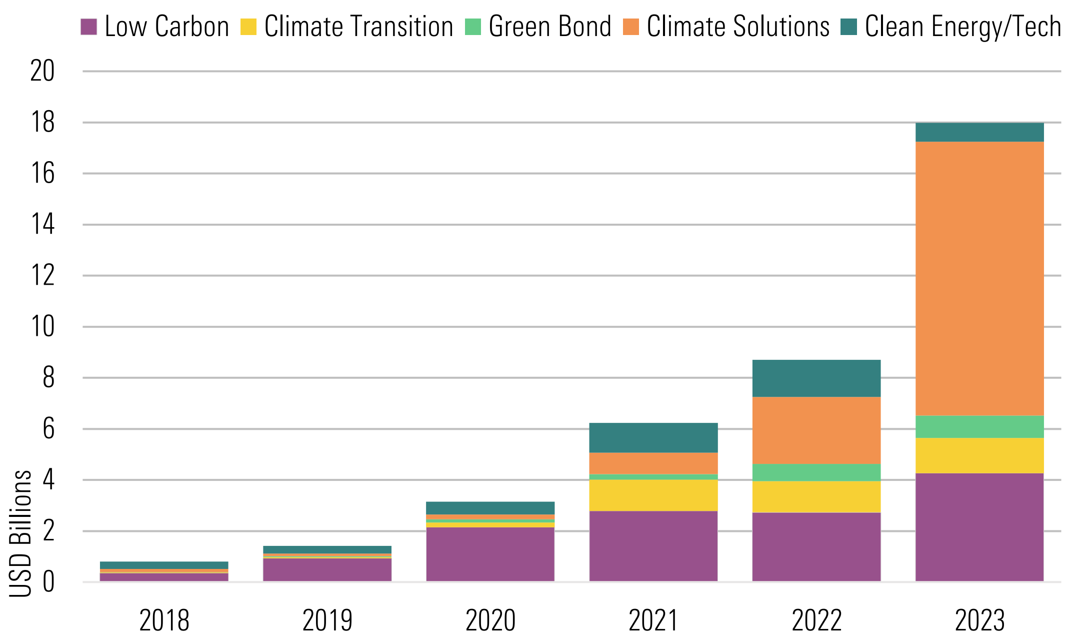
# A Steady Recovery: South Korea, Australia, and Taiwan Dominate the Space

- Climate funds outside of Europe, the US, and China represent a small universe, but their assets recovered steadily over the past 12 months to a new high of USD 15.7 billion in December 2023 thanks mainly to market appreciation.

- Climate Solutions continued to be the dominant strategy, taking up almost two thirds of the assets in this universe. In the distant second is the Low Carbon strategy (21%), of which the assets totaled USD 3.3 billion after growing by over 50%.

- As for the geographical distribution, South Korea topped the list in terms of both numbers and assets, after overtaking Australia and Canada. Climate Solution and Clean Energy/Tech strategies took over almost the entirety (64 out of 70) of the Korean climate fund universe, reflecting the commitment of the government and businesses to renewable energy transition.

## Assets in Climate Funds in Rest of World




## Climate Funds in Rest of World

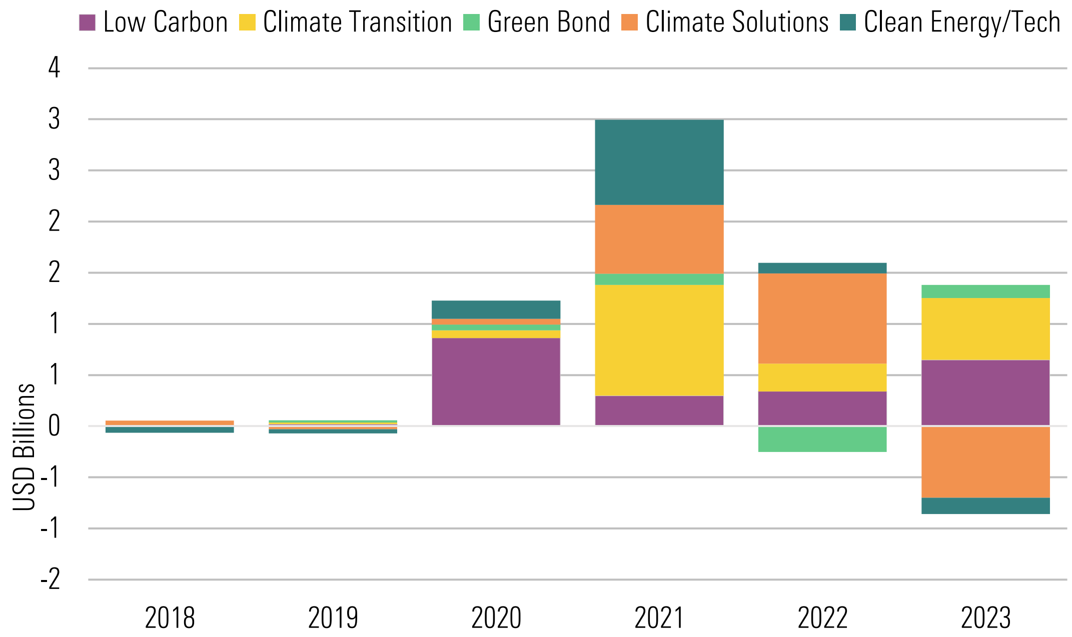
| Country | Number of Climate Funds | AUM (USD, Mil) |
|---|---|---|
| South Korea | 69 | 8,206 |
| Australia | 38 | 3,120 |
| Canada | 48 | 2,514 |
| Taiwan | 27 | 2,214 |
| Japan | 27 | 1,007 |
| Singapore | 7 | 669 |
| India | 1 | 104 |
| Malaysia | 3 | 98 |
| Thailand | 2 | 35 |
| Chile | 2 | 13 |
| Brazil | 3 | 2 |
| Indonesia | 2 | - |

Source: Morningstar Direct. Manager Research. Data as of December 2023.

# Flows Plummet

- Flows into climate funds in the Rest of World group slid to just USD 559 million over 2023 from the restated USD 2.7 billion in 2022, dragged mostly by the significant outflows from Climate Solutions funds, which bled more than USD 660 million over the past 12 months. This was in striking contrast to 2022 when the Climate Solution category accounted for almost the entirety (91%) of the annual inflows.
- Meanwhile, we see a comeback for Climate Transition funds in the group, as flows into this category rebounded to USD 560 million last year from USD 250 million in 2022.
- In line with the geographical distribution, the top five climate funds in the Rest of World are dominated by Korea-domiciled funds, four of which are in the Climate Solutions category while Russell Investments Low Carbon Global Shares Fund Class AUDH belongs to the Low Carbon category. With assets of USD 1.5 billion, **Mirae TIGER China Electric Vehicle Solactive ETF** bypassed **iShares MSCI Japan Climate Action ETF** to top the list.

## Annual Flows Into Climate Funds in Rest of World



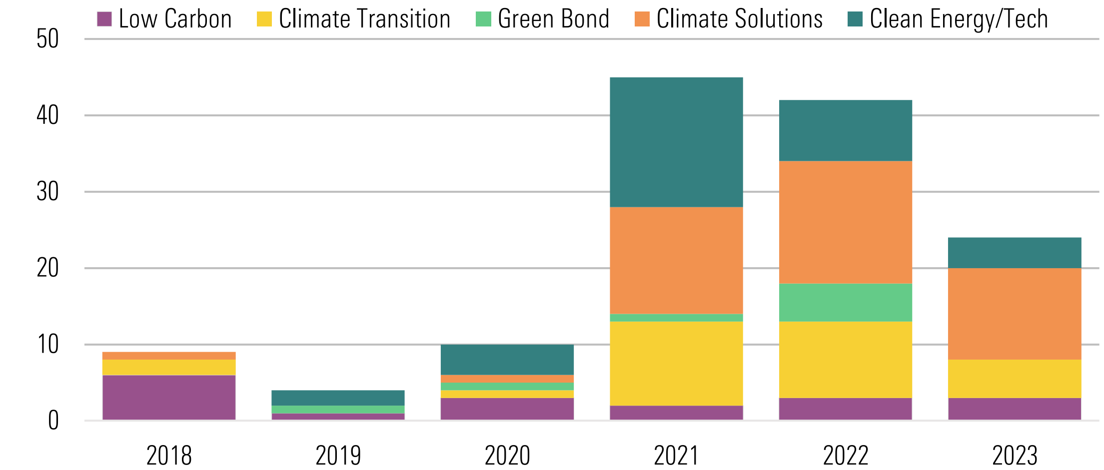

Source: Morningstar Direct. Morningstar Research. Data as of December 2023.

## Leader & Laggards Climate Funds in Rest of World

| Name | Climate Category | AUM (USD, Bil) | Net Flows (USD, Mil) |
|---|---|---|---|
| MiraeAsset TIGER China Electric Vehicle Solactive ETF | Climate Solutions | 1.46 | 647 |
| Cathay Global Autonomous and Electric Vehicles ETF | Climate Solutions | 0.63 | 547 |
| Russell Investments Low Carbon Global Shares Fund Class AUDH | Low Carbon | 0.59 | 292 |
| CTBC Battery & Energy Storage Technology ETF | Climate Solutions | 0.23 | 288 |
| KIM Global Electric Car & Battery Equity | Climate Solutions | 1.19 | 253 |
| Shin Kong 10 Years China Treasury Policy Bank Green Bond ETF | Green Bond | 0.00 | -533 |
| Russell Investments Low Carbon Global Shares Fund | Low Carbon | 0.61 | -301 |
| MiraeAsset TIGER Global Lithium & Battery Tech Solactive | Climate Solutions | 0.27 | -74 |
| Desjardins RI Canada Multifactor Net-Zero Emissions Pathway ETF | Low Carbon | 0.23 | -61 |
| MiraeAsset TIGER Secondary Battery TOP10 ETF | Climate Solutions | 0.24 | -47 |

# Cool Down of Product Development

**Number of Climate Fund Launches in Rest of World**




**Countries in Rest of World by Number of Climate Fund Launches**

| Country | Number of Newly Launched Funds | AUM (USD, Mil) |
|---|---|---|
| South Korea | 8 | 1,091 |
| Japan | 2 | 649 |
| Taiwan | 3 | 479 |
| Singapore | 1 | 467 |
| Thailand | 1 | 33 |
| Canada | 8 | 30 |
| Australia | 1 | 9 |

Source: Morningstar Direct. Manager Research. Data as of December 2023.

- In the rest of the world, fund launch activity cooled down, too. The number of newly incepted climate funds dropped by more than half from 52 for the whole of 2022 to just 24 by the end of 2023.

- South Korea again topped the list in terms of both total number and combined size. Five out of the eight new launches were in the Climate Solution category. **Capital Tip Customized Taiwan ESG Low Carbon 50 ETF** stands out as the largest launch from Taiwan with assets quickly accumulating to USD 405 million toward the year end. The passive strategy tracks the Tip Customized Taiwan ESG Low Carbon 50 Index, which first excludes Taiwan-listed companies with below BBB ESG ratings by Taiwan Index Plus and then the top 20% of the remaining firms with the highest carbon intensity. Another sizable launch is Singapore's **iShares MSCI Asia ex Japan Climate Action ETF.**

- The largest new fund last year was Japan-domiciled **iShares MSCI Japan Climate Action ETF,** which tracks an index that weights companies based on the opportunities and risks associated with the transition to a lower carbon economy.

- In a close second is **Mirae Asset TIGER Secondary Battery Material ETF**, which focuses on cathode materials and vertical integration of the secondary battery value chain in South Korea.

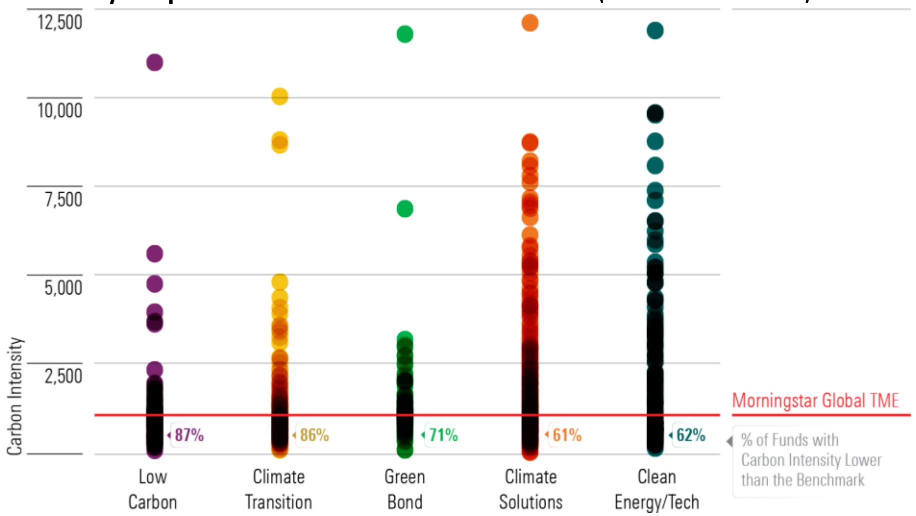
- **Capital Tip Customized Taiwan ESG Low Carbon 50 ETF** was the largest launch from Taiwan with assets quickly accumulating USD 405 million by the end of the year. The fund excludes companies with low ESG ratings and those with the highest carbon intensity. Another sizable launch in 2023 was Singapore's **iShares MSCI Asia ex Japan Climate Action ETF.**

# How Do Climate Funds Stack Up?

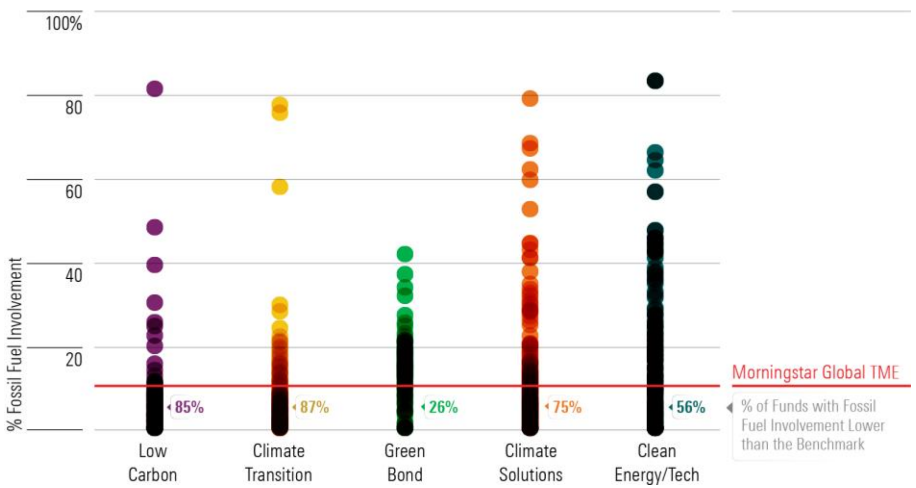
Through the lens of metrics such as carbon intensity, involvement in fossil fuels, oil and gas production, thermal coal, and carbon solutions.

# Companies Contributing to Global Decarbonization Tend to be More Carbon Intensive and Still Involved in Fossil Fuels

**Carbon Intensity Scope 1 2 & 3* Versus Global Benchmark (tCO2/USD Million)**




**Percentage of Fossil Fuel Involvement** Versus Global Benchmark**




In this section, we analyze our list of funds by climate strategy type to better understand their climate and ESG risk profile and ascertain how they compare against one another.

- First, we tested each fund's level of carbon intensity. Of the 1,331 funds covered by the **Carbon Intensity Scope 1, 2, and 3 metric***, 968 (73%) offer an improvement over the global equity benchmark, most of which, as expected, are under the Low Carbon and Climate Transition categories. By contrast, the majority (57%) of the Climate Solutions and close to half (47%) of the Clean Energy/Tech funds exhibit higher carbon intensity than the benchmark. Companies favored by many Climate Solutions and Clean Energy/Tech portfolios face high carbon intensity in their own operations.

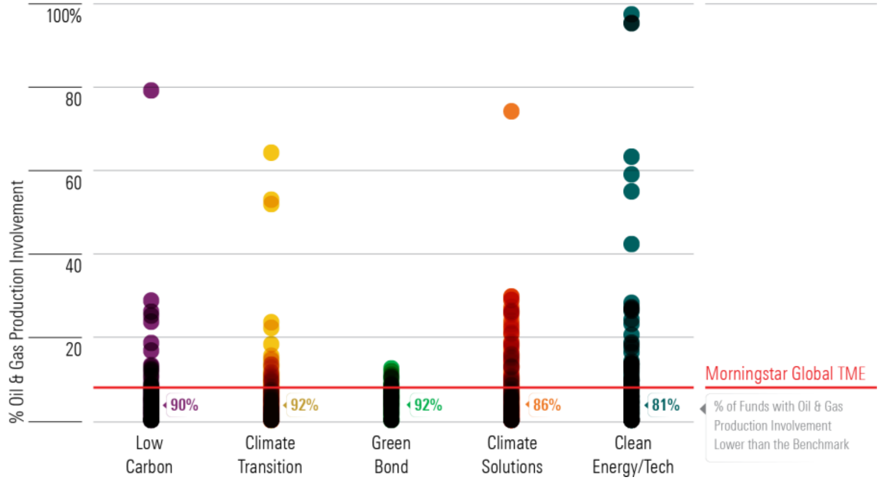
- It should be noted that carbon intensity is a normalized metric dependent on both aggregate carbon footprint and revenue. Large-cap equity stocks can often have a lower carbon intensity thanks to their higher revenue and at least lower Scope 1 emissions when compared with the type of industrial companies that would be involved in engineering green energy solutions.

- Next, we test the involvement of climate funds in fossil fuel companies by using the **Fossil Fuel Percentage of Covered Portfolio Involved metric****. The overwhelming majority of Low Carbon (85%), Climate Transition (87%), and Climate Solutions (75%) funds have lower fossil fuel involvement than the index average of 11%. However, only 26% of Green Bond funds and 56% of Clean Energy/Tech funds meet this criterion. Many of these portfolios hold utilities companies that run renewable energy operations along with their legacy fossil fuel businesses.

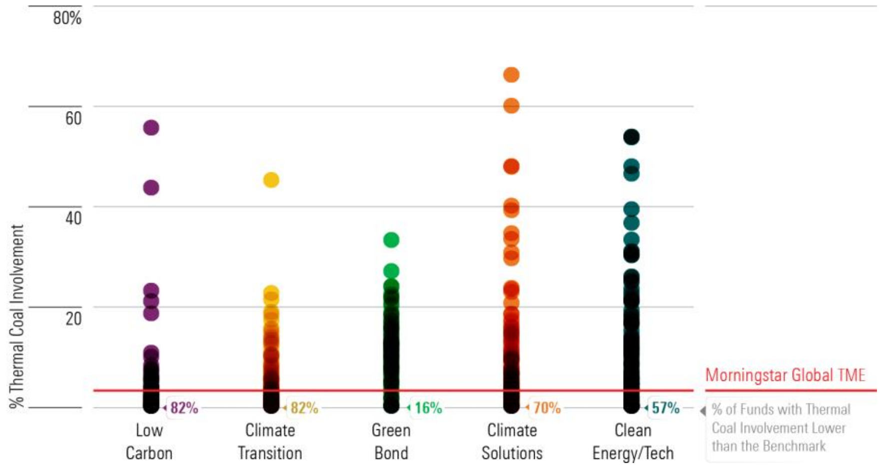
* **Carbon intensity** is computed for each portfolio holding as follows: Total Emissions for Scope 1, 2, and 3 (metric tons of CO2)/Revenue (USD million) and aggregated at the fund level.
** **The Fossil Fuel Percentage of Covered Portfolio Involved** metric is defined as a percentage of the covered portfolio that is exposed to companies that make any revenue 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.

# The Vast Majority of Climate Funds are Less Involved in Oil and Gas Producers and Thermal Coal Than the Benchmark

**Percentage of Oil and Gas Production* Versus Global Benchmark**




**Percentage of Thermal Coal Involvement** Versus Global Benchmark**




- Here, we test the involvement of climate funds in oil and gas producers by applying the **Oil and Gas Production Percentage of Covered Portfolio Involved metric***. The vast majority (88%) of funds in our list have lower exposure to oil and gas producers than the benchmark, which amounted to just over 8.4% at the end of last year. The severe outliers were found among the Climate Solutions and Clean Energy/Tech. For example, **UBS Future Energy Leaders** had almost 30% exposure to oil and gas production. This is driven in part by the fund's focus on companies considered to be central to the energy transition and building the future energy system. These companies are involved in activities such as renewable electricity, advanced biofuels, hydrogen, carbon capture, and grid stability.

- As a primary cause of greenhouse gas and toxic airborne emissions globally, we also examine the involvement of our sample climate strategies to thermal coal power generation using the **Thermal Coal Power Generation Percentage of Covered Portfolio Involved metric****. Only 16% of the Green Bond funds with available thermal coal involvement records managed to beat the global equity benchmark. This is unsurprising given the relatively high exposure of these funds to traditional utilities companies that are looking to finance green projects and transition away from their highly intensive coal-fired electricity-generation activities. Meanwhile, Low Carbon and Climate Transition funds exhibit much lower levels of thermal coal involvement; more than 80% of these portfolios have less exposure to coal than the benchmark index. Only 70% of Climate Solutions funds and 57% of Clean Energy/Tech funds demonstrated lower involvement than the benchmark.

* **Oil and Gas Production Percentage of Covered Portfolio Involved metric** is the percentage of the covered portfolio exposed to corporations that make any revenue from oil and gas production. Involvement in oil and gas production includes involvement in exploration and production, refining, transportation, and storage. A lower involvement percentage is optimal. ** **Thermal Coal Power Generation Percentage of Covered Portfolio Involved** is the percentage of the covered portfolio that is exposed to corporations that make any revenue from power generation based on thermal coal, including companies that own or operate coal-fired power plants.

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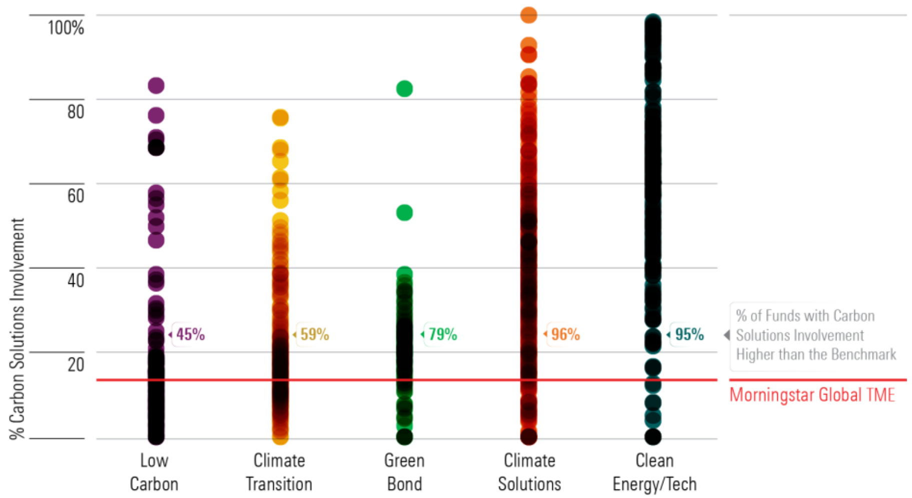
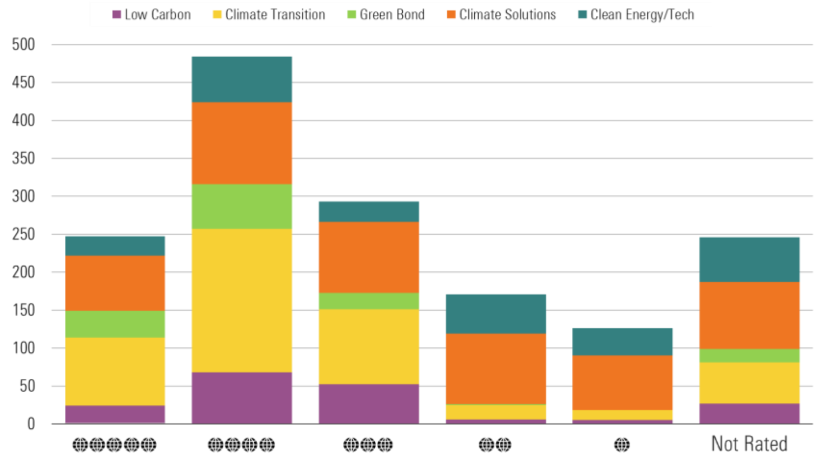
# There can be a Trade-Off Between Climate Solutions Exposure and ESG Risk

**Percentage of Carbon Solutions Involvement Versus Morningstar Benchmark**




**ESG Risk Ratings**




➢ Last, we analyze how much exposure to carbon solutions investors can expect from climate funds using **Carbon Solutions Percentage of Covered Portfolio Involved***. As expected, the funds offering the highest exposure to carbon solutions are in the Climate Solutions and Clean Energy/Tech categories. Between 96% and 95% of these portfolios exhibit higher involvement than the benchmark's 14%, although the level of involvement across offerings varies greatly. For example, **Guinness Sustainable Energy** strategy is assembled from a universe of 250 companies exposed to four investment themes deemed critical for sustainable energy transition, including displacement and improvement of hydrocarbon-based energy, electrification, manufacture and installation of equipments for sustainable energy generation and consumption, as well as sustainable energy production. By December 2023, the portfolio featured carbon solutions exposure of 70%, which placed the strategy within the top 5% of the sample Climate Solutions funds.

➢ By contrast, only about 45% of Low Carbon funds beat the global market benchmark in terms of carbon solutions exposure. By excluding or reducing exposure to fossil fuel or other carbon-intensive companies, Low Carbon funds may be missing out on exposure to climate solutions, as these companies are increasingly developing products and services that address climate change. Climate Transition funds tend to offer slightly more exposure to green solutions.

➢ Although climate metrics are the chief concern for investors in these funds, many will also want to limit exposure to broader ESG risks. We therefore assess the universe of climate funds against the **Morningstar Sustainability Rating**, commonly referred to as the globe rating. The globes reflect the level of ESG risk present in the portfolio normalized on a peer-relative basis. Consistent with the findings based on the Carbon Intensity metric, Climate Solutions and Clean Energy/Tech funds make up the vast majority (85%) of the climate funds with 1- or 2-globe ratings. Relatively few Low Carbon and Climate Transition funds score poorly on the Morningstar Sustainability Rating (only 14% of rated funds in these two groupings earn either 1 or 2 globes), as these tend to invest in companies with Above Average or Strong ESG risk management.

* **Carbon Solutions Percentage of Covered Portfolio Involved** is calculated as the percentage of the covered portfolio exposed to corporations that make any revenue from carbon solutions, including renewable energy generation, renewable energy supporting products/services, energy efficiency distribution and management, energy efficiency material, energy efficiency industrial systems and processes, energy efficiency consumer products, green buildings development, green buildings management, green buildings technologies and materials, green transportation vehicles, green transportation technologies, green transportation services, and green transportation infrastructure involvement. A higher percentage is optimal.

# What’s Inside Climate Funds?

Through the lens of traditional financial metrics.

# Low Carbon Funds Tend to be Broad, Well-Diversified, Portfolios

- Low Carbon funds tend to be well-diversified portfolios with broad sector and stock exposure.
- All but two of the 20 most represented stocks are large caps, and the median return in this cohort was 40.2% for 2023, an impressive 17.5 percentage points above the return for the Morningstar Global Target Market Exposure Index (22.7%), helped by technology stocks. Adobe and Alphabet led the pack with gains of 77.3% and 58.3%, respectively.

## Most Commonly Held Companies in Low Carbon Funds

| Company | Domicile | Sector | Equity Style Box | Morningstar Rating | 2022 Return (%) | 2023 Return (%) |
|---|---|---|---|---|---|---|
| Alphabet | United States | Communication Services | Large Growth | ★★★★ | -39.1 | 58.3 |
| Henkel & Co | Germany | Consumer Defensive | Large Blend | ★★★★ | -11.8 | 18.9 |
| Bayerische Motoren Werke | Germany | Consumer Cyclical | Large Value | ★★★★ | -5.4 | 35.7 |
| Microsoft | United States | Technology | Large Growth | ★★★ | -27.9 | 58.0 |
| Atlas Copco | Sweden | Industrials | Large Growth | ★★ | -30.6 | 47.7 |
| ASML Holding | Netherlands | Technology | Large Growth | ★★ | -32.2 | 41.3 |
| Fox | United States | Communication Services | Mid Value | ★★★★ | -16.4 | -0.6 |
| Schneider Electric | France | Industrials | Large Growth | ★★ | -27.3 | 46.4 |
| SAP | Germany | Technology | Large Growth | ★★ | -25.8 | 52.0 |
| Visa | United States | Financial Services | Large Growth | ★★★ | -3.4 | 26.2 |
| Adobe | United States | Technology | Large Growth | ★★★ | -40.7 | 77.3 |
| Industria De Diseno Textil | Spain | Consumer Cyclical | Large Growth | ★★ | -15.4 | 69.2 |
| Amgen | United States | Healthcare | Large Blend | ★★★ | 20.2 | 12.9 |
| Apple | United States | Technology | Large Growth | ★★ | -26.3 | 48.9 |
| Novo Nordisk | Denmark | Healthcare | Large Growth | ★ | 21.2 | 55.2 |
| Redeia Corporacion | Spain | Utilities | Mid Value | ★★★★ | -14.9 | 1.3 |
| Roche Holding | Switzerland | Healthcare | Large Blend | ★★★★★ | -22.1 | -3.9 |
| Siemens | Germany | Industrials | Large Blend | ★★★ | -17.9 | 39.1 |
| AXA | France | Financial Services | Large Value | ★★★ | -1.1 | 23.9 |
| Cisco Systems | United States | Technology | Large Value | ★★★ | -22.4 | 9.3 |

Source: Morningstar Direct. Manager Research. Data as of December 2023.

# Climate Transition Funds

- Climate Transition funds share many characteristics with Low Carbon and Climate Solutions funds. They also share many common holdings with these two groupings. Adobe, Alphabet, ASML Holding, and Microsoft are popular names in Low Carbon portfolios, while Vestas Wind Systems and Infineon Technologies are commonly held by Climate Transition funds. Notably, Schneider Electric, a leading provider of energy and automation digital solutions to achieve energy efficiency, is one of the top common holdings in three of the equity-focused climate fund groupings: Low Carbon, Climate Transition, and Climate Solutions.

- All the most popular stocks in Climate Transition funds are large caps, and nine of 20 are in the tech sector. The median return for these stocks was nearly 42% for 2023, but Nvidia blew away the competition with a jaw-dropping 239% gain during the period thanks to the artificial intelligence boom.

## Most Commonly Held Companies in Climate Transition Funds

| Company | Domicile | Sector | Equity Style Box | Morningstar Rating | 2022 Return (%) | 2023 Return (%) |
|---|---|---|---|---|---|---|
| Alphabet | United States | Communication Services | Large Growth | ★★★★ | -39.1 | 58.3 |
| Schneider Electric | France | Industrials | Large Growth | ★★ | -27.3 | 46.4 |
| Microsoft | United States | Technology | Large Growth | ★★★ | -27.9 | 58.0 |
| ASML Holding | Netherlands | Technology | Large Growth | ★★ | -32.2 | 41.3 |
| NVIDIA | United States | Technology | Large Growth | ★★★ | -50.3 | 239.0 |
| Adobe Inc | United States | Technology | Large Growth | ★★★ | -40.7 | 77.3 |
| Roche Holding | Switzerland | Healthcare | Large Blend | ★★★★★ | -22.1 | -3.9 |
| Henkel & Co | Germany | Consumer Defensive | Large Blend | ★★★★ | -11.8 | 18.9 |
| Infineon Technologies | Germany | Technology | Large Growth | ★★★★ | -33.9 | 38.8 |
| Atlas Copco | Sweden | Industrials | Large Growth | ★★ | -30.6 | 47.7 |
| SAP | Germany | Technology | Large Growth | ★★ | -25.8 | 52.0 |
| Novo Nordisk | Denmark | Healthcare | Large Growth | ★ | 21.2 | 55.2 |
| L'Oreal | France | Consumer Defensive | Large Growth | ★★ | -23.8 | 41.7 |
| Vestas Wind Systems | Denmark | Industrials | Large Growth | ★★★ | -5.0 | 9.5 |
| Apple | United States | Technology | Large Growth | ★★ | -26.3 | 48.9 |
| Autodesk | United States | Technology | Large Growth | ★★★ | -33.5 | 30.3 |
| Visa | United States | Financial Services | Large Growth | ★★★ | -3.4 | 26.2 |
| Mastercard | United States | Financial Services | Large Growth | ★★★ | -2.7 | 23.3 |
| Dassault Systemes | France | Technology | Large Growth | ★★ | -39.6 | 37.3 |
| AstraZeneca | United Kingdom | Healthcare | Large Growth | ★★★★ | 17.1 | 2.4 |

Source: Morningstar Direct. Manager Research. Data as of December 2023.

# Climate Solutions Funds

- Industrial and technologies companies dominate the league table of the 20 most held stocks among Climate Solutions funds. However, additional sectors, including basic materials and consumer cyclical, make Climate Solutions funds still more diversified than Clean Energy/Tech funds.

- The median return in this cohort stayed marginally above zero but the variance was significant. Following Nvidia, Tesla registered the second-best performance (101%) among the most commonly held stocks in Climate Solutions funds last year. This is in striking contrast to its main competitor BYD, which suffered a share price loss, together with several other Chinese companies (China was the worst-performing equity market globally last year).

- Similar contrast was found also between First Solar and Enphase Energy. Both companies focus on solar but target different distribution markets. First Solar enjoys lucrative investment and production tax credits from the Inflation Reduction Act by selling to utility fields and expanding capacity in the US. Meanwhile, Enphase Energy, which competes in selling residential rooftop solar panels, saw plummeting demand from homeowners due to rising borrowing costs and a law change in California, the biggest US solar market, which lowered homeowner compensation for feeding the power grid.

## Most Commonly Held Companies in Climate Solutions Funds

| Company | Domicile | Sector | Equity Style Box | Morningstar Rating | 2022 Return (%) | 2023 Return (%) |
|---|---|---|---|---|---|---|
| Contemporary Amperex Tech | China | Industrials | Large Growth | ★★★★ | -38.6 | -25.7 |
| BYD | China | Consumer Cyclical | Large Growth | ★★★★ | -12.1 | -24.0 |
| Schneider Electric | France | Industrials | Large Growth | ★★ | -27.3 | 46.4 |
| Tesla | United States | Consumer Cyclical | Large Growth | ★★★ | -65.0 | 101.7 |
| Infineon Tech | Germany | Technology | Large Growth | ★★★★ | -33.9 | 38.8 |
| Vestas Wind Systems | Denmark | Industrials | Large Growth | ★★★ | -5.0 | 9.5 |
| Samsung SDI | South Korea | Technology | Large Blend | ★★★★ | -15.0 | -21.4 |
| Ganfeng Lithium Group | China | Basic Materials | Large Blend | ★★ | -37.3 | -38.2 |
| Guangzhou Tinci Materials Tech | China | Basic Materials | Large Blend | — | -29.1 | -42.6 |
| Aptiv | Jersey | Consumer Cyclical | Mid Blend | ★★★★★ | -43.5 | -3.7 |
| First Solar | United States | Technology | Mid Growth | ★★★★ | 71.9 | 15.0 |
| NVIDIA | United States | Technology | Large Growth | ★★★ | -50.3 | 239.0 |
| Enphase Energy | United States | Technology | Mid Growth | ★★ | 44.8 | -50.1 |
| Waste Management | United States | Industrials | Large Blend | ★ | -4.4 | 15.9 |
| Linde | Ireland | Basic Materials | Large Blend | ★★★ | -4.5 | 27.5 |
| EVE Energy | China | Industrials | Large Growth | — | -31.7 | -52.8 |
| Microsoft | United States | Technology | Large Growth | ★★★ | -27.9 | 58.0 |
| Shanghai Putailai New Energy Tech | China | Basic Materials | Large Growth | — | -40.2 | -41.7 |
| Sungrow Power Supply | China | Industrials | Large Growth | ★★★ | -29.6 | -23.0 |
| Xylem | United States | Industrials | Mid Growth | ★★ | -6.8 | 4.6 |

Source: Morningstar Direct. Manager Research. Data as of December 2023.

# Clean Energy/Tech Funds

- Sector exposure of Clean Energy/Tech funds appears less diversified, with technology, industrials, and utilities dominating the table of the 20 most popular stocks in this fund category. Small and mid-caps account for more than half of these stocks, reflecting the relatively nascent stage of many renewable energy companies.

- Stocks in this segment have been hard-hit over the past couple of years. In 2023, the median loss was 24.3%. The US Inflation Reduction Act has spurred a construction spending boom despite remaining uncertainties of certain tax credits. However, it was overshadowed by fear of overcapacities and by rising financing costs, which constituted a major headwind in the renewable sector. In comparison to traditional fossil fuel options, upfront capital costs account for up to 80% of the lifetime costs of a typical renewable energy project, according to the International Renewable Energy Agency.

- In China, solar power manufacturers faced lower-than-expected overseas demand, due to high inventory level in Europe because of the Russia-Ukraine conflict and the import restriction in the US. In addition, domestic solar power demand and installation decelerated as local governments, dismayed by deteriorating fiscal situations, generally opted for a prudent and pragmatic stance against generous fiscal and other policy supports for clean energy projects.

## Most Commonly Held Companies in Clean Energy/Tech Funds

| Company | Domicile | Sector | Equity Style Box | Morningstar Rating | 2022 Return (%) | 2023 Return (%) |
|---|---|---|---|---|---|---|
| First Solar | United States | Technology | Mid Growth | ★★★★ | 71.9 | 15.0 |
| Enphase Energy | United States | Technology | Mid Growth | ★★ | 44.8 | -50.1 |
| Sungrow Power Supply | China | Industrials | Large Growth | ★★★ | -29.6 | -23.0 |
| SolarEdge Technologies | United States | Technology | Small Growth | ★★★ | 1.0 | -67.0 |
| Sunrun | United States | Technology | Small Blend | ★★★ | -30.0 | -18.3 |
| Vestas Wind Systems | Denmark | Industrials | Large Growth | ★★★ | -5.0 | 9.5 |
| JA Solar Technology | China | Technology | Large Blend | — | -16.6 | -52.1 |
| Flat Glass Group | China | Industrials | Large Blend | — | -51.7 | -28.8 |
| Contemporary Amperex Technology | China | Industrials | Large Growth | ★★★★ | -38.6 | -25.7 |
| Array Technologies | United States | Technology | Small Growth | — | 23.2 | -13.1 |
| Shoals Technologies Group | United States | Technology | Small Growth | ★★ | 1.5 | -37.0 |
| LONGi Green Energy Technology | China | Technology | Large Blend | ★★★★ | -36.7 | -46.0 |
| Sunnova Energy International | United States | Technology | Small Growth | — | -35.5 | -15.3 |
| Ormat Technologies | United States | Utilities | Small Growth | — | 9.7 | -11.8 |
| Jiangsu Goodwe Power Supply Technology | China | Technology | Mid Growth | — | -9.4 | -43.9 |
| Trina Solar | Cayman Islands | Technology | Large Growth | — | -25.6 | -55.4 |
| EDP Renovaveis | Spain | Utilities | Large Blend | ★★★★★ | -11.4 | -5.6 |
| TCL Zhonghuan Renewable Energy Technology | China | Technology | Large Blend | ★★★★ | -17.1 | -48.8 |
| Boralex | Canada | Utilities | Small Growth | ★★★★ | 9.4 | -11.8 |
| Canadian Solar | Canada | Technology | Small Value | — | -1.2 | -15.1 |

Source: Morningstar Direct. Manager Research. Data as of December 2023.

# What Is Inside Climate Funds?

Through the lens of carbon metrics.

# The Low Carbon Transition Rating

- In this section, we examine the most commonly held companies through the lens of the Low Carbon Transition Rating for companies from Morningstar Sustainalytics, as well as some underlying metrics, including dominant scope of emissions and management quality.

- The Low Carbon Transition Rating, 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.

- A company's ITR comprises two assessments: the exposure assessment, which evaluates how the company would be expected to perform if it took no actions to reduce emissions; and the management assessment, which evaluates how prepared the company is to manage its emissions through its governance, policies, programs, and investments. Company management receives a score ranging from Very Weak to Very Strong and is based on indicators such as the use of an internal carbon price, programs to support customers' reduction of energy or water consumption, and management incentives to reduce emissions

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.

# Low Carbon Funds Hold Many Companies that are Significantly or Highly Misaligned Companies to a 1.5°C World, But With Strong Emission Management

- Among the 20 most common holdings in Low Carbon, we find many companies that are significantly and highly misaligned, but some are also only moderately misaligned to the 1.5°C trajectory. These include Atlas Copco which has an average implied temperature rise (ITR) score of 2 °C. Atlas Copco is a leading manufacturer of specialized machinery such as compressors, air treatment systems, vacuum solutions, industrial power tools and assembly systems. Unsurprisingly, Scope 3–Downstream constitutes the largest source of the company's carbon emission.

- On the other end of the spectrum is Inditex. With over 92% of its emissions coming from its suppliers, mainly involved in fabric production, garment manufacturing, raw materials and upstream transport (Scope 3–Upstream), the group's business model comes with an ITR of 6.1°C, though significantly reduced from the projected emissions exposure of 7.1°C thanks to its Strong emission management.

## Most Commonly Held Companies in Low Carbon Funds: Carbon Metrics

| | | | Implied Temperature Rise | | Carbon Emission Profile | | | |
|---|---|---|---|---|---|---|---|---|
| **Company** | **Domicile** | **Industry** | **ITR (°C)** | **Industry % Rank** | **Key Scope** | **% Total Emissions** | **Management Quality** | **ESG Risk Rating** |
| Alphabet | United States | Software & Services | 2.4 | 17 | 3 | 59 | Strong | 🌐🌐🌐 |
| Henkel & Co | Germany | Household Products | 4.0 | 67 | 3 | 98 | Strong | 🌐🌐🌐🌐 |
| Bayerische Motoren Werke | Germany | Automobiles | 3.7 | 18 | 3 | 98 | Strong | 🌐🌐🌐 |
| Microsoft | United States | Software & Services | 2.6 | 21 | 3 | 74 | Strong | 🌐🌐🌐🌐 |
| Atlas Copco | Sweden | Machinery | 2.0 | 3 | 3 | 100 | Average | 🌐🌐🌐 |
| ASML Holding | Netherlands | Semiconductors | 5.5 | 87 | 3 | 98 | Strong | 🌐🌐🌐🌐 |
| Fox | United States | Media | 2.1 | 1 | 2 | 66 | Weak | 🌐🌐🌐🌐 |
| Schneider Electric | France | Electrical Equipment | 1.9 | 4 | 3 | 99 | Strong | 🌐🌐🌐🌐 |
| SAP | Germany | Software & Services | 2.0 | 2 | 2 | 36 | Strong | 🌐🌐🌐🌐 |
| Visa | United States | Software & Services | 3.3 | 51 | 3 | 86 | Strong | 🌐🌐🌐🌐 |
| Adobe | United States | Software & Services | 3.1 | 35 | 3 | 88 | Strong | 🌐🌐🌐🌐 |
| Industria De Diseno Textil | Spain | Retailing | 6.1 | 95 | 3 | 97 | Strong | 🌐🌐🌐🌐 |
| Amgen | United States | Pharmaceuticals | 4.1 | 93 | 3 | 92 | Average | 🌐🌐🌐 |
| Apple | United States | Technology Hardware | 3.7 | 63 | 3 | 96 | Strong | 🌐🌐🌐🌐 |
| Novo Nordisk | Denmark | Pharmaceuticals | 2.3 | 27 | 2 | 96 | Strong | 🌐🌐🌐 |
| Redeia Corporacion | Spain | Utilities | 2.6 | 76 | 3 | 40 | Strong | 🌐🌐🌐🌐 |
| Roche Holding | Switzerland | Pharmaceuticals | 5.9 | 98 | 3 | 93 | Average | 🌐🌐🌐 |
| Siemens | Germany | Industrial Conglomerates | 1.9 | 9 | 3 | 100 | Strong | 🌐🌐🌐 |
| AXA | France | Insurance | 2.2 | 46 | 3 | 66 | Average | 🌐🌐🌐🌐 |
| Cisco Systems | United States | Technology Hardware | 4.0 | 62 | 3 | 97 | Strong | 🌐🌐🌐🌐 |

Source: Sustainalytics. Morningstar Direct. Manager Research. Data as of December 2023.

# Climate Transition Funds Tilt Towards Companies With Stronger Emission Management

- Of the four groupings analyzed here, we found that the 20 most common holdings in Climate Transition are the least aligned to the 1.5°C goal, with average ITR of 3.5°C. The list features several severely misaligned companies, such as ASML (5.5°C), Roche Holdings (5.9°C) and L'Oreal (5.7 °C) which rank among the worst in their respective industries in terms of ITR. ASML ranks in the 87th percentile of its industry, Roche 98th, and L'Oreal 98th.

- Out of the top 20 most commonly held companies, 18 boast a Strong or Very Strong Management Quality score. This is a higher number than what we find in other categories, which evidences that Climate Transition funds tend to invest in, or tilt towards, companies that are taking action to decarbonize their business, and therefore are better prepared for the transition to a low-carbon economy.

- Vestas Wind System is the only company in the top 20 stocks of all categories to have a Very Strong Management Quality score. The company aims to reduce $CO_2$ emissions in its own operations by 55% by 2025 and 100% by 2030, compared with 2019. The company strives to scale back $CO_2$ emissions in the supply chain, too.

## Most Commonly Held Companies in Climate Transition Funds: Carbon Metrics

| | | | Implied Temperature Rise | | Carbon Emission Profile | | | |
|---|---|---|---|---|---|---|---|---|
| Company | Domicile | Industry | ITR (°C) | Industry % Rank | Key Scope | % Total Emissions | Management Quality | ESG Risk Rating |
| Alphabet | United States | Software & Services | 2.4 | 17 | 3 | 59 | Strong | 🌐🌐🌐 |
| Schneider Electric | France | Electrical Equipment | 1.9 | 4 | 3 | 99 | Strong | 🌐🌐🌐🌐 |
| Microsoft | United States | Software & Services | 2.6 | 21 | 3 | 74 | Strong | 🌐🌐🌐🌐 |
| ASML Holding | Netherlands | Semiconductors | 5.5 | 87 | 3 | 98 | Strong | 🌐🌐🌐🌐 |
| NVIDIA | United States | Semiconductors | 3.8 | 86 | 3 | 95 | Strong | 🌐🌐🌐🌐 |
| Adobe | United States | Software & Services | 3.1 | 35 | 3 | 88 | Strong | 🌐🌐🌐🌐 |
| Roche Holding | Switzerland | Pharmaceuticals | 5.9 | 98 | 3 | 93 | Average | 🌐🌐🌐 |
| Henkel & Co | Germany | Household Products | 4.0 | 67 | 3 | 98 | Strong | 🌐🌐🌐🌐 |
| Infineon Tech | Germany | Semiconductors | 2.3 | 36 | 3 | 64 | Strong | 🌐🌐🌐🌐 |
| Atlas Copco | Sweden | Machinery | 2.0 | 3 | 3 | 100 | Average | 🌐🌐🌐 |
| SAP | Germany | Software & Services | 2.0 | 2 | 2 | 40 | Strong | 🌐🌐🌐🌐 |
| Novo Nordisk | Denmark | Pharmaceuticals | 2.3 | 27 | 3 | 96 | Strong | 🌐🌐🌐 |
| L'Oreal | France | Household Products | 5.7 | 93 | 3 | 100 | Strong | 🌐🌐🌐 |
| Vestas Wind Systems | Denmark | Electrical Equipment | 2.0 | 10 | 3 | 98 | Very Strong | 🌐🌐🌐🌐 |
| Apple | United States | Technology Hardware | 3.7 | 63 | 3 | 96 | Strong | 🌐🌐🌐🌐 |
| Autodesk | United States | Software & Services | 3.9 | 67 | 3 | 91 | Strong | 🌐🌐🌐🌐 |
| Visa | United States | Software & Services | 3.3 | 51 | 3 | 86 | Strong | 🌐🌐🌐🌐 |
| Mastercard | United States | Software & Services | 3.4 | 59 | 3 | 90 | Strong | 🌐🌐🌐🌐 |
| Dassault Systemes | France | Software & Services | 4.8 | 81 | 3 | 96 | Strong | 🌐🌐🌐🌐 |
| AstraZeneca | United Kingdom | Pharmaceuticals | 4.8 | 90 | 3 | 94 | Strong | 🌐🌐🌐 |

Source: Morningstar Direct. Manager Research. Data as of December 2023.

# Climate Solutions Funds Tilt Towards Companies With Average and Weak Emission Management

- In contrast with the two previous fund categories, Climate Solutions funds tilt towards companies with Average and Weak emission management. One common holding that stands out is China's BYD. Despite discontinuing the production of internal combustion engine vehicles, Scope 3–Downstream remains its largest source (90%) of carbon emissions. Weak emission management aggravates the company's already-highly misaligned projected emission exposure (3.8°C) and leads to a more significant misalignment with an ITR of 4.8°C. The company's rapid growth of sales has triggered quality and safety issues, in addition to potential misconduct such as unsafe features, insufficient transparency, and misleading marketing, As a result, BYD carries a 3-globe, or Average, ESG risk rating.

- In contrast, Tesla features a Strong emission management profile, which limits its ITR to 2.3 °C. But Tesla's ambitious production targets exposes the company to risks concerning labor relations and its ability to recruit and retain employees. Also, while Tesla's autopilot technology places the company years ahead of its peers, its deployment simultaneously exposes it to more product-governance risks related to the safety of its cars. As a result, Tesla also receives a 3-globe, or Average, ESG risk rating.

## Most Commonly Held Companies in Climate Solutions Funds: Carbon Metrics

| | | | Implied Temperature Rise | | Carbon Emission Profile | | | |
|---|---|---|---|---|---|---|---|---|
| **Company** | **Domicile** | **Industry** | **ITR (°C)** | **Industry % Rank** | **Key Scope** | **% Total Emissions** | **Management Quality** | **ESG Risk Rating** |
| Contemporary Amperex Tech | China | Electrical Equipment | 2.2 | 24 | 3 | 68 | Average | 🌐🌐🌐🌐 |
| BYD | China | Automobiles | 4.8 | 51 | 3 | 90 | Weak | 🌐🌐🌐 |
| Schneider Electric | France | Electrical Equipment | 1.9 | 4 | 3 | 99 | Strong | 🌐🌐🌐🌐 |
| Tesla | United States | Automobiles | 2.3 | 3 | 3 | 94 | Strong | 🌐🌐🌐 |
| Infineon Tech | Germany | Semiconductors | 2.3 | 36 | 3 | 64 | Strong | 🌐🌐🌐🌐 |
| Vestas Wind Systems | Denmark | Electrical Equipment | 2.0 | 10 | 3 | 98 | Very Strong | 🌐🌐🌐🌐 |
| Samsung SDI | South Korea | Technology Hardware | 2.0 | 34 | 2 | 74 | Average | 🌐🌐🌐🌐 |
| Ganfeng Lithium Group | China | Chemicals | 2.3 | 16 | 3 | 45 | Weak | 🌐🌐🌐 |
| Guangzhou Tinci Materials Tech | China | Chemicals | 2.3 | 17 | 3 | 47 | Weak | 🌐🌐 |
| Aptiv | Jersey | Auto Components | 2.4 | 37 | 3 | 97 | Average | 🌐🌐🌐🌐 |
| First Solar | United States | Semiconductors | 2.7 | 57 | 2 | 40 | Strong | 🌐🌐🌐🌐 |
| NVIDIA | United States | Semiconductors | 3.8 | 86 | 3 | 95 | Strong | 🌐🌐🌐🌐 |
| Enphase Energy | United States | Electrical Equipment | | | 3 | 83 | | 🌐🌐🌐 |
| Waste Management | United States | Commercial Services | 3.4 | 81 | 1 | 90 | Average | 🌐🌐🌐🌐 |
| Linde | Ireland | Chemicals | | | 3 | 41 | | 🌐🌐🌐🌐 |
| EVE Energy | China | Electrical Equipment | 2.5 | 68 | 3 | 71 | Weak | 🌐🌐 |
| Microsoft | United States | Software & Services | 2.6 | 21 | 3 | 74 | Strong | 🌐🌐🌐🌐 |
| Shanghai Putailai New Energy Tech | China | Electrical Equipment | 2.4 | 64 | 3 | 70 | Weak | 🌐🌐 |
| Sungrow Power Supply | China | Electrical Equipment | 2.4 | 65 | 3 | 92 | Weak | 🌐🌐🌐 |
| Xylem | United States | Machinery | 3.3 | 71 | 3 | 100 | Average | 🌐🌐🌐🌐 |

Source: Sustainalytics . Morningstar Direct. Manager Research. Data as of December 2023.

# Clean Energy/Tech Funds: Lower ITRs but also Weaker Emission Management

- Of the four groupings analyzed here, we found that the 20 most common holdings in Clean Energy/Tech funds are the most aligned, with an average ITR score of 2.3°C, despite their weaker management quality, on average.

- Availability of climate-related data for the stocks that are most held by Clean Energy/Tech funds remains less guaranteed due to the prevalence of small- and mid-cap companies. As with other ESG data providers, Sustainalytics relies on disclosure, which proves less consistent among smaller firms, especially those from emerging markets. Hence, we have ITR data for only 14 of the 20 most commonly held stocks. Still, these companies tend to be less misaligned with the Paris Agreement's goal of limiting global warming at 1.5°C than the top companies in other climate fund groupings, despite weaker emission management scores. On average, they carry an ITR of 2.3°C.

- For example, Flat Glass Group's emission management is Weak, leading to a higher ITR of 2.0°C than the projected emission exposure of 1.8°C. With most of its revenue derived from photovoltaic, or PV, glass production and sales, Scope 1 accounts for over 60% of the company's total emission sources from the downstream and upstream of its value chain.

## Most Commonly Held Companies in Clean Energy/Tech Funds: Carbon Metrics

| | | | Implied Temperature Rise | | Carbon Emission Profile | | | |
|---|---|---|---|---|---|---|---|---|
| Company | Domicile | Industry | ITR (°C) | Industry % Rank | Key Scope | % Total Emissions | Management Quality | ESG Risk Rating |
| First Solar | United States | Semiconductors | 2.7 | 57 | 3 | 81 | Strong | 🌐🌐🌐🌐 |
| Enphase Energy | United States | Electrical Equipment | | | 3 | 83 | | 🌐🌐🌐 |
| Sungrow Power Supply | China | Electrical Equipment | 2.4 | 65 | 3 | 92 | Weak | 🌐🌐🌐 |
| SolarEdge Tech | United States | Electrical Equipment | 1.9 | 5 | 2 | 57 | Average | 🌐🌐🌐🌐 |
| Sunrun | United States | Utilities | | | 3 | 95 | | 🌐🌐🌐 |
| Vestas Wind Systems | Denmark | Electrical Equipment | 2.0 | 10 | 3 | 98 | Very Strong | 🌐🌐🌐🌐 |
| JA Solar Tech | China | Semiconductors | 2.3 | 36 | 2 | 74 | Weak | 🌐🌐 |
| Flat Glass Group | China | Building Products | 2.0 | 3 | 1 | 61 | Weak | 🌐🌐🌐 |
| Contemporary Amperex Tech | China | Electrical Equipment | 2.2 | 24 | 3 | 68 | Average | 🌐🌐🌐🌐 |
| Array Tech | United States | Semiconductors | | | 3 | 98 | | 🌐🌐🌐🌐 |
| Shoals Technologies Group | United States | Electrical Equipment | 2.8 | 92 | 3 | 92 | Weak | 🌐🌐🌐 |
| LONGi Green Energy Tech | China | Semiconductors | 3.5 | 80 | 3 | 91 | Weak | 🌐🌐 |
| Sunnova Energy International | United States | Traders & Distributors | | | 3 | 100 | Weak | 🌐🌐🌐🌐 |
| Ormat Technologies | United States | Utilities | | | 1 | 89 | | 🌐🌐🌐🌐 |
| Jiangsu Goodwe Power Supply Tech | China | Electrical Equipment | | | 3 | 62 | Weak | 🌐🌐🌐 |
| Trina Solar | Cayman Islands | Semiconductors | 2.2 | 34 | 3 | 94 | Weak | 🌐🌐 |
| EDP Renovaveis | Spain | Utilities | 2.2 | 73 | 2 | 87 | Average | 🌐🌐🌐🌐 |
| TCL Zhonghuan Renewable Energy Tech | China | Semiconductors | 1.9 | 14 | 2 | 90 | Weak | 🌐🌐 |
| Boralex | Canada | Utilities | 2.2 | 68 | 3 | 69 | Average | 🌐🌐🌐 |
| Canadian Solar | Canada | Semiconductors | 2.2 | 27 | | | Average | 🌐🌐 |

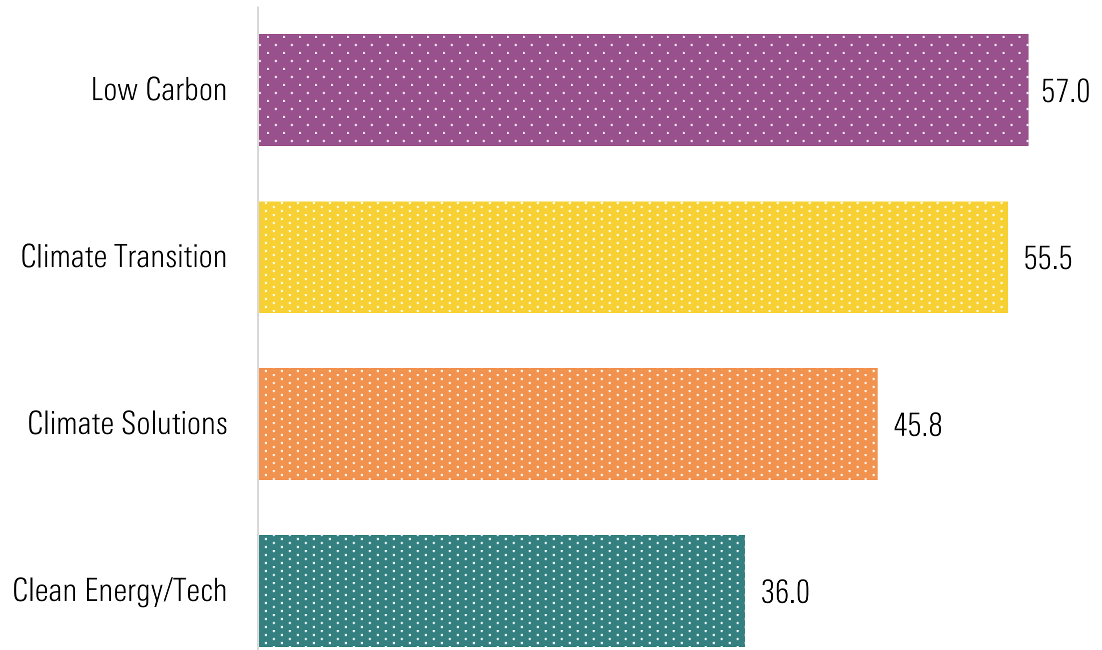
Source: Sustainalytics. Morningstar Direct. Manager Research. Data as of December 2023.

# Low Carbon and Climate Transition Funds Exhibit the Highest Emission-Management Scores

- Low Carbon and Climate Transition funds invest in, or tilt toward, companies that tend to manage their emission reduction better than those held by Climate Solutions and Clean Energy/Tech funds. This is reflected in the higher average Sustainalytics' ITR Management Score of the former two categories relative to the latter two.

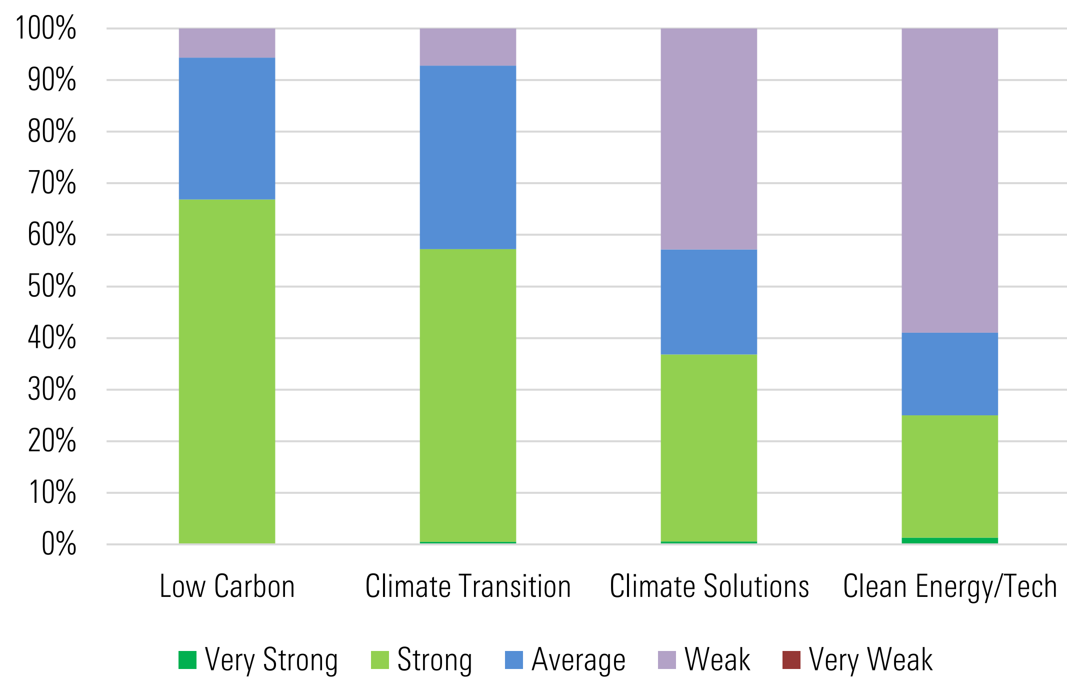
- Companies with Strong and Very Strong emission management accounted for 67% and 57% of the sample holdings of Low Carbon and Climate Transition strategies, respectively, compared with the 36% and 24% of the sample Climate Solutions and Clean Energy/Tech funds, respectively.

**Average ITR Management Score****




** Weighted average calculated on the 200 most commonly held stocks in each climate fund category. Each stock is weighted based on the number of funds holding the stock. The most commonly held stocks receive a higher weight.

**ITR Management Classification Distribution***




* Distribution of the 200 most commonly held stocks in each climate fund category.

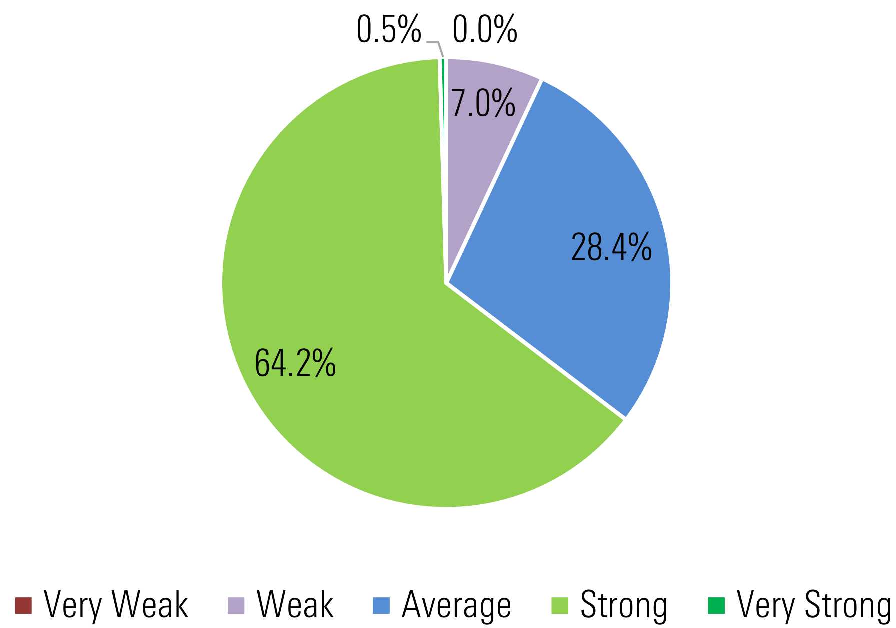
Source: Sustainalytics. Morningstar Direct. Manager Research. Data as of December 2023.

# Actively Managed Climate Transition Funds Hold Companies With Slightly Better Emission Management Than Direct Peers

- Looking at the 200 most popular holdings in the actively managed Climate Transition funds universe, we find that over 64% of these holdings feature Strong or Very Strong emission-management quality. This is higher than the 57% average for the 200 most popular holdings in the overall Climate Transition funds category, but it is lower than the 67% equivalent average for the Low Carbon funds category.

- The weighted average ITR Management Score for the top 200 common holdings (57.2 vs. 55.5) in active Climate Transition funds also surpasses the one for the overall climate transition category shown earlier. This can be explained by the slightly more selective approach taken by active fund managers.

**Emission-Management Classification for Active Climate Transition Funds**




* Distribution of the 200 most commonly held stocks in each climate fund category.

**Companies With Highest ITR Management Scores in Active Climate Transition Funds**

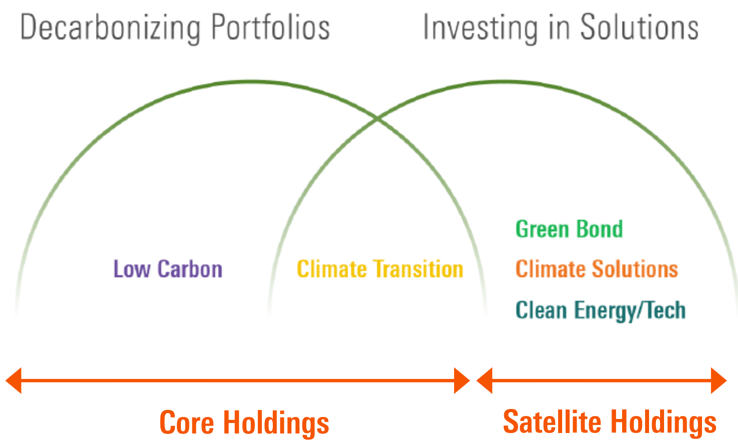
| Company | Industry | ITR (°C) | ITR Management Score | ITR Management Classification |
|---|---|---|---|---|
| Vestas Wind Systems | Electrical Equipment | 2 | 79.9 | Very Strong |
| Schneider Electric | Electrical Equipment | 1.9 | 74.4 | Strong |
| RELX | Media | 1.7 | 72 | Strong |
| Moody's | Diversified Financials | 1.6 | 71.2 | Strong |
| Johnson & Johnson | Pharmaceuticals | 3.8 | 70.9 | Strong |
| Tesla | Automobiles | 2.3 | 70.9 | Strong |
| Legrand | Electrical Equipment | 2 | 69.4 | Strong |
| Microsoft | Software & Services | 2.6 | 68.4 | Strong |
| T-Mobile US | Telecom Services | 2.3 | 68.1 | Strong |
| Iberdrola | Utilities | 1.9 | 67.5 | Strong |

Source: Sustainalytics. Morningstar Direct. Manager Research. Data as of December 2023

# How Climate Funds Fit Into an Investor's Portfolio

PORTFOLIO CONSTRUCTION

## How Climate Funds Fit Into an Investor's Portfolio




The five climate fund groupings we have identified represent a broad range of approaches globally that aim to meet different investor needs and preferences. The choice of one type over another largely depends on an investor's investment goals, risk appetite, and preferences.

Investors who simply want to protect their portfolios against climate change risks can use Low Carbon funds to "decarbonize" their portfolios. These approaches provide broad and diversified exposure to the market and are therefore suitable as part of a portfolio core allocation. In fact, within an asset allocation, Low Carbon funds can substitute for a lot of core equity exposure. They would, however, be less suitable for investors who want to benefit from the opportunities offered by the climate transition. For that, investors must choose among the remaining types.

Risk-conscious investors looking also to take advantage of this transition can turn toward Climate Transition funds. These typically exhibit low-carbon risk like Low Carbon funds, with the added benefit of higher exposure to carbon solutions.

These are suitable for investors wanting to strike a balance between mitigating risk and looking to benefit from the green transition.

Further along the risk-opportunity spectrum, Climate Solutions and Clean Energy/Tech strategies can appeal to investors with a greater risk appetite and who consider climate change as an alpha-generating opportunity. Because of their narrower market exposure and often mid- and small-cap bias, Climate Solutions and Clean Energy/Tech funds represent more-volatile investments. Sharp price fluctuations in the clean energy sector over the past few years are testament to this. Since registering their best annual performance in 2020, with returns of up to more than 200%, Clean Energy/Tech funds have lagged the market.

Climate Solutions and Clean Energy/Tech funds can also come with higher carbon intensity. We have seen this begin to change gradually as the transitioning companies implement their solutions. Given their less-diversified and higher risk profile, Climate Solutions and Clean Energy/Tech funds are more suitable as part of a satellite allocation to complement rather than replace existing core holdings.

Green Bonds may be inherently lower risk, but investors must be sure that the projects sitting within the bonds have positive environmental and/or climate benefits; many green-bond issuers operate in traditional "brown" sectors, including utilities, energy, and industrials. Ideally, in the coming years, we would like to see increased disclosure on green-bond projects and how they serve to lower the environmental impact of their issuer in a material way. For instance, a distribution company issuing a green bond to electrify its fleet has a greater impact on the issuer than an oil and gas firm issuing a green bond to electrify warehouse operations.

# Appendix

APPENDIX
# Defining the Universe of Climate Funds

The global universe of climate funds consist of open-end funds and ETFs that have investment strategies related to the climate change theme.

Morningstar's universe of climate funds is based on intentionality rather than holdings. For example, many sustainable portfolios score well on climate metrics, but if climate issues are not the focus of these funds' investment strategies, they are not included in our universe. To identify intentionality and understand the strategies, we relied on a combination of fund names (a strong indicator of intentionality) and information found in legal filings.

To identify these funds, we used a range of key terms in their names (or index names in the case of passive funds). Key terms include obvious words such as "climate," "carbon," "transition," and "green," but also words related to themes and sectors linked to climate change solutions such as "renewable energy," "electric vehicles," and "batteries." Using natural-language-processing technology to comb Morningstar's comprehensive global fund database, we made efforts to identify as many of these funds as possible. We used this sample to analyze the latest trends in terms of assets, flows, product development, and the climate-related profiles of these portfolios.

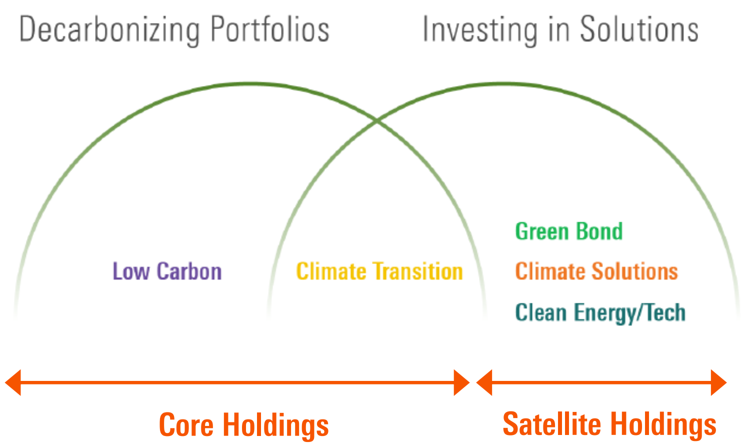
In this spirit, we did not include those funds whose sole climate-related mandate is to exclude fossil fuel companies. Globally, a small number of funds are branded ex-fossil fuel (with "ex-fossil fuel" or "fossil fuel-free" in their names), but many more unbranded funds similarly exclude fossil fuels. Fossil fuels have become part of a broader exclusion list for many asset managers, alongside weapons, tobacco, and other controversial activities.

Moreover, the scope of fossil fuel exclusions varies greatly, from the limited omission of companies involved in thermal coal extraction and generation to full-scale removal of companies with fossil fuel reserves or any involvement in fossil fuel-related activities, including exploration, production, and distribution. Excluding fossil fuels is one way to decarbonize a portfolio, but we elected to exclude ex-fossil fuel funds from this study to ensure a well-defined and cohesive universe of climate funds.

Similarly, we did not include the growing number of funds that seek to maintain a lower carbon intensity relative to their investable universe without providing a specific carbon-reduction target. For most of these funds, climate considerations represent only a small part of the investment process. To be included in our climate fund universe, a fund committed to reducing its portfolio's carbon footprint or intensity must target a reduction of at least 30% relative to its reference benchmark.

Finally, we did not include funds that claim using investment stewardship as an approach to mitigate climate risks, unless it is the sole objective of the fund. We acknowledge the crucial role that proxy voting and engagement activities play in better understanding and managing climate risks and opportunities in portfolios. But these activities often complement other key objectives and can’t be considered the focus of the strategy. We have included only a couple of climate-engagement funds in our universe.

# Defining the Universe of Climate Funds




## Low Carbon

Low Carbon funds seek to invest in companies with reduced carbon intensity and/or carbon footprint relative to a reference benchmark. These funds typically market themselves as low-carbon strategies and incorporate quantifiable targets related to carbon-emissions reduction. Low Carbon funds tend to offer broad market exposure across all sectors.

Within the portfolio, Low Carbon funds provide core allocation, featuring asset classes such as equity, fixed income, and real estate.

## Climate Transition

Climate Transition funds 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. Climate Transition funds tend to invest in a mix of companies: those that better align with the transition and those that provide climate solutions. Also included in this category are passive funds tracking EU Paris-aligned benchmarks—or EU PAB—or EU climate-transition benchmarks, or 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.

## Green Bond

Green Bond funds invest in debt instruments that finance projects facilitating the transition to a green economy. The Green Bond Principles, formulated by the International Capital Market Association, provide high-level categories for eligible green projects. The eligible categories include, but are not limited to, renewable energy, energy efficiency, pollution prevention and control, clean transportation, sustainable water and wastewater, climate change adaptation, eco-efficient and/or circular economy-adapted products, and green buildings.

## Climate Solutions

Climate Solutions funds target companies that are contributing to the transition to a low-carbon economy through their products and services and that will benefit from this transition. Included in this category are funds that provide exposure to companies involved in industries and technologies such as hydrogen, nuclear, electric vehicles, batteries, critical raw materials, energy storage, carbon capture and storage, circular economy, and pollution control. Climate Solutions funds differ from Climate Transition funds in that they invest primarily in companies whose goods and services provide solutions for climate change mitigation and adaptation.

## Clean Energy/Tech

Clean Energy/Tech funds invest in companies that contribute to or facilitate the clean energy transition. This includes renewable energies such as wind, solar, hydro, wave, and geothermal power along with grid infrastructure improvements, transmission, and distribution. Clean Energy/Tech funds are characterized as sector-specific, are typically more concentrated than the first three fund groupings above, and often have a bias toward mid- and small caps.



The list of funds included in this report is available upon request. Please email ManagerResearchServices@morningstar.com

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