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Climate Action Implementation Guide

A Road Map for Private Markets

This report updates the previous version published in September 2023.

Climate action investing, which we define as the effort to direct capital toward climate solutions and mitigate climate-related investment risks, is top of mind for many investors seeking compelling risk-adjusted returns and interested in supporting the transition to a less carbon-intensive economy. This increased focus is largely driven by 1) heightened awareness of the impact of a changing climate on our ecosystems, economies and livelihoods; 2) meaningful commitments and financing from governments and the private sector to reduce greenhouse gas (GHG) emissions; and 3) an increasing number of attractive climate action investment opportunities coming to market.

Private markets offer investors opportunities to contribute to and benefit from the low-carbon transition in a more targeted way than what might be possible in public markets. According to PitchBook, 65% of 2024 private market dollars allocated to impact[1] had some allocation to climate—including categories such as agriculture, biodiversity, climate, pollution and water[2]—while infrastructure funds, many of which have meaningful allocations to low-carbon energy sources and projects, accounted for another 22%.[3]

Although recent data shows a pullback in fundraising and fund launches for private-market climate opportunities, this shift aligns with the broader private market trend in which fundraising has slowed significantly amid persistent macroeconomic headwinds, elevated interest rates and a more cautious investor outlook. Taking a longer-term view, the trend still shows substantial growth compared with the early 2010s, which is good news for investors, who still have multiple options.

The Morgan Stanley Wealth Management Global Investment Office has written on the rise of private markets (see "Portfolio Implementation Guide for Private Investments") and on climate action investing (see "Climate Action: Positioning Your Portfolio for Decarbonization"). This guide seeks to bring these topics together to address the risks and opportunities of climate action investing in private markets.

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The Case for Climate Action Investing

The Low-Carbon Transition Presents Significant Opportunities for Private Market Investors

There is broad consensus that human activity—specifically, industrialization and the burning of fossil fuels, which has increased the presence of heat-trapping GHGs in the atmosphere—is responsible for the accelerated rise in global temperatures.[4] Earth's average temperature has increased by at least 1.3 degrees Celsius (°C) since 1880, with much of that warming occurring since 1975.[5] A primary driver of the increase has been carbon dioxide (CO_2) emissions, which are the most abundant GHGs released by human activities.[6] As it stands, global atmospheric concentration of CO_2 is more than 50% greater than in 1800.[7] See our climate action investment primer for more on the negative impact of climate change on the environment, the global economy, energy systems and health and well-being.

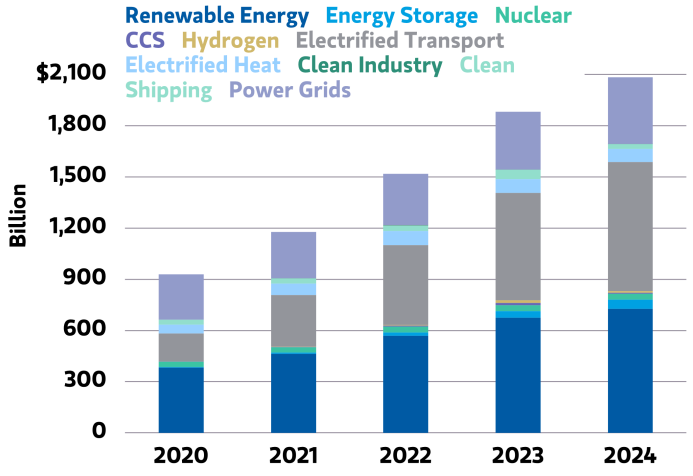
Climate action continues to be a focus for many governments and corporates globally, and they have increasingly introduced ambitious GHG emissions-reduction targets over the past several years.[8] Domestically, supportive policy action during the Biden administration mainly through 2022's Inflation Reduction Act (IRA), which allocated $369 billion to energy security and climate change programs over the following 10 years, drove robust investor interest.[9]

While political support for low-carbon energy sources and technologies has waned under the Trump administration, the impact of current policies on these energy sources has been more constructive than headlines may suggest.[10,11] For example, the passage of the One Big Beautiful Bill Act (OBBBA) in July 2025, which phases out many of the IRA's low-carbon energy investment and production tax credits, resulted in less draconian timelines than originally expected. Many alternative energy beneficiaries have a delayed phase-out not occurring until 2033, which may blunt the OBBBA's negative impacts. In addition, the OBBBA not only preserves, but also expands many tax incentives associated with nuclear and geothermal energy as well as carbon capture, utilization and storage (CCUS).

At the same time, emerging technologies like artificial intelligence (AI) are reshaping both the demands and the dynamics of the low-carbon transition. On one hand, AI-related infrastructure—such as data centers and chip manufacturing—drives rising energy and water needs, underscoring the urgency of decarbonizing electricity grids and improving efficiency. On the other hand, AI offers powerful opportunities to support the transition itself, from smart grid optimization and GHG emissions accounting to precision agriculture and early-stage climate technology—which we will continue to refer to as climate tech.

More broadly, increased low-carbon spending from the public and private sector during the last decade has disrupted supply-demand dynamics in various sectors and helped to fuel growth in emerging technologies. Global investment in low-carbon technology climbed to a record $2 trillion in 2024 and will continue to be critical to achieving a successful low-carbon transition (see Exhibit 1).[12]

Exhibit 1: Low-Carbon Energy Investment Reached a Record $2 Trillion in 2024



Source: BloombergNEF, Morgan Stanley Wealth Management Global Investment Office as of Jan. 30, 2025

Looking ahead, it is estimated that annual investment in the transition needs to nearly triple from 2024's record to $5.6 trillion per year, on average, for the remainder of the decade in order to reach net-zero emissions by 2050.[13] Around 60% of global low-carbon investment will need to be carried out by private investors responding to market signals and policy incentives set by governments.[14]

Given the very early stage of much emerging climate tech, private market investments will play an important role in helping companies critical to the low-carbon transition to mature. Further, as a result of the wide breadth of investable opportunities—from both a thematic and geographical perspective—private market investors can contribute to and benefit from the transition more selectively than currently possible in public markets.[15]

Investable Low-Carbon Themes

Investors seeking to identify attractive climate action investment opportunities in the private markets can source them from a growing pool of innovative technologies. As the transition to a less carbon-intensive economy continues, capital inflows will be required not just towards emissions reduction, but towards resilience, energy security and critical infrastructure stability as well.

While traditional proven technologies, such as wind, solar and electric vehicles remain part of the broader landscape, momentum has shifted towards sectors that are strategically valued in the current political environment including 1) nuclear, 2) geothermal, 3) CCUS, 4) battery storage and 5) grid-tied infrastructure systems supporting national security priorities such as AI development and energy independence, many of which are covered in more detail in our climate action investment primer.

Along with these low-carbon technologies, we have identified three additional investable themes that are tied to carbon-intensive activities for private-market investors to consider. These also stand to benefit from developments in AI, including improved emissions modeling, precision resource tracking and early-risk detection across supply chains:

- *Sustainable Food and Agriculture.* Agriculture and food systems are estimated to account for up to one-third of global GHG emissions.[16] These emissions are driven by land-use changes and deforestation associated with farming, as well as by food production and consumption further down the supply chain.[17] Investment opportunities aimed at reducing emissions tied to agri-food systems and supporting global food security include solutions for improving land productivity, reducing food waste and packaging, and shifting consumption away from meat and toward plant-based meat alternatives and fish.[18]

- *Waste Reduction and the Circular Economy.* Extracting and using finite resources is energy intensive and can lead to deforestation and land degradation. To reduce associated GHG emissions, investors can target opportunities that support the circular economy. The circular economy involves increasing the utilization of materials and products by keeping them in circulation as long as possible and finding new uses for them at what would previously have been the end of their useful lives.[19] Reusing more products, materials and resources can help reduce new production and minimize waste.

- *Conservation and Biodiversity.* Deforestation and land degradation, which are meaningfully linked to agricultural and extractive processes, are responsible for emitting GHGs into the atmosphere and contributing to biodiversity loss.[20] A growing investable area for consideration is natural capital solutions, which are actions to conserve, restore, sustainably use and manage natural assets such as forests, grasslands, wetlands and oceans. These efforts seek to reduce biodiversity loss while simultaneously supporting the ability of these natural assets to absorb carbon from the atmosphere and store it.[21] This could include investing in reforestation, the restoration of coastal ecosystems like mangroves and ocean-based technologies.

The Morgan Stanley Wealth Management Global Investment Office has written on natural capital investing (see "Natural Capital Investing: Supporting Nature-Positive Outcomes").

Climate Action Investing Opportunities by Asset Class

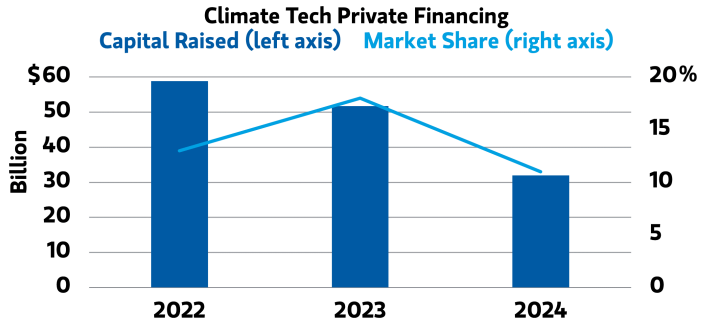
Below, we walk through the key private market asset classes that are relevant to climate action and discuss recent trends, risks and opportunities.

Private Equity

For investors seeking to address climate action through private markets, private equity (PE)—which includes venture capital (VC)—has historically offered the most direct access, particularly to early-stage innovation climate tech. According to our definition, climate tech refers to technologies that are explicitly focused on reducing GHG emissions and/or addressing the impact of a changing climate while aiding in the transition to a low-carbon economy. Currently, climate tech maintains a healthy share of overall funding activity that reflects the enduring interest in solutions ranging from carbon removal to clean energy infrastructure.

While climate tech represents a distinct thematic opportunity, it remains subject to similar macroeconomic, regulatory and fundraising forces that shape the private capital—including impact—landscape more broadly. In 2024, impact private capital fundraising fell to $71.4 billion, less than half of the 2022 peak of $156.9 billion.[22] Similarly, climate tech funding in PE fell to $32 billion, slightly more than half of its 2022 record high of $59 billion (see Exhibit 2).[23] Growth during this period focused primarily on the early-stage, venture capital stack.

Exhibit 2: Climate Tech PE/VC Funding as a Percentage of Broader PE/VC Funding Remains Stable



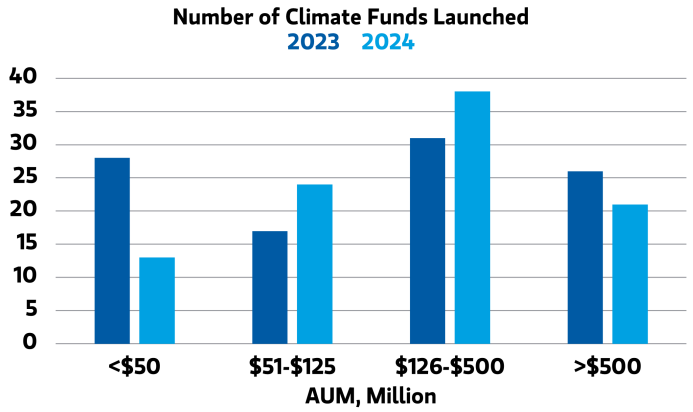
Source: BloombergNEF, Morgan Stanley Wealth Management Global Investment Office as of Jan. 30, 2025

In addition to market headwinds, the slowdown in venture activity may also reflect a maturing climate tech ecosystem. As early-stage climate opportunities mature, the sector may enter a consolidation phase in which growth equity and PE could play larger roles. Given the current environment, limited partners (LPs) may become more selective—holding fund managers to a higher standard with a focus on the track records of the general partners (GPs) and historical returns.

Unlike the "Cleantech 1.0" investment era of the early 2000s, current PE/VC climate tech investment landscape continues to be focused on sectors beyond just energy. As they seek to decarbonize the economy, startups are targeting a broad range of industries, including transportation, building, food systems and industrial processes. With greater diversification and regard for development stage, capital intensity and climate solution investment readiness, startup companies, GPs and PE/VC investors can take a more sophisticated approach to climate action investing.

Not only has the low-carbon technology PE/VC investment universe expanded since Cleantech 1.0, but the number of market entrants has increased significantly as the climate fund environment has remained robust through 2024, with new vehicles continuing to enter the market across strategies and asset sizes. According to Sightline Climate, a climate tech investment data aggregator, from 2021 to 2024 midsize funds have emerged as a dominant category with the majority raising at least $126 million (see Exhibit 3).[24] Conversely, there has been a declining number of funds of less than $50 million.

Exhibit 3: Midsize Funds on the Rise, While <$50M Funds Are in Decline



Source: Sightline, Morgan Stanley Wealth Management Investing with Impact as of Jan. 30, 2025

This likely undercounts the total number of new entrants, as it only includes funds whose primary investment strategy is related to climate tech, while excluding those with a generalist strategy featuring climate tech as a portion of their overall fund allocation. Given the uptick in new entrants, it is increasingly important for investors to have a clear understanding of manager investment and sector experience. A fund should also have a well-defined strategy and detail how the manager will measure success from both a financial and climate impact perspective.

PE/VC climate action strategies range across sizes and themes. Below are several strategy types and examples of potential underlying investments aiming to support the transition to the low-carbon economy, while seeking market-rate returns:

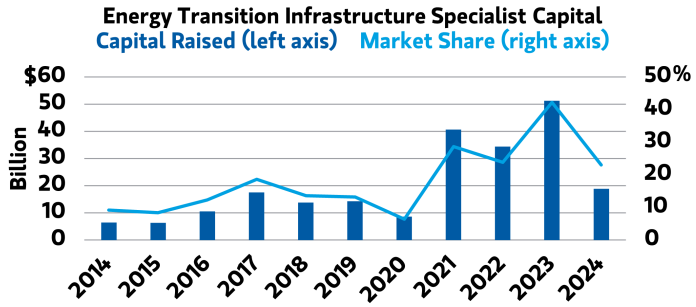
- *PE fund* investing a portion of their portfolio in businesses that contribute to environmental and conservation goals, such as a company that sells carbon credits that enable monetization of carbon-absorbing projects or a company that sells electric bikes at scale. The remainder of the portfolio is invested in other impact themes, such as education, health care and access to financial services. This is consistent with a broader trend whereby large PE impact funds are investing across various impact themes but still dedicating a sizable portion of their portfolio to climate action.
- *Growth equity PE fund* investing in companies directly contributing to avoidance of CO_2 emissions or their removal from the atmosphere in order to help achieve net zero by 2050. Investable companies may include a biofertilizer producer or one that is building out a network of EV charging stations.
- *VC and growth equity fund* investing largely in data and software companies helping to enable a decarbonized economy. Investments may include agriculture data companies that help farmers make more sustainable choices or software platforms that capture supply chain data of consumer goods companies, which in turn facilitate better estimation of scope 3 emissions.
- *VC fund* investing in early-stage climate tech businesses, which might include a plant-based meat alternative company or a robotics company that improves the recycling process by reducing waste and increasing the amount of product recycled.
- *VC fund* investing in climate-oriented, deep-tech companies developing solutions aimed at meaningfully reducing GHG emissions. This may include companies engaged in more efficient lithium mining or the development of less carbon-intensive cement-making processes.

Real Assets

Infrastructure

Infrastructure has historically played a central role in advancing climate action objectives in the private markets. This category includes a broad range of renewable-energy and energy-efficiency projects—spanning solar, wind, biomass, tidal and geothermal, battery storage, EV charging and CCUS—alongside infrastructure improvements across transportation, buildings and industry. Climate action infrastructure fundraising and deployment activity have slowed more than the broader market following the 2021–2023 peaks (see Exhibit 4). They have been concentrated in strategies reliant on public-private partnerships or policy-linked returns. In the current environment, investors are recalibrating around a narrower set of themes tied to AI, national security, rare earths and critical supply chains.

Exhibit 4: Momentum Into Low-Carbon Infrastructure Fundraising Is Cooling



Source: PitchBook, Morgan Stanley Global Investment Office, Morgan Stanley Wealth Management Investing with Impact as of April 2025

In the US, headwinds to renewable infrastructure investments include new tariffs on imports from countries such as China—the supplier for a significant share of global solar and battery components. In addition, tighter permitting conditions have created a less-than-friendly environment for some segments, particularly those that depend on tax credits, subsidies or long planning timelines for completion.

However, opportunities remain in other segments such as nuclear energy. According to the World Nuclear Association, nuclear energy powers 9% of the world's electricity and is the second largest source of low-carbon power.[25] There are approximately 440 nuclear reactors, and that number is anticipated to increase. Many countries have taken steps to extend operations at existing nuclear power plants as well as build new facilities. President Trump signed executive orders in May 2025 to accelerate the deployment of new nuclear reactors and the expansion of nuclear power in the US from around 100 GW currently to 400 GW by 2050.[26]

As such, we foresee climate-infrastructure investing shifting as GPs concentrate capital into platforms focused on commercially viable, yet politically aligned solutions. Leading areas of investor focus include the following:

- Advanced nuclear deployments including small modular reactors (SMRs) that are viewed as potential reliable power sources aligned with energy security priorities.
- Next-generation geothermal infrastructure that uniquely benefits from bipartisan support and advances in deep drilling technologies.
- CCUS retrofits, especially those tied to industrial assets or fossil-based energy transition pathways.
- Resilient and distributed energy systems—such as microgrids, linear generator, and long-duration storage for critical sites like hospitals, military bases and data centers—which are being shaped by AI, including AI-powered grid optimization, predictive maintenance for microgrids and real-time energy demand forecasting.
- Adaptation infrastructure including nature-based engineering and bioscience-driven solutions for agriculture, water and ecological resilience.

To invest effectively in this evolving landscape, it is helpful to understand the two distinct asset types: greenfield and brownfield.

- *Greenfield*, which comes from a British term for undeveloped land,[27] refers to projects that are still in the development stage or in the process of being constructed. Greenfield investments are made prior to assets reaching the commercial operations stage and have a higher overall risk profile given development and construction risk. In the development stage, land required for a project needs to be secured, project funding needs to be obtained, and construction permits and contracts need to be finalized. In the construction stage, cost overruns, project delays and environmental issues may prevent projects from being completed on time or at all. One benefit of greenfield investments is that they offer climate investors the ability to add specific requirements to a project or company, such as decarbonization or those tied to other climate-related goals.
- *Brownfield* refers to assets that have moved past the development and construction phases and become operational. Brownfield investments occur once an asset has reached the commercial operations stage and is generating cash flow; as such, they are less risky given that the hurdles associated with development and construction have been eliminated. There is, however, less scope to influence the project.[28]

The mix of greenfield versus brownfield opportunities varies across sectors. For example, nuclear and geothermal projects are often greenfield projects, as they require long lead times and permitting. Meanwhile, CCUS, retrofits and microgrid deployments are typically brownfield projects, as they seek to enhance existing infrastructure.

Across both categories, potential for infrastructure investment may be found across the capital structure, and appetite will vary depending on risk tolerance. Infrastructure investments generally have lower return profiles than what is typically expected from PE and VC investments, in keeping with their higher costs of capital, longer durations and more stable and predictable cash flows.

Real Estate

Private real estate plays a pivotal role in meeting climate action objectives, with buildings accounting for nearly 40% of global greenhouse gas emissions.[29] Investors seeking exposure to climate action through their private market real estate investments can allocate to managers who invest in projects that use sustainable building materials and focus on improving energy and water efficiency. This may include installing solar panels, using low-carbon cement for new developments, or retrofitting older buildings with energy-efficient LED lighting, insulation and high-efficiency HVAC systems.

Private market real estate investments that prioritize climate action outcomes can have financial and sustainability benefits beyond helping in the transition to a lower-carbon economy. Energy efficiency improvements, for instance, can reduce utility bills for residents and cut operating costs for landlords and property managers.[30] Improvements to building infrastructure can also make properties more resilient to extreme weather events, which are increasing in frequency and severity due to the changing climate. This can mitigate physical climate risks and help avoid costly damages. Further, evidence suggests that properties meeting requirements for certifications—for instance, the LEED certification issued by the US Green Building Council and the Energy Star certification issued by the Department of Energy and the Environmental Protection Agency—often have higher market values than peer properties.[31] A recent study from JLL indicated that retrofitting green buildings to meet green certification requirements yielded an 11.6% increase in market value in the US and a 7.1% increase in market value globally compared with non-green buildings.[32]

Among subsets of private market real estate investing, affordable housing opportunities tend to be heavily focused on building sustainability. Fund managers working to preserve existing affordable housing units or to develop new affordable housing stock will typically also direct part of their strategy to improving building sustainability and efficiency. Reasons for such positioning include many of the aforementioned, such as lower cost and climate resiliency, as well as support for the broader impact mission of improving quality of life for residents.

Private Credit

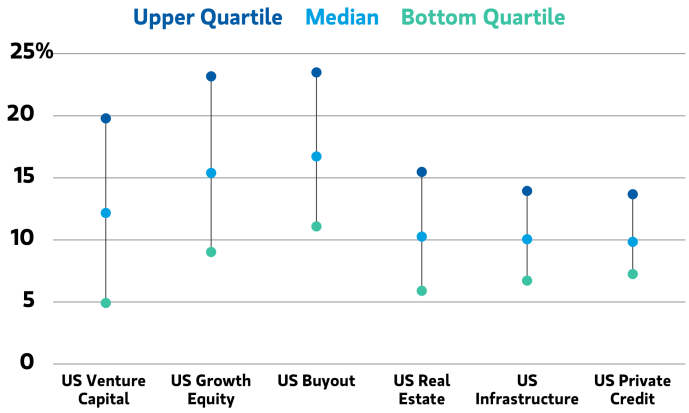
Low-carbon debt has grown in recent years, driven by expanding issuance of green, sustainability-linked and energy transition bonds. In 2024, energy transition debt issuance reached $1 trillion, driven by growth in corporate debt, particularly in China, France, Canada and the US.[33] As it has evolved, more private credit managers have contributed to decarbonization through their lending activities. This might take the form of a private credit manager providing secured credit facilities to solar and storage projects or financing large wind farms.

Given that private credit lenders often lack board seats, they must use the levers at their disposal, which tend to be through the loan agreements. Sustainability-linked loans (SLLs), which aim to facilitate and support environmentally and socially sustainable economic activity and growth, have particularly grown in popularity among private credit managers. The creation of a market for SLLs has led to the development of ESG ratchets, which provide a reduction or increase in the interest rate depending on the borrower's performance against pre-agreed ESG-related criteria and targets.[34] These tools help align borrowers' incentives with long-term decarbonization outcomes. Although there are few dedicated SLL funds, investors may still obtain exposure to these instruments via funds that feature it as a component of their overall strategy, which may include private credit and infrastructure funds.

The Importance of Manager Selection

After investors have considered the various climate action subthemes and private market asset classes in the context of their unique financial and impact objectives, the next step is manager selection. As with all private market investments, but particularly in the current rapidly evolving climate private markets landscape, manager selection is critical. Historical performance of top- and bottom-quartile managers has varied dramatically, as illustrated in Exhibit 5, reflecting the importance of strong manager due diligence and selection.[35] With so many new entrants to the climate action investment universe, manager selection has become even more critical; it is based on numerous factors, including team experience and expertise, as well as past performance, when applicable. Choosing a top-tier manager may help generate more consistent results in the future.

Exhibit 5: Private Market Median Net Internal Rates of Return (IRR) and Quartile Boundaries by Vintage Year



Note: For vintage years 2008-2020. Private equity returns exhibited are net of fees to limited partners. Private equity index data sourced from Cambridge Associates. Past performance does not guarantee future results.
Source: Morgan Stanley Wealth Management Global Investment Manager Analysis (GIMA), Cambridge Associates as of March 31, 2025

Monitoring of a Climate Private Market Strategy

As with other investments, monitoring and reporting progress is an important component of investing in climate action opportunities through private markets. Data availability in private markets has continued to evolve: The growth in impact data providers has increased the amount of reported impact criteria for investors and asset managers to consider alongside financial metrics. This has enabled them to better measure impact and more effectively compare investments based on specific climate action metrics, such as energy efficiency, carbon footprint and renewable energy use.

Whether investing in new battery technologies or the wide range of sectors with significant emission-reduction potential —such as plant-based meat substitutes, CCUS, low-carbon cement, electric grid management and zero-emission transportation—investors now have better metrics and tools to measure outcomes, benchmark their impact goals and inform their investment decisions.[36]

Morgan Stanley Impact Quotient® (Morgan Stanley IQ®) is our award-winning[37] and patented[38] impact reporting application —it captures a client's unique impact preferences and delivers multidimensional reporting on their investment portfolio's alignment with these preferences. With this application, climate-minded investors can work with their Financial Advisors, Private Wealth Advisors and Institutional Consultants to identify the portion of their portfolio that is invested in impact and climate-specific private market opportunities. Morgan Stanley IQ® can also be used to adjust portfolio holdings to improve alignment over time.

Conclusion

Given the magnitude of change required to transition to lower-carbon sources in coming decades, investors should have ample opportunity to capitalize. Private market investments—across asset classes and climate action themes —will be important to enable a successful transition. Morgan Stanley is well positioned to help private market investors develop a climate action investment strategy that seeks to meet their long-term financial goals while simultaneously helping to reduce emissions and aid in the low-carbon transition with their capital allocation decisions.

Endnotes

[1]PitchBook is a Morningstar company that aggregates data for private markets and tracks global impact assets under management. Climate-action oriented funds refers to an aggregation of multiple PitchBook categories that are relevant for climate-action: Agriculture; Air; Biodiversity & Ecosystems; Climate; Energy; Land; Oceans and Coastal Zones; Pollution; Waste and Water.

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[38]Morgan Stanley Impact Quotient® is a patented ("US Pat. No. 11,188,983") technology that enables alignment of client portfolios with unique social and environmental impact goals.

Disclosure Section

Index Definitions

For index, indicator and survey definitions referenced in this report please visit the following: https://www.morganstanley.com/wealth-investmentsolutions/wmir-definitions

Risk Considerations

Equity securities may fluctuate in response to news on companies, industries, market conditions and general economic environment.

Asset allocation and diversification do not assure a profit or protect against loss in declining financial markets.

International investing entails greater risk, as well as greater potential rewards compared to U.S. investing. These risks include political and economic uncertainties of foreign countries as well as the risk of currency fluctuations. These risks are magnified in countries with emerging markets and frontier markets, since these countries may have relatively unstable governments and less established markets and economies.

Investing in commodities entails significant risks. Commodity prices may be affected by a variety of factors at any time, including but not limited to, (i) changes in supply and demand relationships, (ii) governmental programs and policies, (iii) national and international political and economic events, war and terrorist events, (iv) changes in interest and exchange rates, (v) trading activities in commodities and related contracts, (vi) pestilence, technological change and weather, and (vii) the price volatility of a commodity. In addition, the commodities markets are subject to temporary distortions or other disruptions due to various factors, including lack of liquidity, participation of speculators and government intervention.

Growth investing does not guarantee a profit or eliminate risk. The stocks of these companies can have relatively high valuations. Because of these high valuations, an investment in a growth stock can be more risky than an investment in a company with more modest growth expectations.

Value investing does not guarantee a profit or eliminate risk. Not all companies whose stocks are considered to be value stocks are able to turn their business around or successfully employ corrective strategies which would result in stock prices that do not rise as initially expected.

Because of their narrow focus, sector investments tend to be more volatile than investments that diversify across many sectors and companies. Technology stocks may be especially volatile. Risks applicable to companies in the energy and natural resources sectors include commodity pricing risk, supply and demand risk, depletion risk and exploration risk. Health care sector stocks are subject to government regulation, as well as government approval of products and services, which can significantly impact price and availability, and which can also be significantly affected by rapid obsolescence and patent expirations.

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REITs investing risks are similar to those associated with direct investments in real estate: property value fluctuations, lack of liquidity, limited diversification and sensitivity to economic factors such as interest rate changes and market recessions.

Yields are subject to change with economic conditions. Yield is only one factor that should be considered when making an investment decision.

Certain portfolios may include investment holdings that takes into account one or more Environmental, Social and Governance ("ESG") factors (referred to as "ESG investments"). For reference, environmental ("E") factors can include, but are not limited to, climate change, water, waste, and biodiversity. Social ("S") factors can include, but not are not limited to, employees, diversity & inclusion, cyber security, data privacy, health & wellness, supply chains, product safety & security, community engagement, and human rights. Governance ("G") factors can include, but are not limited to, board structure & oversight, leadership composition, pay and incentive structures, corruption & bribery, ethics & business conduct, shareholder rights, accounting & audit practices, tax evasion, and risk management. You should carefully review an investment product's prospectus or other offering documents, disclosures and/or marketing material to learn more about how it incorporates ESG factors into its investment strategy.

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