

The GIIN Climate Solutions Investing Framework

Executive Summary

Investments in climate solutions have emerged as a critical lever to accelerate the global transition to limit global warming to 2 degrees Celsius. However, achieving global climate goals requires more than just allocating capital — it requires deliberate strategies that prioritize the most meaningful among climate investment options. Not all climate solutions are equally significant, and not all investment strategies are likely to assemble portfolios that contain the technologies, assets and models sufficient to meet these goals. The methodologies and frameworks that are currently available cannot assess the sufficiency of available strategies on their own.

Climate solutions investing goes beyond understanding individual opportunities — it demands two things. First, a systematic approach to portfolio construction prioritizes among climate solutions investments based on their potential contribution to limiting warming to 2 degrees Celsius. Those contributions can be evaluated on their ability to deliver and scale meaningful emissions reductions and contribute to a broader economic transition. Second, it requires investments that build the commercial ecosystems needed to support transitions across a range of sectors. Portfolios and investments that incorporate climate solutions investing can target a range of financial returns, from above market to below market rate.

Assessing the potential of investment strategies can create challenges for asset owners since investing into solutions is fundamentally forward-looking and involves many uncertainties. **This framework is designed to provide practical guidance for navigating these challenges, offering a clear set of criteria to identify and prioritize among climate solutions investments that contribute meaningfully to global climate goals.**

The framework also incorporates foundational concepts essential to understanding and applying its criteria:

- Climate solutions investing is a unique strategy
- Asset class contributions vary
- Climate solutions technologies differ from climate solutions investments
- Transitioning to a low-carbon economy requires solutions of varying maturity and building supporting ecosystems
- The sufficiency of a solutions investing strategy must be carefully assessed
- Financial risk and return profiles will vary
- Managing uncertainty is important

- Multiple tools are needed to evaluate climate solutions

The criteria outlined in this guidance address key considerations for new entrants to climate solutions investing when assessing strategies:

- Part 1: Integrating climate solutions investing into a traditional strategic asset allocation
- Part 2: Applying criteria to evaluate and select climate solutions strategies
 - **The climate strategy's thesis:** Assessing how the strategy connects investments to broader emissions reduction and economic transition goals
 - **The investment's contribution to economy-wide decarbonization:** Evaluating the investment's direct and system contribution to real-economy emissions reductions
 - **The context for prioritization:** Considering the maturity and scalability of technologies and their alignment with investment needs
 - **How uncertainty is managed:** Addressing forward-looking challenges with tools and frameworks designed to navigate uncertainties

Introduction

As the world has crossed the first year of temperature rise over 1.5 degrees Celsius,¹ the urgency of accelerating the decarbonization of the global economy has become even more apparent. Achieving economy-wide decarbonization will require investments in climate mitigation, encompassing both the reduction of emissions in energy-intensive sectors and the development of solutions that enable the decarbonization or replacement of emissions-intensive activities. The latter is captured under the term “climate solutions” and covers a wide range of investments, such as low-carbon substitutes for delivering goods and services, renewable energy, energy efficiency improvements in buildings, or carbon capture through nature-based solutions. To achieve this global transformation, capital must flow towards these solutions at a scale sufficient to transition to a decarbonized economy.

At the same time, the widespread deployment of climate solutions presents significant investment opportunities, appealing to some investors purely on financial merits while aligning with broader climate strategies for others. However, within the domain of climate solutions, not all investment opportunities contribute in the same way to achieve global climate goals. Some investments may deliver emissions reductions at an insufficient scale or pace, while others may rely on parallel investments into supporting infrastructure, ecosystems or market conditions that may not materialize within required timelines.

The inherent uncertainty in climate solutions investing underscores the importance of robust portfolio construction, or asset selection, processes. Prioritizing the most meaningful investments will determine the likelihood of achieving the necessary climate outcomes in transitioning sectors or economies. This framework assumes that the primary goal of climate solutions investing within a climate strategy is to accelerate the development and deployment of climate solutions technologies and assets that contribute to the elimination, removal or reduction of real-economy GHG emissions while also providing a financial return.

For investors, climate solutions may serve as both a hedge for future risk and a pathway to economic growth. They may also be attractive as a component of an overall climate strategy designed to align with the interests of beneficiaries. To support either objective, it becomes important for investors to compare strategies effectively and identify those with the greatest potential to deliver results sufficient to meet climate challenges.

¹ [WMO confirms 2024 as warmest year on record at about 1.55°C above pre-industrial level](#)

About this document

This framework provides criteria for evaluating managers and their investment strategies, whether they are internal or external to an asset owner. This framework comprises:

1. **Foundational concepts:** What sets climate solutions apart from other climate strategies and what is important to consider when assessing climate solutions investing strategies.
2. **Criteria for evaluation:** Guidance for assessing internal or external managers' approaches to climate solutions investing.
 - Understanding your strategy and goals as an asset owner — important questions that will allow asset owners understand their priorities and climate objectives and how they support selection of the right climate solutions strategies
 - Assessing strategies — key aspects to assess climate solutions strategies externally or internally

Numerous funds are active in climate investing, showcasing diverse skills and competencies. Traditional due diligence questions remain relevant, such as:

- Track record in investment performance
- Experience in climate investing
- Size and expertise of the investment team
- Capability to execute investment strategies effectively

The list above is illustrative and not exhaustive. The unique aspect of evaluating climate solutions strategies lies in understanding how managers define and construct their investment portfolios. This process requires specialized knowledge in areas such as climate change, potential future changes and opportunities to meet global climate goals. This document seeks only to focus on those aspects unique to climate solutions strategies.

This guidance can also be useful for asset owners and managers looking to communicate their climate solutions investments efforts and increase transparency.

Laying the Groundwork: Foundational Concepts

This section outlines key definitions, concepts and assumptions critical to evaluating climate solutions strategies. There are eight foundational concepts listed below in bold font.

Climate Solutions Investing is a Unique Strategy

Climate solutions investing is complementary but distinct from other climate investing approaches and requires assessment methods that differ from other climate investing strategies. Several key frameworks are widely used by asset owners and other investors to define and describe climate strategies and their investing components — particularly the NZIF, Paris Aligned Investment Initiative, Glasgow Financial Alliance for Net Zero (GFANZ) and NZAOA. While each uses its own terminology, they share a common view that there is a sub-set of investing that prioritizes directing capital towards the goods and services that provide low-carbon or zero-carbon substitutes for high-carbon activities. These goods and services include both primary technologies or assets, such as wind farms, electric vehicles or sustainable landscapes, and the components that support their functionality, such as lithium for batteries or more efficient transmission wires for electrical grids. This approach differs from investing strategies aimed at lowering emissions in companies whose primary goods or services serve broader economic needs, like consumer products, industrial products, hospitality services and others.

For many climate investing strategies, like those focusing on carbon reductions, measuring mitigation performance focuses on understanding the past and expected emissions profile of the investee, especially in high-emitting sectors. Typically, the goal is to ensure that emissions decrease at a rate consistent with science-based targets and pathways. Evaluating such strategies often involves tracking emissions trends, corporate climate targets and potentially reviewing how portfolio managers engage with portfolio companies to drive decarbonization. While these efforts are necessary and can indirectly stimulate demand for and deployment of climate solutions (e.g., an airline shifting to alternative jet fuels), scaling market demand for or deployment of a specific solution is not typically the primary basis for evaluating the performance of strategies that seek to transition or align companies.² Typically the basis of evaluating the success of strategies to transition or align

² GFANZ outlines four financing strategies to support net zero goals: enabling the transition of high-emitting companies, increasing capital to already-aligned companies, accelerating the development of climate solutions, and retiring high-emitting assets responsibly. GFANZ, [Financial Institution Net-zero Transition Plans](#), November 2022.

companies to pathways for limiting warming to 2 degree Celsius is to track their actions, investor engagement and changes to their footprint.

In contrast, assessing climate solutions investments means measuring their potential to significantly reduce, displace, sequester or eliminate emissions both within other companies, or through consumer use, and throughout the broader economy, thus supporting the transition to decarbonization. Because these solutions often involve products and services that are not yet widely deployed or demanded, evaluations typically rely on modeling potential future decarbonization outcomes rather than examining the company's historic emissions trends. Some climate solutions may also have substantial greenhouse gas footprints of their own or other negative impacts that must be managed, such as impacts associated with mining minerals required for battery production. However, the emissions impact of such investments is still more typically evaluated in terms of their contribution to decarbonizing the wider economy. This wider contribution is often the result of a combination of the effectiveness of the technology, the scale of its deployment and the growth of the commercial ecosystem necessary to support its use. This document focuses specifically on these types of climate solutions.

Asset Class Contributions Vary

Opportunities to invest into climate solutions exist within different asset classes, but each offers distinct types of contributions. For instance, capital invested in primary markets typically provides direct financial support to help companies grow, while capital invested in secondary markets has a different, often indirect, impact. When assessing or discussing climate solutions strategies, it is important to distinguish the differences in how they contribute to accelerating climate solutions.

Another perspective for understanding the differences between the contributions available in different asset classes is a focus on stimulating demand for solutions compared to investing into increasing the supply of solutions being brought to market. For example, investment strategies in listed equities can play a critical and necessary role in stimulating demand for solutions. This might include investing into companies like a publicly traded logistics firm that develops transition strategies that depend on increasing the use of transportation optimization software or electric vehicles. Such increased use represents increased demand for climate solutions. In contrast, investing into a climate tech venture capital fund will likely support the development of new, early-stage substitutes or efficiency solutions. Alternatively, an investor could choose to invest into a fund that focuses on scaling supply through the development of optimization software for logistics companies.

The criteria, methodologies and reference points for comparing strategies that stimulate demand for climate solutions will differ from those used for evaluating the strategies that stimulate supply. This framework is focused specifically on evaluating strategies where success is judged by either increasing the success of companies that are supplying climate solutions or by the strategy's success in accelerating the deployment of climate solutions into the wider economy.

Climate Solutions Technologies Differ from Climate Solutions Investments

Both within and across asset classes, it is important to understand how particular investments support the actual deployment of a technology across economies. To do this, it is necessary to clearly distinguish between a climate technology and a climate investment. Solutions are typically delivered through a technology, such as a substitute, enabler, efficiency enhancement, or through sequestration assets, such as forest landscapes, but these solutions are almost always embedded within in a business entity, like an SPV, corporation or LLC. This raises two considerations for asset owners.

First, investment vehicles and structures vary in how they connect investors' capital to the deployment of solutions, even within asset classes. For example, bonds may be issued for general purposes or have restrictions on the use of proceeds. Strategies focused on either will offer different levels of certainty that investors' capital directly supports the deployment of solutions.

Second, asset owners need to consider the types of businesses that a strategy will target. Some business entities may be exclusively focused on a climate solution, while others might have diversified business interests, potentially including emissions-intensive activities. Managers' approaches will differ depending on how they balance "pure play" companies and companies with diverse business interests. It cannot be assumed that every dollar invested into a company that deploys climate solutions will necessarily be allocated to those climate solutions if the company also holds a portfolio with unrelated products, services or businesses. As a result, investments differ in their climate-relevant benefit, or "transmission value."

Transitioning to a Low-Carbon Economy Requires Solutions of Varying Maturity and Building Supporting Ecosystems

Climate solutions technologies are diverse, each with unique investment needs to fully contribute to an economy-wide decarbonization. These solutions range from early-stage, innovative technologies being developed by startups to well-established solutions, like

wind energy, where the focus is more on large-scale deployment than on innovation. Achieving an economy aligned with IPCC-recommended temperature targets demands both significant innovation in technology and business models as well as substantial capital to make these and existing technologies widely accessible. Deployment of these technologies requires not just innovations in the primary technology (e.g., clean fuels for marine transport), but also building comprehensive supply chains and commercial ecosystems to support their production and use. Although these enablers³ may not directly reduce GHG emissions, they are necessary components for emissions removal and sequestration.

Investment strategies will vary depending on the types of solutions prioritized and the role the solutions are expected to play in achieving specific global outcomes. The optimal combination of solutions needed to achieve progress will differ across geographies.

Asset owners need to make choices about the nature of the contribution that they seek through their solutions investing, whether by financing innovation, scaling mature solutions or supporting development in specific markets. Certain types of contribution are more aligned with specific asset classes than others. For example, financing the early-stage development of next-generation sequestration technologies requires the flexibility to invest into venture capital or seed-stage opportunities, which may not be accessible to all investors. As such, investors must align their goals with their capacity to invest into asset classes, key markets and strategies that suit their objectives.

The Sufficiency of a Solutions Investing Strategy Must Be Carefully Assessed

Achieving global, regional or local climate goals requires reaching a critical mass of investment into the right combination of technologies and assets. The sufficiency of a climate solutions investing strategy depends on its potential contribution relative to investment needs, along with an understanding of the remaining viable pathways to achieve economy-wide decarbonization. The most viable mix will change over time due to new technological breakthroughs or failures to meet key critical pathway milestones. For example, expanding renewable energy generation capacity will fail without parallel investments into distribution grids or other necessary infrastructure. Therefore, the effectiveness of investment strategies in delivering a sufficient set of solutions is tied to

³ Enablers, defined by GFANZ, refer to companies or entities that facilitate the transition to a net zero economy by providing essential technologies, services, or infrastructure that reduce emissions across sectors. These include, but are not limited to, providers of renewable energy, energy storage, infrastructure, carbon capture and storage technologies, and efficiency-enhancing solutions (GFANZ, [Scaling Transition Finance and Real-economy Decarbonization, 2023](#)).

their ability to identify actual investment gaps, assess the potential of specific investments in specific sectors and regions, recognize synergies between investments, and support the wider commercial ecosystems required for scaling these solutions. For asset owners, understanding sufficiency will require looking beyond individual investments in isolation and looking at how portfolios and portfolio construction processes align with viable pathways towards achieving climate goals.

Financial Risk and Return Profiles Will Vary

Allocations to climate solutions are made within the wider context of an asset owner's entire portfolio strategy. Investments that can accelerate the development or deployment of climate solutions do not share a uniform risk and return profile, nor must they be confined to specialized investment categories. For example, certain mature solutions can easily fit as individual investments within general-purpose funds. An infrastructure fund, for example, might invest into rail or renewable energy projects purely based on their business merits. In a successful portfolio, there will be an alignment between investor risk-return objectives and the investment strategy as investors will need to calibrate their aspirations with their ability to invest and strategies that match.

Managing Uncertainty is Important

Decarbonization or footprint assessments measure the past or current performance of a company against a reference value, target or threshold. In contrast, climate solutions investing aims to assess a substitute, enabler or removal technology's effects in the wider economy as they are deployed, with more dependencies implicit and more modeling needed to understand immediate and future impacts. A sub-set of climate solutions investments, such as seed-stage investments, are posited on delivering impacts in the future and their relevance is based on the expected scale of improvement as compared to more mature solutions. For climate solutions investments, whose primary value lies in their ability to significantly shift sectors in the future, managers often use frameworks, guidelines, or other tools to estimate potential performance, which help to make informed decisions despite uncertainties. However, these tools are based on developing models and assumptions, which include dependencies on key parameters, such as temperature targets, the pace of global decarbonization and other critical factors for reaching a decarbonized economy to meet global climate goals. Additionally, these models may assume various counterfactual and specific conditions for the technology's potential to mitigate, remove or reduce emissions.

Therefore, comparing climate solutions investments requires more than examining projected outcomes — it also involves understanding differences in what quantification

methods managers are using, how managers make projections and develop underlying assumptions and how the assumptions are being monitored and updated to ensure they remain relevant. As investments shift from direct substitutes to more indirect enablers and the supply chain of enablers, the reliance on assumptions increases. Funds and strategies differ in the tools and approaches they use to manage uncertainty, further distinguishing them from one another.

Multiple Tools are Needed to Evaluate Climate Solutions

There are a range of tools that have been developed to help stakeholders analyze and select amongst actions in the interests of finding the investment approach with the greatest likelihood of achieving climate goals. These tools range from qualitative or scorecard approaches to scenario planning, transition pathway mapping, taxonomies, cost curves, life cycle assessments and other resources that provide both quantitative and qualitative insights into the relevance of an investment, technology or strategy in achieving global climate goals.

Estimating future financed avoided or reduced emissions of individual climate solutions is currently one of the more advanced approaches. Given the nature of decarbonization contributions from climate solutions — operating predominantly at the systems level — traditional, backward-looking KPIs are often inadequate at capturing the full climate mitigation potential of a climate solutions investment. To address this gap, the estimation of avoided emissions has emerged as a valuable, complementary metric⁴ of climate solutions investing and increasingly common in the industry.⁵ However, these estimates alone cannot assess whether an investment sufficiently contributes to global climate objectives. Due to uncertainties inherent in avoided emissions methodologies, investors should consider these metrics alongside other robust tools to form a holistic assessment.⁶

⁷ A strategy focused solely on comparing avoided GHG emissions⁸ between investments

⁴ For detailed guidance on calculating avoided emission, see the World Business Council for Sustainable Development's (WBCSD) [Guidance on Avoided Emissions](#).

⁵ The benefits of estimated avoided emission are explored in greater detail in the [GIIN's Climate Solutions Scoping Report \(2024\)](#).

⁶ For methodologies and principles on integrating avoided emissions within net zero financing strategies, refer to GFANZ's [Scaling Transition Finance and Real-economy Decarbonization](#).

⁷ The Partnership for Carbon Accounting Financials offers detailed [frameworks](#) for assessing financed emissions.

⁸ Also referred to as Scope 4 emissions, avoided emissions represent the reductions in greenhouse gas emissions that occur outside a company's direct operations because of its products, services or investments, compared to a baseline scenario. While not formally recognized under the GHG Protocol, they are increasingly used to evaluate investments (WRI, Estimating and Reporting the Comparative Emissions Impacts of Products, 2019).

may not yield the optimal portfolio for economy-wide decarbonization for the following reasons.

First, frameworks for estimating the impact on future GHG emissions have inherent limitations in precision and their ability to predict future outcomes. Standardizing models and attributing contributions to economy-wide decarbonization are challenging. For example, electric vehicles require integration of cars, chargers and batteries, making it difficult to fairly allocate the emissions avoided from one electric vehicle across these critical components. A consistent set of assumptions and variables used across the market are needed to make meaningful comparisons.

Second, building a portfolio solely based on investments that meet a certain threshold of avoided emissions may lead to individually effective choices that lack complementarity at the level of the economy, and the quality of inputs can vary here too. For example, hydrogen and electrification could both be highly effective as fuel solutions but require substantially different enabling conditions and may compete in certain applications. Two investments with similar potential emissions reductions may not have equal likelihood of achieving that potential and may not both be viable in the same future economy.

While modeling expected avoided emissions or emissions reductions has value, it must be supplemented with other methods, such as life cycle assessments, scenario tools and taxonomies, to contextualize estimates and support decision-making. For example, the use of avoided emissions factors based on industry studies differ from measuring the lifecycle impact of a challenger product using an ISO-certified assessment and comparing it to the incumbent on a lifecycle basis. Understanding the range of qualitative and quantitative tools that a manager or strategy uses to guide its investment process is important for distinguishing approaches and how they define sufficiency.

Criteria for Evaluating Climate Solutions Strategies

The following section outlines aspects of solutions investing and associated questions that are important for assessing specific climate solutions investing strategies. Making assessments requires an asset owner to have both: clarity on their overall goals and portfolio strategy and insight into the specific practices being deployed in an investment strategy. This section addresses both requirements.

Understanding Your Climate Goals as an Asset Owner

Like all investments, climate solutions investments must fit within an asset owner's existing investment objectives, which typically include risk, return and sometimes intentional positive impact. However, not all climate solutions investments have the same type of investor contribution to climate mitigation. A critical choice in climate solutions investing is determining the nature of the achievements that an asset owner aspires to deliver through their investing. This decision shapes the range of investment options but does not necessarily serve as a basis for comparing the quality of investment processes.

- **Innovation:** Early-stage investments that enable the success of new climate mitigation technologies and business models, including seed capital, venture capital and some earlier stage private equity. The investor's contribution to climate mitigation is primarily in the provision of new capital, creating the opportunity for innovative new climate solutions to emerge.
- **Scaling:** Primary market investments that enable climate mitigation technologies and business models to scale, including private debt, project finance, bank loans, public equity IPOs and new issuances of public debt. The investor's contribution to climate mitigation is primarily in the provision of larger amounts of capital for more proven technologies and business models, which have the potential to scale and be replicated to create more climate mitigation impact.
- **Signaling:** Liquid, public market investments that signal mainstream adoption and provide more cost-efficient financing of climate mitigation technologies and business models, including public equities, public debt securities, mutual funds and ETFs, and others. The investor's contribution is primarily in the provision of low-cost, highly liquid capital that allows efficient operation and recycling of capital by the climate solutions enterprise. Signaling capital invested by institutional asset owners can also demonstrate demand for climate solutions securities and funds, which helps stimulate supply for consumption by retail investors over time.

Asset owners will benefit from differentiating between a focus on these three categories to better understand the investor contribution they are making toward climate mitigation, and to better communicate their contribution to their own stakeholders. In addition, asset owners may choose to prioritize certain geographies or sectors, which will also impact the possible climate mitigation benefits exposure and how the investors consider risk, return and climate solutions sufficiency.

As noted above, the different types of contribution have a general correlation with different asset classes. Most asset owners will approach the management of their assets by designating an asset allocation structure or putting parameters in place to guide the overall balance of exposure. Depending on the nature of the climate contribution that an owner seeks, there may or may not be an easy alignment or deep opportunity set within the parameters of the existing asset allocation structure.

Additionally, it is important for asset owners to assess where they may already have exposure to climate solutions — whether the initial investment thesis was explicitly related to solutions investing — and then consider these factors in the context of their existing portfolio. These existing exposures indicate areas where it is possible to increase exposure in a manner compatible with their overall portfolio strategy or adopt a more focused approach to investing into solutions.

Questions that can support internal discussions:

1. What are our investment objectives today, and how does a contribution toward climate mitigation fit in with those objectives? Will we pursue climate mitigation intentionally?
2. What are the main strategies through which we want to contribute to climate mitigation? Do we want to focus on reducing the carbon emissions of businesses, contribute to the growth of climate solutions, protect and restore nature, or do we have another strategy in mind?
3. Where do we hold investments in climate solutions today, and what is the breakdown between innovation, scaling and signaling capital among those existing investments?
4. Where could we grow investments in climate solutions in the future, within the boundaries of our strategic asset allocation?

Assessing Strategies

There are multiple aspects to assess that are described below with short explanations and sample questions. There are four criteria that can serve as a basis for differentiating the approaches of managers and their relative sufficiency for contributing to achieving climate goals. The following criteria are applicable across all asset classes.

Each criterion:

- Describes an aspect of differentiation in investment strategies.
- Provides a short explanation of some of the different approaches that an owner might see amongst managers.
- Lists a series of sample questions that owners could use in dialogue with managers to better elicit and understand the differences in approaches.

The criteria are intended to help asset owners differentiate strategies to identify those most likely to generate the portfolios of investment with sufficient climate impact to achieve global climate goals.

1. Identify a Strategy's Climate Thesis

Many investments can contribute to climate change mitigation, but not all investments align with a likely pathway for transitioning to a specific sector or geographic region. A critical question for investors is understanding the logic behind portfolio construction in terms of the themes, technologies and individual investments chosen. This can generally be framed along a spectrum from investment approaches with minimal parameters to approaches that build heavily on an impact thesis.

At one end of the spectrum, a strategy may be open to any investment that crosses some minimum criteria of climate benefit. For example, some funds use a threshold of a specific volume of avoided emissions of a technology as the basis for eligibility for consideration of investing. Among such strategies, construction can vary in the type of criteria that it sets, but the pattern of portfolio will be more influenced by the range of opportunities that the manager sees than by a particular view on climate solutions. While such a strategy can contribute to mitigating climate change, the collective results are less predictable because the investments are not sourced from a shared hypothesis. Moreover, the portfolio of investments may not align with a cohesive assessment or fit into a unified pathway to climate mitigation.

On the other hand, strategies can focus on building a portfolio of investments that share a common analysis or thesis of the most likely pathways for a low-carbon transition.⁹ A thesis can range in detail and rigor from a set of general assumptions about the relative importance of a range of technologies to detailed, research-based conclusions about specific technologies with the greatest potential. A fund-level thesis can be applied at varying levels of geographic and sectoral granularity.

Fund-level strategies that use a thesis to guide investments will have a climate objective that will support the building of an overall investment strategy and seek appropriate technologies and investees. Potential investments will be assessed firstly from the perspective of the objective, then within a technology that aligns with the best technological pathways that addresses the problem or decarbonizes the specific area and how that fits within broader market context, such as existing infrastructure, energy grid mix or transportation patterns, and finally will involve the evaluation of the specific company and comparison of that company with other potentially available companies in the market against the chosen theoretical view.

For example, applying a climate thesis about the electrification of transport could lead a manager to assess investments in relation to a set of assumptions about infrastructure needs, charging capabilities and the baseline energy mix. They would then evaluate a specific opportunity in comparison to other technology providers to determine which had the highest potential to meet future needs.

A thesis will also specify what types of climate solutions are considered investable under the strategy. While there are a variety of taxonomies in the market to help identify climate solutions, some at a high level of granularity, asset owners may find it useful to categorize their climate solutions investments in the following way to help distinguish the different roles each may play:

1. Substitutes: Technologies or business models that directly mitigate climate change by reducing or avoiding future emissions.
2. Removals: Natural assets or technologies that remove previously emitted CO₂ from the atmosphere.
3. Enablers: Providers of critical inputs or services to other climate solutions.

These differing characteristics play a significant role in determining the types of investments that align with an asset owner's overall portfolio strategy. They also define the

⁹ This could be called a climate thesis, impact thesis or, depending on the specific content, a theory of change.

role an investor can play in accelerating the development and deployment of climate solutions. It is possible to affect change without a climate thesis, and this may or may not be aligned with an asset owners' goals. However, impacts that are more durable and with more continuity will come from managers with a climate thesis that serves as a compass and keeps the fund in a direction that is more likely to be predictable.

Questions

- What is the climate thesis of the fund? How does it influence the scope of investments that the fund considers?
- What types of climate solutions technologies are included in the strategy: substitutes, removals and/or enablers?
- Does the asset manager have specific goals they are working towards with their climate solutions portfolio?
- What frameworks and tools are the manager using to align their investment decision making processes? Does it differ by geographies and sectors?
- What are examples of investments that were not included in the fund because of their inadequacy in achieving economy-wide decarbonization by 2050 or insufficient fit with the climate thesis?
- What climate solutions investing definition does the manager use to identify potential climate solutions technologies or assets?
- How does the manager assess the climate potential of the fund and its alignment with the fund's strategy? How formally is the investment selection process associated with climate thesis built into the strategy?
- Does the manager have a focus area on a particular economic system, geography or sector?
- What is the research basis of the climate thesis and primary assumptions? How often is it updated?

2. Assess the Approach to Quantifying Contribution to Economy-Wide Decarbonization

Climate change is ultimately a problem of cumulative GHG concentrations, and it is important for any solutions strategy to include some form of quantitative measurement to help assess the relative value of individual investments in addressing climate change. This may include, for example, analyzing green revenues, capital expenditures, carbon aversion and other metrics that demonstrate a portfolio's alignment with science-based targets and

pathways for listed markets.¹⁰ Investment managers typically use some combination of quantitative and qualitative methods to assess opportunities, and it is important for an asset owner to understand the methods being used.

There are multiple methodologies used to assess investments and each has its unique advantages. It is important for an asset owner to understand their underlying frameworks, evidence base and integration into wider portfolio considerations, such as climate theses and market analyses. Methodologies commonly used by investors include technology assessment and life cycle assessment (LCA), avoided emissions quantification, efficiency measures and sequestration methodologies.

Life Cycle Assessment (LCA)

LCA techniques are widely used in many industries to quantify the environmental costs and benefits of products across their full lifecycle, including raw material extraction, production, use and disposal. LCAs that comply with ISO and ISAE standards, include peer review and careful selection of functional units and system boundaries, and offer a rigorous and credible approach to quantifying environmental impacts, such as GHG emissions, on a per-unit-of-product basis. LCAs for low-carbon replacement products with appropriate incumbent products or portfolios can yield a direct measure of emissions avoided on a per-unit replacement basis.¹¹ This measure serves as a high-quality input for avoided emissions or carbon yield calculations, but does not address economic, future or counterfactual scenarios.

LCA methodologies typically rely on existing datasets regarding emissions across a product's life cycle, avoiding some of the modeling risks associated with estimated future avoided emissions. In addition, LCAs can evaluate multiple environmental attributes beyond GHG emissions, such as water use or other resource impacts. However, the quality and accuracy of an LCA depend heavily on the availability of robust data and the assumptions made to address any gaps. As a foundational tool in climate and environmental analysis, LCAs are most informative when used in conjunction with other analyses, such as comparisons between LCAs of incumbent technologies, to contextualize their results.

¹⁰ For detailed methodologies applicable to listed equities, see IIGCC, [Investing in Climate Solutions: Listed Equity and Corporate Fixed Income](#) (2023).

¹¹ The GIIN IRIS+ system's [greenhouse gas emissions of product replaced](#) metric provides a standardized approach to quantifying emissions avoided.

Avoided Emissions Quantification

Estimated emissions reduction or avoided emissions refer to the decrease in overall emissions achieved by a project, product or service when compared to what would have occurred in an alternative scenario. In other words, they represent the emission reductions made possible only because the specific project, product or service exists.¹² This concept is gaining traction as an advanced way to evaluate the potential climate benefit of future investments.

Avoided emissions assessments are useful when evaluating the trade-offs between specific investment opportunities where there is sufficient contextual information and a simple mechanism that underpins the investment's progress towards decarbonization, such as applying a solution that captures methane leaks. Assessing GHG mitigation potential across investments enables managers to compare by using similar metrics.

As any assessment, including financial models, avoided emissions estimates depend on assumptions in their modeling. Uncertainty is inevitable in all forward-looking approaches, and this is particularly relevant for early-stage investments in incubation or piloting phases. To assess the reliability, rigor and comparability across markets of avoided emissions estimates, asset owners need to understand the overall frameworks managers use in their methodologies with transparency. Managers whose models are documented transparently and clearly outline the assumptions about how the technology will enable or contribute to a decarbonized economy, along with a method to estimate the magnitude of that contribution, will be better positioned to assess and prioritize climate solutions investments.

Efficiency Measures

Efficiency measurement methodologies combine avoided emissions quantification with the market value of a climate solution to arrive at a value for how effective the investment is in driving climate impact. Efficiency measures articulate the climate mitigation potential per dollar deployed and this can support making choices between individual investments within and across asset classes.

Where this approach uses both LCAs and carbon avoided estimates as inputs, the same rigor and quality guidelines discussed above apply to efficiency measures.

¹² For more details on the concept and methodologies for calculating avoided emissions, refer to the Partnership for Carbon Accounting Financials, [The Global GHG Accounting and Reporting Standard, Financed Emissions, Part A.](#)

An important distinction of efficiency measures, such as carbon yield, is that they are influenced by market pricing. For instance, if the price of equity increases, then yield, or GHG emissions per dollar invested, decreases. This dynamic can lead to differing investment conclusions among managers. For example, a company with a high volume of projected avoided emissions and a high company valuation would be judged quite differently by an investor focused on absolute emissions as compared to an investor focused on carbon yield.

Sequestration methodologies

Sequestration encompasses a range of methodologies aimed at capturing and storing carbon to mitigate climate change. These methodologies offer avenues for reducing greenhouse gas concentrations through both natural and technological means. Primary sequestration approaches include:

- Forestry-based sequestration, which may involve afforestation, or establishing new forests on previously non-forested lands, and reforestation, or replanting trees in deforested areas to enhance CO₂ absorption.¹³
- Agricultural sequestration, in which regenerative agricultural practices, such as cover cropping, reduced tillage and crop rotation, are implemented to increase organic matter in soils, thereby enhancing their capacity to store carbon.¹⁴
- Ocean-based sequestration, which may involve the conservation and restoration of coastal habitats, such as mangroves, salt marches and coral reefs to facilitate significant carbon storage, among other benefits.¹⁵
- Carbon capture, utilization and storage is a process that captures CO₂ emissions from industrial sources or power plants and either stores them underground in geological formations or repurposes the captured carbon for industrial application, such as enhanced oil recovery or the production of synthetic fuels and buildings materials.¹⁶

Standards and methodologies for these sequestration approaches are evolving, with organizations contributing to the development of protocols that ensure the credibility and effectiveness of sequestration projects.

¹³ WRI, [How Effective Is Land At Removing Carbon Pollution? The IPCC Weighs In](#), 2019.

¹⁴ BCG, [Unearthing Soil's Carbon-Removal Potential in Agriculture](#), 2024.

¹⁵ WRI, [Carbon Removal from the Ocean, Explained](#), 2022.

¹⁶ WRI, [What is Carbon Capture, Utilization, and Storage \(CCUS\)?](#), 2023.

Questions

- How does a manager quantify the contribution of its portfolio to global climate goals?
- What, if any standards, published tools or guidance does it use to implement its approach?
- How does the chosen assessment approach align with the fund’s investment thesis or support its climate thesis?
- How does the investment manager govern the use of emissions reduction quantification in the decision-making process? Who is responsible for conducting the analysis, and how are findings integrated into investment decisions?
- What is the relationship between emissions reduction quantification and financial underwriting in the investment process? Are these processes conducted in parallel, used complementarily or prioritized differently?
- What are the primary sources of data used in the emissions reduction quantification? Is the data sourced directly from investment targets, supported by external evidence, research or validated through technical diligence?
- How is the reliability of emissions reduction data ensured? Are there standards, frameworks or third-party audits applied to validate the quantification process?

3. Understanding the Context for Prioritization

Quantifications of expected climate mitigation potential from various technologies and investments need to be placed in a context to inform the prioritization of investments. Any emission reduction expectations need to be placed in a context with a point of reference to understand what the calculated number means in practice. There are various ways managers can do this:

Geography

The applicability of climate solutions varies substantially across regions, and geographic considerations are a key criterion to incorporate into prioritization regardless of the quantitative methodologies applied. It is important to understand if the manager’s thesis and prioritization tools take differences in pathways across various geographies into account when evaluating an asset or a technology.

Geographic context will include investors analyzing: the specific targeted market needs — either in terms of climate mitigation or in terms of investment; the market’s baseline — what the alternatives to the specific solution are (e.g. other lower carbon modes of

transport, other similar solution providers), what the status quo is (e.g. current grid); the existing eco-system for a specific technology under consideration (supply chain, grid efficiency, infrastructure to support the solution); and expected trends and changes in all of the above, metrics used and the potential climate mitigation benefit of a technology.

Minimum Thresholds

A manager can set themselves a minimum threshold for performance to determine if a certain investment has a sufficient level of impact. For example, some venture capital funds set a minimum threshold of one gigaton of avoided emissions potential as the basis for qualifying any prospective investment for consideration. This allows a manager to ensure that all investments in the strategy meet a minimum expectation. The specific threshold value likely will have certain levels of assumptions, and varying timelines, about specific market forces to be in place to ensure that these investments are sufficient to achieve economy-wide decarbonization by 2050.

Taxonomy

Taxonomies provide a list of vetted solutions that have been identified by a third party as meeting a minimum set of criteria or alignment with a future decarbonized economy. As a tool, taxonomies offer simplicity and can help to categorize different types of solutions as enabling, replacement or removal, and sometimes even serve as an identification tool and a substitute for quantitative assessment. Their relative value, however, depends heavily on the quality and execution of the criteria underlying their design. Taxonomies tend to be effective in considering mature solutions but may miss other viable technologies that are less established. They are most useful when managers are using market- and geography-specific taxonomies and capturing technological and market changes, including unforeseen technologies' deployment. They also often exclude enabling technologies, so it is important to understand whether and how managers are addressing this gap.

Scenarios

Scenarios can offer an overview of a future low-carbon economy that can include descriptions of future industry sectors and technologies as well as various quantitative estimates or threshold values. Scenarios range enormously in their detail, approach to assumptions and quality of design.

Scenarios allow a manager to evaluate an investment in relation to a certain economic or policy scenario and compare the intended emissions mitigation potential with the needs of

the geography included in the scenario. Managers could also model the expectations with certain future economic, technological and policy developments in mind.¹⁷

Overall, there are a range of different tools available for contextualizing data about an investment. These tools offer varying degrees of precision, so it is important to understand which tools are being used in a strategy and how they are being applied to guide decisions.

Questions

- What are the ways in which the manager contextualizes the climate outcomes estimates for a given geography?
- Does the manager use geographical, sectorial or economic contexts to predict climate outcomes as part of the investment decision making process?
- What is the specific climate-mitigating need that the companies within the climate solutions fund address, given the market context?
- Why are the particular solutions considered the most appropriate ones for the given market?
- What are the specific target market needs?
- What is the market's baseline or status quo? What is the existing ecosystem for the specific technology under consideration?
- How does the method of contextualizing and prioritizing investments align with the fund's thesis and support its climate thesis?

4. Understanding the Methodologies Used to Manage Uncertainties

Climate solutions investing is inherently forward looking so all analysis will include a level of uncertainty in projections and dependencies. The choices that investors can make to enhance the accuracy of projections include looking at:

- The number of assumptions underlying any analysis or quantitative estimate (including looking at cases where there are no assumptions, which could suggest missed steps in calculation)
- Whether assumptions depend on or project major changes to consumer patterns, policy frameworks or other major shifts

¹⁷ For a detailed framework on selecting and evaluating pathways, see GFANZ, [Guidance on the Use of Sectoral Pathways for Financial Institutions](#) (2022), which outlines key considerations for ensuring scenario alignment with science-based carbon budgets, credibility, feasibility and sector-specific needs.

- The frequency with which the manager updates the research and their thesis, if they have one
- The monitoring and third-party assurance processes that they apply to existing investments and whether those insights lead to updates to their estimates or projections

Incorporating assumptions and estimations into models is common across finance. For climate solutions, these models often involve significant future changes, relying on factors such as policy shifts, evolving consumer preferences or other forces that shape markets broadly. Managing this uncertainty requires several choices by managers in the design of their models for avoided emissions or their selection of tools for prioritization. Investment processes can be distinguished by the rigor applied in setting assumptions, the complexity of assumptions required for achieving intended outcomes and the methods managers establish to monitor and update assumptions or models over time. Providing transparency to asset owners regarding material changes to assumptions and models is also critical, ensuring alignment and trust throughout the investment lifecycle.

Questions

- What framework, transparency practices and quality control measures, such as attestation, third-party verification, or others, are in place to govern the use of assumptions and ensure the reliability of quantitative estimates?
- What market conditions need to be in place for the expected climate contribution to be met?
- How does a manager identify the exact products, services or parts of the supply chain that the climate solutions technology under consideration is displacing or substituting in a particular geographic location?
- Do assumptions depend on major changes to consumer patterns, policy frameworks, or other major shifts?
- What is the frequency with which a manager updates their research and thesis?
- What monitoring is applied to existing investments, and how does the manager use insights from monitoring to update estimates or projections and take appropriate action?

Appendix

- Climate solutions as defined by GFANZ:
 - Technologies, services, tools, or social and behavioral changes that directly contribute to the elimination, removal, or reduction of real-economy GHG emissions or that directly support the expansion of these solutions, including:
 - **Solutions:** assets and entities that directly remove or reduce real-economy GHG emissions
 - **Enablers:** assets and entities that indirectly contribute to, but are necessary for, emissions reductions by facilitating the deployment and scaling of solutions or supporting the decarbonization of other actors' operations
 - **Nature-based solutions:** solutions that use natural systems to reduce GHG emissions and store carbon
- Transition finance as defined by GFANZ:¹⁸ The development and scaling of climate solutions.
 - Assets or companies already aligned to a 1.5 degrees Celsius pathway
 - Assets or companies committed to transitioning in line with 1.5 degrees Celsius-aligned pathways
 - The accelerated managed phaseout of high-emitting physical assets
- IIGCC'S Net Zero Investment Framework (NZIF)
 - The IIGCC defines climate solutions as “activities, goods or services that contribute substantially to, and/or enable, emissions reductions to support decarbonization in line with credible 1.5C pathways towards net zero, or that contribute substantially to climate adaptation.”
- NZAOA
 - NZAOA's fourth iteration of its Target-Setting Protocol defines climate solutions as “investments in economic activities considered to contribute to climate change mitigation (including transition enabling) and adaptation, in alignment with existing climate-related sustainability taxonomies and other generally acknowledged climate-related frameworks.”
- Paris Aligned Asset Owners (PAAO) uses the NZIF framework.
- Impact investments are investments made with the intention to generate positive, measurable social or environmental impact alongside a financial return. (<https://thegiin.org/publication/post/about-impact-investing/>). Climate solutions

¹⁸ GFANZ, [Transition Finance and Real Economy Decarbonization](#), 2023.

investments can be impact investments but can equally exist without having impact intentionality or the impact investment labelling.