Investors Can Measure and Maximize Their Climate Impact
Context and objectives

GenZero partnered with BCG to develop a robust and practical framework that incorporates climate impact into the strategy and measurement of decarbonization investments. The framework also facilitates GenZero to achieve its double bottom-line mandate.

This study highlights the importance of climate impact measurement, shares the key considerations when measuring climate impact, and introduces the GenZero Climate Impact Measurement Framework.

We hope that this study will galvanize greater discussions and action on climate impact measurement among the investment community, as well as foster further convergence on the topic in the market.

Source: BCG and GenZero analysis.
Why climate impact measurement matters

Four key aspects to consider

From framework to practice

Source: BCG and GenZero analysis.
More than $1.5 trillion of private investments went toward climate finance over the past five years.

Sources: Climate Policy Initiative; BCG analysis.

Yet, many investors don’t know if they are funding the right opportunities.
Climate impact measurement can help private capital investors make informed decisions at each step of the investment process.

**Portfolio construction**

- Assess the **potential** climate impact of individual investment opportunities or a portfolio.

**Investment decisions**

- Measure the **realized** climate impact of individual investments or a portfolio.

**Performance measurement**

**Reporting**

*Source: BCG and GenZero analysis.*
Climate impact measurement is distinct from carbon accounting because it assesses the amount of carbon removed, reduced, or avoided.

**Carbon accounting**
- Assesses the carbon emissions of a company or an investor
- Tracks the carbon produced
- Focuses on Scope 1, Scope 2, and Scope 3 emissions

**Climate impact measurement**
- Assesses the positive carbon impact of a company or an investor
- Tracks the carbon removed, reduced, or avoided
- Focuses on the direct, indirect, and transformational impacts

Source: BCG and GenZero analysis.
Climate impact measurement is still a nascent topic in the investor community, but it is gaining importance.

Source: BCG and GenZero analysis.
Note: This is a sample only.
Why climate impact measurement matters

Four key aspects to consider

From framework to practice

Source: BCG and GenZero analysis.
Four key aspects to consider when measuring climate impact

<table>
<thead>
<tr>
<th>1</th>
<th>Is all impact created equal?</th>
<th>2</th>
<th>How much impact should we claim?</th>
<th>3</th>
<th>What is the right time frame to use?</th>
<th>4</th>
<th>Are larger volumes always better?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct climate impact</td>
<td></td>
<td>Ownership share</td>
<td></td>
<td>Holding period versus lifetime value</td>
<td></td>
<td>Tradeoffs between quality, quantity, and cost over time</td>
</tr>
<tr>
<td></td>
<td>Indirect climate impact</td>
<td></td>
<td>Value chain contribution</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transformational climate impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: BCG and GenZero analysis.
1. IS ALL IMPACT CREATED EQUAL?

Three distinct types of climate impact

**Direct climate impact**

**DESCRIPTION**
Investments in companies whose solutions (products or services) **directly reduce or avoid emissions**

**EXAMPLE**
Reforestation projects and solar power plants

**Indirect climate impact**

**DESCRIPTION**
Investments in companies that provide enabling infrastructure or technology

**EXAMPLE**
An exchange that helps transact carbon credits from a reforestation project or a company that distributes solar panel components

**Transformational climate impact**

**DESCRIPTION**
Investments in companies that develop **next-wave technologies or solutions** or in companies that contribute to a **more favorable market** for these solutions

**EXAMPLE**
More effective soil-carbon monitoring solutions or more efficient photovoltaic cells

**MARKET CONSENSUS**

More well defined

Less well defined

Source: BCG and GenZero analysis.
We have a similar approach where we distinguish between direct, enabling, and systematic climate impact. As an organization, we think it’s crucial to have a standardized structure in place on definitions. By nature, measuring and assessing impact becomes more complex as you move from direct to enabling to systematic impact.

LIGHTROCK CLIMATE IMPACT FUND

Source: BCG and GenZero analysis.
Ownership share

What is the fair share of impact to claim given the level of investment in a company?

Example: Five private equity funds invest in a solar panel operator; each has a 20% ownership share

Approach 1: Impact claim is based on investment contribution
Example: Each private equity fund claims 20% of the climate impact of the company
+ Captures a more defensible and attributable share of the impact
+ Aligns with industry best practices and with where the market is moving
+ Reduces double counting in the climate impact universe
  – Requires calculation; can be complex depending on the ownership model
  – For forward-looking calculations, requires projecting changes in ownership share

Approach 2: Impact claim is based on total impact without adjustment
Example: Each private equity fund claims 100% of the climate impact of the company
+ Simpler, with no need for additional adjustment from the reported impact
+ Fewer assumptions are needed when projecting a forward-looking view
  – Does not capture the attributable share of impact
  – Is not aligned with industry best practices and with where the market is moving
  – Contributes to the global double-counting issue in the climate impact landscape

Source: BCG and GenZero analysis.
2. HOW MUCH IMPACT SHOULD WE CLAIM?

Taking into account value chain contribution (1/2)

Value chain contribution is key to measuring indirect climate impact, but there is no consensus on the approach

*Example: Three stakeholders are involved in the solar panel value chain*

**How much climate impact should be attributed to each stakeholder?**

- Raw material miner
- Solar panel manufacturer
- Distributor and installer

Our approach considers varying degrees of attribution along the value chain

- Evaluate and report indirect climate impact *separately* from direct climate impact
- Calculate indirect climate impact by applying different value chain attribution factors
- Assess what value chain attribution is required for the investment to be attractive
- Consider if that value chain attribution is realistic

There is alignment in the market about the need to distribute impact among stakeholders, but there is no consensus on the approach

Source: BCG and GenZero analysis.
We do not allocate the impact of our enabled impact between actors along the value chain—all of them play an enabling role and all are needed. However, within our portion of the value chain—providing financing—we allocate enabled savings proportionate to our ownership share.

**Voices from the industry**

**ENERGY IMPACT PARTNERS**

Source: BCG and GenZero analysis.
3. WHAT IS THE RIGHT TIME FRAME TO USE?

Opportunity to anchor around holding period or lifetime impact (1/2)

**Holding period impact**

**EXAMPLE**

Climate impact of solar panels generated during the holding period

**Lifetime impact of products sold during the holding period**

Lifetime impact of all solar panels sold during the holding period

**Lifetime impact**

Impact of all solar panels sold during the lifetime of the company

Source: BCG and GenZero analysis.

Note: Y = year.
By investing in the climate solutions of the future, Decarbonization Partners aims to make a long-lasting contribution to the global energy transition on behalf of our clients. We forecast a company’s potential decarbonization outcome during the fund life as well as its longer-term impact as the company grows in scale. This measurement framework helps us to put our growth capital to use by supporting early-stage companies that we have strong conviction will successfully evolve through pilot to commercial scale and in doing so contribute materially to global decarbonization efforts.
4. ARE LARGER VOLUMES ALWAYS BETTER?

Implications of moving up the abatement cost curve

Marginal costs of achieving positive climate impact may increase over time

Achieving incremental carbon reductions or removals over time requires progressively more complex and costly solutions, which are reflected in the increase of carbon prices over time.

Example: Marginal abatement cost curve

This rising cost curve will decrease an investor’s incremental climate-impact volumes if capital is kept constant

The idea that carbon mitigation is getting more costly over time is a well-established fact in the investor community and a common feature of investing in carbon solutions, rather than a bug.

LEADING CLIMATE IMPACT INVESTOR

Source: BCG and GenZero analysis.
Note: t = tonne; CO$_2$e = carbon dioxide equivalent; Mt = megatonne.
Why climate impact measurement matters

Four key aspects to consider

From framework to practice

Source: BCG and GenZero analysis.
Four guiding principles for the GenZero Climate Impact Measurement Framework

Adaptability
Easy to adjust to evolving industry consensus

Defensibility
Fair and transparent methodology that holds up to public scrutiny

Simplicity
Can be calculated by investment teams themselves

Explainable
Understood and used by investment committees and stakeholders to make better decisions

Source: BCG and GenZero analysis.
We all have a role to play to ensure a livable climate. Today, investors around the world have heard this call to action and are working to update their decision making processes in service to the planet. However, assessing how the decisions we make today will impact the future is difficult, complex work. That's why Project Frame is dedicated to working together to tackle forward-looking GHG impact with humility, while prioritizing transparency and accountability.

KERI BROWDER, DIRECTOR OF PROJECT FRAME AT PRIME COALITION
## A distinct measurement approach for each impact type

<table>
<thead>
<tr>
<th>Impact measurement</th>
<th>Decision making</th>
<th>Impact reporting</th>
</tr>
</thead>
</table>
| Direct climate impact | · Qualitative impact assessment  
· Quantitative impact measurement | Targets are used as a reference for decision making |
| Indirect climate impact | · Qualitative impact assessment  
· Quantitative impact measurement based on sensitivity analysis | Sense check the quantitative impacts; decision making is led by the investment thesis |
| Transformational climate impact | Qualitative impact assessment | Ensure the transformational potential of the opportunity; decision making is led by the investment thesis |

---

*Source: BCG and GenZero analysis.*
## Direct climate impact: Measurement approach

| Source: BCG and GenZero analysis.  
Note: t = tonne; CO$_2$e = carbon dioxide equivalent. |

### Qualitative assessment of quality standards; quality criteria specific to the sector and subsector

For example, for nature-based solutions, ensure that projects are in line with core carbon principles (CCPs)

### Expected cost of climate impact of an individual investment over the holding period ($/t CO$_2$e)

\[
\text{Expected cost of climate impact of an individual investment over the holding period} = \frac{\text{Expected capital investment ($)}}{\text{Climate impact (t CO$_2$e)}} 
\times \frac{\text{Expected volume of a product or service (units) over the holding period}}{\text{Expected climate impact per unit (t CO$_2$e/unit)}} \times \text{Expected ownership share (%)}
\]

- **Expected capital investment ($)**: Based on financial or commercial forecasts of a company, vetted by the deal team.
- **Climate impact (t CO$_2$e)**: Calculated on the basis of carbon savings of the product or service versus the alternative or baseline, leveraging the life cycle assessment (LCA) of climate impact from the company and external sources.
- **Expected volume of a product or service (units) over the holding period**: Expected ownership share (%)
Direct climate impact: Example (1/2)

Investment opportunity
Potential investment in a developer of reforestation projects
- Investment amount: $30 million
- Ownership share: 80%
- Planned holding period: ten years
- Expected climate impact during the holding period: 2.5 Mt

Climate impact calculation

- Capital investment: $30 million
- Climate impact: 2 Mt CO\textsubscript{2}e
- Expected climate impact over the holding period: 2.5 Mt CO\textsubscript{2}e
- Ownership share: 80%

\[ \frac{\text{Expected cost of climate impact over a ten-year holding period}}{\text{Climate impact: 2 Mt CO}_2\text{e}} = \times \text{Ownership share: 80%} = \text{$15 per tonne of CO}_2\text{e} \]

Source: BCG and GenZero analysis.
Note: CO\textsubscript{2}e = carbon dioxide equivalent; Mt = megatonne. The example is for illustrative purposes only.
Direct climate impact: Example (2/2)

**Investment opportunity**
Potential investment in an operator of solar power plants
- Investment amount: $18 million
- Ownership share: 80%
- Planned holding period: ten years
- Expected solar power produced during the holding period: 450 GWh
- Cradle-to-grave emissions from producing 1 GWh of power through solar PV: 50 tonnes of CO$_2$e
- Cradle-to-grave emissions from producing 1 GWh of power in the current power mix: 650 tonnes of CO$_2$e

**Climate impact calculation**

Capital investment: $18 million

\[
\text{Climate impact: } 216,000 \text{ t CO}_2\text{e}
\]

Expected solar power produced during the holding period: 450 GWh

Avoided emissions from solar power vs. the current power mix: 600 t CO$_2$e/GWh

Ownership share: 80%

\[
= \frac{$83}{\text{tonne of CO}_2\text{e}}
\]

Source: BCG and GenZero analysis.
Note: t = tonne; CO$_2$e = carbon dioxide equivalent; GWh = gigawatt hours; PV = photovoltaic. The example is for illustrative purposes only.
Indirect climate impact: Measurement approach

Our approach assesses indirect climate impacts using sensitivity analysis and considers varying degrees of attribution.

<table>
<thead>
<tr>
<th>VALUE CHAIN ATTRIBUTION</th>
<th>EXPECTED CLIMATE IMPACT ATTRIBUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>Total impact</td>
</tr>
<tr>
<td>50%</td>
<td>50% of total impact</td>
</tr>
<tr>
<td>25%</td>
<td>25% of total impact</td>
</tr>
<tr>
<td>10%</td>
<td>10% of total impact</td>
</tr>
</tbody>
</table>

Is it still an attractive investment with only a 10% to 25% climate impact attribution?

Source: BCG and GenZero analysis.
Indirect climate impact: Example

Investment opportunity
Potential investment in an exchange and marketplace for voluntary carbon credits
- Investment amount: $20 million
- Ownership share: 20%
- Planned holding period: ten years
- Expected volume of voluntary carbon credits traded on the platform over the holding period (the equivalent to enabled climate impact): 20 Mt

Climate impact calculation
(at 100% value chain attribution)

Expected cost of climate impact over a ten-year holding period

Capital investment: $20 million

Expected climate impact over holding period: 20 Mt CO₂e

Ownership share: 20%

$5 per tonne of CO₂e

Sensitivity analysis
(at different value chain attributions)

<table>
<thead>
<tr>
<th>VALUE CHAIN ATTRIBUTION</th>
<th>EXPECTED COSTS OF CLIMATE IMPACT ($/t CO₂e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>5</td>
</tr>
<tr>
<td>50%</td>
<td>10</td>
</tr>
<tr>
<td>25%</td>
<td>20</td>
</tr>
<tr>
<td>10%</td>
<td>50</td>
</tr>
</tbody>
</table>

At 10% to 25% value chain attribution, the expected costs of climate impact over a ten-year period are $20 to $50 per tonne of CO₂e. Is this still an attractive investment?

Source: BCG and GenZero analysis.
Note: t = tonne; CO₂e = carbon dioxide equivalent; Mt = megatonne. The example is for illustrative purposes only.
# Transformational climate impact: Measurement approach

## Transformational climate impact criteria

**Key question**
Is the investment truly transformational in nature?

**Three key assessment criteria:**
- Intentionally transformational
- Strictly additional
- Novel market

## Total addressable carbon emissions

**Key question**
What is the potential climate impact of the market that the investment is aiming to accelerate?

Calculation of total addressable carbon emissions of technology in a steady state

**Examples**
Potential climate impact at a steady state (Gt CO₂e per year)^3

<table>
<thead>
<tr>
<th>Technology</th>
<th>Potential climate impact (Gt CO₂e per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerant management</td>
<td>3.8</td>
</tr>
<tr>
<td>Tropical forest restoration</td>
<td>3.6</td>
</tr>
<tr>
<td>Methane leak management</td>
<td>1.3</td>
</tr>
<tr>
<td>Concentrated solar power</td>
<td>1.2</td>
</tr>
</tbody>
</table>

---

**Source:** BCG and GenZero analysis.

**Note:** Gt = gigatonne; CO₂e = carbon dioxide equivalent.

^3Project Drawdown’s steady state estimate as 1/15 of cumulative 2022–2050 impact.
Transformational climate impact: Example (1/2)

**Investment opportunity**
Potential investment in a startup that develops a novel measurement, reporting, and verification technology for soil carbon sequestration
- Investment amount: $5 million
- Planned holding period: five years
- Technology aims to measure the carbon content of soil in a more accurate and cost-effective manner, which will increase viability of soil carbon projects
- The technology will likely take eight to ten years to mature

**Transformational climate impact criteria**

**Intentionally transformational**
An investment in the startup is intended to significantly accelerate the market for soil carbon projects by improving the measurement and credibility of such projects

**Strictly additional**
As a first of its kind technology, the technology removes a key market-growth barrier (monitoring, reporting, and verification in this sector)

**Novel market**
The company supports the development of the novel market of soil carbon projects

**Total addressable carbon emissions estimation**
The technology has the potential to enable a market with 2 to 6.5 gigatonnes of CO₂e per year in a steady state

Source: BCG and GenZero analysis.
Note: CO₂e = carbon dioxide equivalent. The example is for illustrative purposes only.
Transformational climate impact: Example (2/2)

Investment opportunity
Potential investment in a startup that develops new, more efficient photovoltaic cells
- Investment amount: $5 million
- Planned holding period: ten years
- Technology will increase the power output of solar panels by 20%
- Technology is still at a nascent stage and will only be market ready in 10 to 15 years

Transformational climate impact criteria

Intentionally transformational
The startup has been founded and fully focused on developing more efficient photovoltaic cells; the company needs external funding to continue its R&D

Strictly additional
The company is the first and only of its kind that develops such a technology; no other technology can unlock similar types of improvements

Novel market
The company supports the research and development of a new technology under development

Total addressable carbon emissions estimation
The technology has the potential to avoid 0.6 to 1.2 gigatonnes of CO₂e per year in a steady state

Source: BCG and GenZero analysis.
Note: CO₂e = carbon dioxide equivalent. The example is for illustrative purposes only.
About GenZero
GenZero is an investment platform company focused on accelerating decarbonisation globally. Founded by Temasek, we seek to deliver positive climate impact alongside long-term sustainable financial returns by investing in opportunities with the potential to be nurtured into impactful and scalable solutions.

Driven by a common purpose to decarbonise for future generations, we recognise the need for a holistic and integrated approach to achieve a net zero world. At GenZero, we adopt a flexible investment approach across three focus areas to drive climate impact: (i) nature-based solutions that help protect and restore our natural ecosystems while benefiting local communities and biodiversity; (ii) technology-based solutions that deliver deep decarbonisation impact; and (iii) carbon ecosystem enablers which refer to companies and solutions that support the development of an effective, efficient, and credible carbon ecosystem.

For more information on GenZero, visit https://genzero.co/
Disclaimer


The companies in which Carbon Solutions Platform Pte. Ltd. directly and indirectly owns investments are separate legal entities. In this presentation “GenZero” is sometimes used for convenience where references are made to Carbon Solutions Platform Pte. Ltd. and its subsidiaries in general.

BCG and GenZero have used data from various sources and assumptions provided to BCG and GenZero from other sources. The data and assumptions from these sources used in these analyses have not been independently verified. Changes in the underlying data or operating assumptions will clearly impact the analyses and conclusions. BCG and GenZero do not guarantee or make any representation or warranty as to the accuracy, reliability, completeness, or currency of the information in this document nor its usefulness in achieving any purpose. Readers are responsible for assessing the relevance and accuracy of the content of this document. It is unreasonable for any party to rely on information in this document. To the fullest extent permitted by law (and except to the extent otherwise agreed in a signed writing by BCG and GenZero), BCG and GenZero shall have no liability whatsoever to any party, and any person using this document hereby waives any rights and claims it may have at any time against BCG and GenZero with regard to the document. Receipt and review of this document shall be deemed agreement with and consideration for the foregoing.

BCG and GenZero do not provide legal, accounting, or tax advice. Parties are responsible for obtaining independent advice concerning these matters. This advice may affect the guidance in the document. Further, BCG and GenZero have made no undertaking to update the document after the date hereof, notwithstanding that such information may become outdated or inaccurate. BCG and GenZero do not provide fairness opinions or valuations of market transactions, and this document should not be relied on or construed as such. Further, any evaluations, projected market information, and conclusions contained in this document are based upon standard valuation methodologies, are not definitive forecasts, and are not guaranteed by BCG and GenZero.

This document is not intended to make or influence any recommendation and should not be construed as such by the reader or any other entity.

This document is co-authored by BCG and GenZero and reflects GenZero’s and BCG’s perspectives. While BCG was not paid by a client to write this document for the purpose of publication, the content included herein stems from an engagement for a commissioned study whereby BCG was compensated by GenZero.

This document does not purport to represent the views of the companies mentioned in the document. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by BCG and GenZero.

Apart from any use as permitted under the Singapore Copyright Act 2021, no part may be reproduced in any form without the express prior written consent of BCG and GenZero.