

METHODOLOGY ABSTRACT

Low Carbon Transition Rating

Version 1.4

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Low Carbon Transition Rating

Methodology Abstract

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Morningstar Sustainalytics **Low Carbon Transition Rating**² assesses the degree to which a company's projected Greenhouse Gas Emissions (GHG) differ from its fair-share budget for GHG emissions. The rating does not place the entire burden of mitigating emissions on the highest emitters but acknowledges that all companies have a responsibility to limit GHG emissions according to a set path to meet a **Global Emissions Budget**. By considering a company's preparedness to deliver business model transformation, the assessment goes beyond a company's ambitions and targets.

Highlights

- The Low Carbon Transition Rating is Morningstar Sustainalytics' flagship product for measuring public issuers' alignment to a Net-Zero **Pathway**.
- As a science-based and forward-looking assessment, the rating considers emissions projections up to 2050: A milestone year for achieving global climate targets.
- Based on the principle that companies are expected to limit their emissions to meet a net-zero budget, the rating's main output is an Implied Temperature Rise score that indicates how close the company is towards attaining its net-zero (1.5 degrees Celsius) budget.
- The **GHG Emissions Budget** is unique to each company, rooted on the company's business model and where it operates.
- The rating provides many useful signals, including assessments of Low Carbon Transition Management and Exposure, and Low Carbon Transition Value at Risk.
- An additional Low Carbon Transition Value at Risk signal provides a financial assessment of the transition related policy and market risks faced by a company based on the expected emissions projection, indicating the potential cost impacts between now and 2050.

Introduction

Our rating acknowledges that all companies have a responsibility to limit GHG emissions

Morningstar Sustainalytics **Low Carbon Transition Rating** assesses the degree to which a company's projected GHG emissions differ from its fair-share budget for GHG emissions. The primary output of the rating is a temperature in degrees Celsius, which answers the question: **"What would be the expected increase in global temperatures, if all companies manage their emissions in the same way as this company?"** In this way, the rating does not place the entire burden of mitigating emissions on the highest emitters but acknowledges that all companies have a responsibility to limit GHG emissions according to a set path.

Assessing a company's preparedness to deliver business model transformation

Additionally, the assessment goes beyond a company's ambitions and targets, by considering a company's preparedness to deliver business model transformation.

Methodology Description

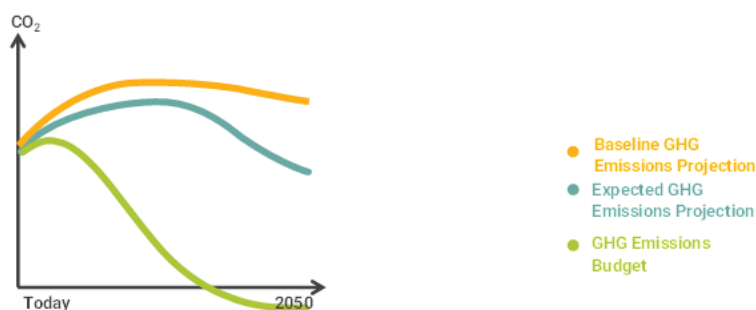
GHG Emissions Projections

Measuring how much a company's GHG emissions are expected to exceed or drop its share of emissions

The Low Carbon Transition Rating is powered by extensive data and provides multiple signals but at its heart the concept is straightforward. It is a measure of how much a company's GHG emissions are expected to overshoot or undershoot its fair share budget of emissions. Critical to this assessment are three GHG emission projections:

Three Low Carbon Transition Rating emission projections

1. The GHG Emissions Budget represents the amount of emissions a company can have while being aligned to 1.5 degrees Celsius pathway. This alignment—often referred to as 'net-zero' alignment—is based on companies cutting GHG emissions to as close to zero as possible over the next three decades. The GHG Emissions Budget is represented by the green line in Exhibit 1 below.
2. The **Baseline GHG Emissions Projection** represents the emissions the company is expected to have if it takes no actions to manage its emissions. The Baseline GHG Emissions is represented by the orange line in Exhibit 1.
3. The **Expected GHG Emissions Projection** represents the emissions the company is expected to have based on its management. Strong management suggests that expected emissions will be lower than the baseline emissions while weak management indicates that expected emissions will be higher than baseline emissions. The Expected GHG Emissions is represented by the teal line in Exhibit 1.

Exhibit 1: Low Carbon Transition Rating Emissions Projections

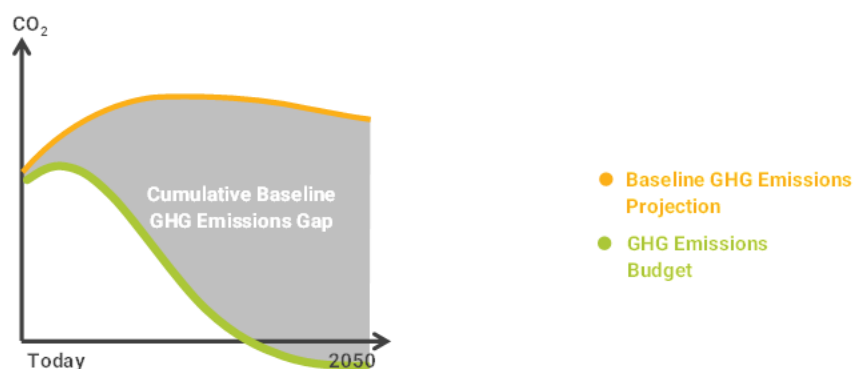
Source: Morningstar Sustainability

Emissions gaps quantify the differences between different emissions projections

GHG Emissions Gaps and Percentage Gaps

To truly understand how well a company is expected to perform, the projections need to be compared to each other. The comparison of the quantitative difference between two projections is referred to as a **GHG Emissions Gap**. The two relevant 'gaps' calculated in the product are:

1. **Baseline GHG Emissions Gap**: The absolute difference between the company's baseline GHG emissions projection and its **GHG Emissions Budget Projection**. When aggregated for multiple years, this gap is referred to as the **Cumulative Baseline GHG Emissions Gap**, which is represented by the gray shaded area in Exhibit 2.
2. **Expected GHG Emissions Gap**: The absolute difference between the company's expected GHG emissions projection and its GHG emissions budget projection. When aggregated for multiple years, this gap is referred to as the **Cumulative Expected GHG Emissions Gap**.

Exhibit 2: Baseline GHG Emissions Gap

Source: Morningstar Sustainability

Factoring in the size of the gap relative to the budget

To better understand the two GHG Emissions Gaps, the size of the gap relative to the budget is considered. This is done by dividing the GHG Emissions Gap (either Baseline or Expected) by the GHG Emissions Budget and the output is referred to as **GHG Emissions Gap Percentage**. Similarly, there are two key GHG Emissions Gap Percentages in the rating:

1. **Baseline GHG Emissions Gap Percentage**: The relative difference between the company's baseline GHG emissions projection and its GHG emissions budget projection. When this gap percentage is calculated for multiple years, this is referred to as the **Cumulative Baseline GHG Emissions Gap Percentage**.
2. **Expected GHG Emissions Gap Percentage**: The relative difference between the company's expected GHG emissions projection and its GHG emissions budget projection. When this gap percentage is calculated for multiple years, this is referred to as the **Cumulative Expected GHG Emissions Gap Percentage**.

Showing the alignment of a company with global temperature goals

Implied Temperature Rise Calculation

The GHG Emissions Gap Percentages are further adapted into Implied Temperature Rise Scores to show the alignment of a company with global temperature goals. The percentage is translated into a temperature according to a standard formula derived from the Intergovernmental Panel on Climate Change (IPCC). This formula uses the Transient Climate Response to Cumulative Carbon Emissions Factor (TCRE), an IPCC derived factor that determines the amount of radiative forcing (warming) as degree Celsius (°C) per megaton (Mt) of GHG emissions.

This calculation can be done for both the Baseline GHG Emissions Gap Percentage and the Expected GHG Emissions Gap Percentage. After being translated to an implied temperature rise, the Baseline GHG Emissions Gap Percentage is known as Exposure and the Expected GHG Emissions Gap Percentage is known as the Low Carbon Transition Rating.

GHG Emissions Budget

Identifying the amount of GHG emissions a company is allowed up to 2050, while aligned to 1.5 degrees °C

The GHG Emissions Budget is fundamental to the rating, as it specifies the amount of GHG emissions a company is allowed in each year up to 2050, while being aligned to 1.5 degrees Celsius. The GHG Emissions Budget is calculated for each Scope of Emissions downscaled from the 1.5C Required Policy Scenario (RPS) from the UN PRI commissioned Inevitable Policy Response (IPR). The emissions budget is unique to each company since it is determined by the country specific emissions budgets—mapped to the location of the company's operations. As an example, if the IPR budget for Canada specifies that the automotive industry must reduce its emissions by 7% in 2024, all automotive companies with sales in the Canada will be expected to reduce emissions by 7% for the Canadian portion of its sales. This gets combined with the emissions reduction specified for all regions where the company sells cars to generate the company specific budget.

The second key component for calculating the Low Carbon Transition Rating

Baseline GHG Emissions Projection and Exposure

The Baseline GHG Emissions Projection is the second key component for calculating the Low Carbon Transition Rating. Underlying this assessment is an evaluation of the company's Baseline GHG Emissions as compared to its GHG Emissions Budget, with the difference between the two known as the Baseline Emissions Gap. These values are calculated for each scope and for each year up to 2050. Then, they are combined to understand the cumulative amount of Baseline GHG Emissions and GHG Emissions Budget.

Projecting the current year's baseline emissions into the future based on the International Energy Agency Scenario

Baseline GHG Emissions Projection

The current year's baseline GHG emissions is projected into the future by assuming that the company continues to have the same market share—production increases or decreases at the same rate as the market—and that it has the same carbon intensity for each unit of production as it does now. Expected changes in business activity are based on the International Energy Agency's Stated Policies Scenario.

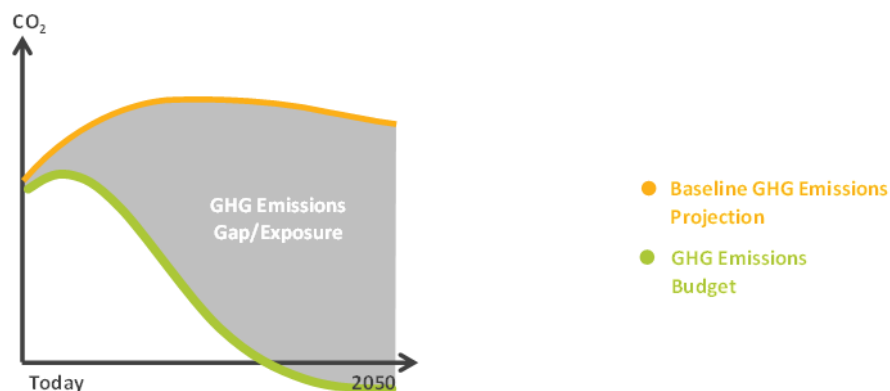
Emissions gap: Measuring how much a company's GHG emissions are expected to overshoot or undershoot its emissions budget

With projections of emissions calculated into the future, the **Cumulative Baseline GHG Emissions Projection** is calculated. This figure adds all baseline emissions from the current year up to 2050. The Cumulative Baseline GHG Emissions are then compared with the GHG Emissions Budget, with the difference between them known as the Cumulative Baseline GHG Emissions Gap. The emissions gap is also considered as a measure of how much a company's GHG emissions are expected to overshoot or undershoot its company-specific emissions budget.

Exhibit 3 depicts an example where the company's baseline GHG emissions overshoot its budget, with the shaded area depicting the GHG Emissions Gap/Exposure.

An example where the company's baseline GHG emissions overshoot its budget

Exhibit 3: Company Baseline GHG Emissions Projection Versus Company GHG Emissions Budget – Example



Source: Morningstar Sustainability

Translating a company's Baseline GHG Emissions Gap into an Implied Temperature Rise Score

Exposure

When a company's Baseline GHG Emissions Gap is translated into an Implied Temperature Rise Score, this is referred to as the company's **Exposure (Low Carbon Transition)**. It assumes that the company simply follows current stated policies and takes no additional management actions that would increase or decrease emissions. The implied temperature rise specifies to what degree the world would warm if all companies' emissions differed from their net-zero budgeted emissions to the same degree as this company.

Assessing how much of the exposure is expected to be managed by the company: The preparedness for a Low Carbon Transition

Expected GHG Emissions Projection and Management

Although the Baseline GHG Emissions Projection is useful for setting the stage of the starting point of a company, it does not give the full picture of where a company's emissions are expected to end up, since only the latter incorporates information on the company's management. The Expected GHG Emissions Projection and Management assessment build upon the baseline, revealing how much of the company's exposure is expected to be managed by the company. Both elements can be seen as a measure of the company's organizational preparedness through its investment alignment, governance, strategy, risk management, financial strength, and historical performance. These are all critical aspects of the rating that transcend the company's ambitions and give a full picture of the company's preparedness for a Low Carbon Transition.

Arriving to an overall projection for each scope by region

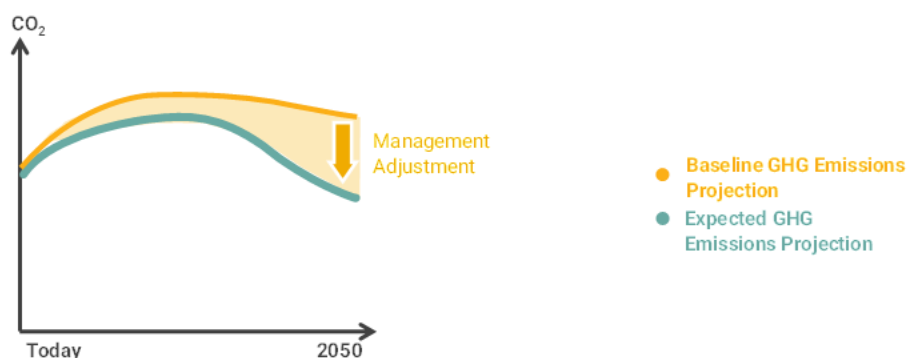
Expected GHG Emissions Projection

The Expected GHG Emissions Projection is calculated by combining the company's **Management Score** (see description below) with the company's Baseline GHG Emissions Projection. By doing so, it works as an adjustment to baseline emissions to illustrate the amount of emissions that the company is expected to manage through its investments and management preparedness.

A Management Score, ranging between 0 and 100

The starting point of the adjustment is a Management Score, ranging between 0 and 100. A score of 50 implies that the company will not manage any of its emissions. Any point higher or lower than 50 equates to a 2% reduction or increase to exposure, respectively. A company that scores 100 is expected to manage all its emissions. Projected Emissions are calculated for each scope—Scope 1, Scope 2, **Scope 3 Upstream**, and **Scope 3 Downstream**—by region for each company and combined to give an overall projection.

Exhibit 4 below illustrates the difference between a company's baseline emissions and its expected emissions, after accounting for management. In this example, the expected emissions are less than baseline emissions, which suggests that the company will positively manage some of its emissions exposure.

Exhibit 4: Projected Company Emissions Versus Baseline Emissions

Source: Morningstar Sustainability

More than 80 available management indicators with predetermined weights unique to each subindustry

Management Score

The Management Score gets calculated for each Scope of Emissions, based on a set of management indicators that have predetermined weights that are unique to each subindustry. In total, Morningstar Sustainability employs more than eighty management indicators. However, there are cases where not all indicators are relevant for each company. In cases where an indicator is usually relevant for a subindustry but not relevant for a specific company in that subindustry, the non-relevant indicators are disabled, and the weight is proportionally distributed proportionally amongst all remaining indicators to ensure that the combined weight of indicators within any scope always adds to 100%.

Exhibit 5 below shows that a company has a Management Score of 66, as determined by scoring on its indicators. The score of 66 for the example company can be further explained as leading to a -32% Management Adjustment to baseline emissions, based on the approach whereby each point above 50, translates to a 2% reduction in emissions as compared to the Baseline GHG Emissions Projection.

Exhibit 5: Determining Company Management Score for Scope 1 Emissions – Example

Indicator Name	Score	Weight	Weighted Score
Investment Alignment - Scope 1	92	50%	46
GHG Performance Targets	0	10%	0
GHG Risk Management	75	8%	6
Carbon Price Integration	0	10%	0
Scope of GHG Reporting	100	5%	5
GHG Emissions Targets	50	10%	5
Operating Performance	50	2%	1
Solvency	75	2%	1
Financial Flexibility	75	2%	1
Asset Performance	25	2%	0
Management - GHG Scope 1		100%	66

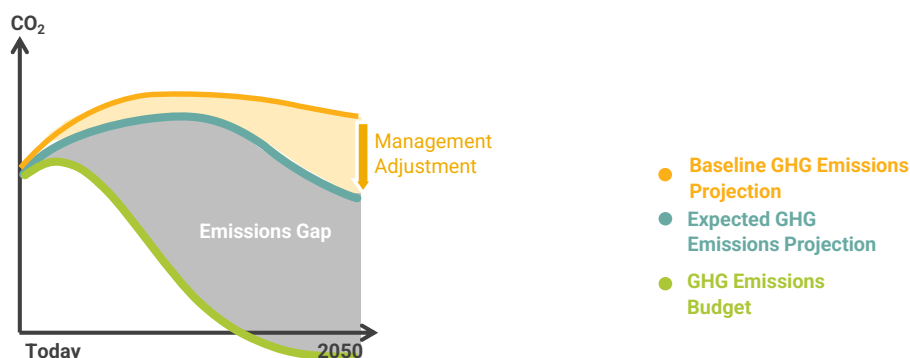
Source: Morningstar Sustainability

Low Carbon Transition Rating: An implied temperature rating

Low Carbon Transition Rating Calculation

The final rating outcome brings together the Exposure and Management components, to give an overall implied temperature rating: The Low Carbon Transition Rating. This rating is calculated as the difference between the company's **Cumulative Expected GHG Emissions Projection** and its **Cumulative GHG Emissions Budget**, which is for the period cumulative up to 2050. The difference between these two figures is known as the Cumulative Expected GHG Emissions Gap Percentage and is depicted as the shaded gray area in Exhibit 6.

Exhibit 6: Expected GHG Emissions Versus GHG Emissions Budget



Source: Morningstar Sustainalytics

Using the Implied Temperature Rise to translate to an overall temperature rating

The **Cumulative GHG Emissions Gap Percentage** is then used to translate to an overall temperature rating using the Implied Temperature Rise calculation formula noted in a previous section.

TCFD Module

Leveraging a globally recognized framework to enhance the design of the rating

The Taskforce of Climate-Related Financial Disclosure (TCFD) is a globally recognized framework to improve and increase reporting of climate-related financial information. The TCFD contributed significantly to the design of the Low Carbon Transition Rating, particularly through the design of management indicators which align to TCFD recommendations. Although not the main output of the Low Carbon Transition Rating, the rating includes a separate TCFD module that explains how sufficient the company's disclosure is in meeting TCFD recommendations.

TCFD Disclosure Sufficiency

Assessing how comprehensive a company is in reporting on topics recommended by the TCFD

At its core, **TCFD Disclosure Sufficiency** explains how comprehensive a company is in reporting on topics recommended by the TCFD. Since not all Sustainalytics indicators are based on TCFD recommendations, the first step is to identify whether each indicator is expected to be disclosed upon according to the TCFD. Following this determination, the module calculates how many of the recommended indicators the company is expected to disclose upon and how many of those expected indicators were found by analysts in the company's publicly available reporting. The relative difference between the amount expected and disclosed, and the amount expected, represents the company's

An example of how this works for a company with a limited set of five indicators

disclosure sufficiency. Note that the calculation is agnostic to how well the company is reporting on each topic, and simply considers whether the company is reporting on the topic.

Exhibit 7 below provides an example of how this works in practice for a company with a limited set of five indicators researched by Morningstar Sustainalytics. For this specific company, it is expected that the company disclose 3 indicators but of those 3 indicators, the analyst only found disclosure for 1 indicator (Carbon Leadership Talent). As such, this company's disclosure sufficiency is 33%. Although the company reports on Positive Climate Policy Engagement, this does not contribute to its TCFD Disclosure Sufficiency score because this indicator pertains to a topic that was not recommended by the TCFD.

Exhibit 7: Example of Calculating Disclosure Sufficiency

Indicator	Expected (1=yes, 0=no)	Disclosed by Company (1=yes, 0=no)	Expected and Disclosed (1=yes, 0=no)
GHG Performance Targets	1	0	0
Carbon Leadership Talent	1	1	1
Positive Climate Policy Engagement	0	1	0
GHG Risk Management	0	0	0
TCFD Alignment - Financials	1	0	0
Total	3	2	1
Disclosure Sufficiency	1/3 = 33%		

Source: Morningstar Sustainalytics

Low Carbon Transition – Value at Risk

Adding a financial signal to Transition Risk

In addition to the Implied Temperature Rise the data inputs and scenarios that feed into the LCTR have been utilised to create a financial based signal that demonstrates the potential loss value that a company may experience due to the risks posed by a transition to a low carbon economy, Low Carbon Transition – Value at Risk (LCT-VaR). LCT-VaR considers the most material transition risks to generate a dollar value impact that speaks to the potential value impact of not transitioning to a low carbon economy.

The Morningstar Sustainalytics LCT-VaR model provides a forward-looking metric that demonstrates how low carbon transition risk may impact the future value of a company.

The output of LCT-VaR is based on a policy risk model that forecasts policy costs associated with the Expected Emissions projection for Scope 1, 2 and 3 Upstream GHG emissions and where material, a market risk model, that forecasts market risk associated with revenue impacts linked to demand changes under a 1.5-degree scenario compared to business as usual.

The yearly transition related costs are then discounted using our proprietary discounted cashflow model to give a present value and summed for all years.

The final value is a quant-based cumulative value demonstrating the value at risk to a company between now and 2050. The Morningstar Sustainalytics LCT-VaR

model aims to provide a forward-looking metric on how low carbon transition risk may impact the future value of a company. LCT-VaR is the sum of policy and market risk impacts as demonstrated in Exhibit 8 below.

Exhibit 8: High Level LCT-VaR Calculation



Source: Morningstar Sustainabilitytics

Scenario Analysis

Understanding broader Scenarios

In addition to assessing the emissions gap of a company against the IPR RPS, carbon budgets have been calculated against an additional orderly scenario, the IEA NZE Scenario and the disorderly IPR FPS Scenario.

This allows clients to understand a company’s misalignment in percentage and absolute terms against alternative scenarios, to support with broader scenario analysis and regulatory reporting through the addition of a disorderly scenario, and an energy system centric orderly scenario.

The company budgets for each scenario are calculated utilising the same methodology outlined in the GHG Emissions Budget section of this document.

For both scenarios, and the underlying IPR RPS from which the LCTR is derived, emissions misalignment is provided between now and 2050, and with the additional time horizon to 2030, to support investor reporting.

Additional Information

Scopes of Emissions

Assessing each scope separately to better evaluate where a company may be excelling or falling behind

Central to all calculations of each budget and projection is the principle that emissions budgets and projections are calculated separately for each **Scope of Emissions**. This is to account for diverse business models that have varying splits of emissions between the different scopes. For example, a company may be expected to reduce its **Scope 1** emissions by 12% in 2022, while its **Scope 2** emissions are expected to decline by a modest 8% in the same year. One of the benefits of assessing each scope separately is that it allows us to create more insights into the areas where a company may be excelling or falling behind.

Glossary of Terms

Baseline GHG Emissions Gap	The absolute difference between the company's baseline GHG emissions and its GHG emissions budget.
Baseline GHG Emissions Gap Percentage	The percentage difference between the company's baseline GHG emissions and its GHG emissions budget.
Baseline GHG Emissions Projection	The company's baseline emissions from all scopes for a given year. The baseline emissions assume that the company has not taken any steps to actively manage its emissions.
Cumulative Baseline GHG Emissions Gap	The absolute difference between the company's baseline GHG emissions and its GHG emissions budget for all years until 2050.
Cumulative Baseline GHG Emissions Gap Percentage	The percentage difference between the company's baseline GHG emissions and its GHG emissions budget for all years until 2050.
Cumulative Baseline GHG Emissions Projection	The company's baseline emissions until 2050. The baseline emissions assume that the company has not taken any steps to actively manage its emissions.
Cumulative Expected GHG Emissions Gap	The absolute difference between the company's expected GHG emissions and its GHG emissions budget for all years until 2050.
Cumulative Expected GHG Emissions Gap Percentage	The percentage difference between the company's expected GHG emissions and its GHG emissions budget for all years until 2050.
Cumulative Expected GHG Emissions Projection	The company's expected emissions for all years until 2050. The expected emissions accounts for management adjustment to the company's cumulative baseline GHG emissions.
Cumulative GHG Emissions Budget	The company's budgeted GHG emissions for all years until 2050.
Expected GHG Emissions Gap	The absolute difference between the company's Expected GHG Emissions from all scopes and its net-zero-aligned emissions budget for any given year.
Expected GHG Emissions Gap Percentage	The percentage difference between the company's expected GHG emissions and its GHG emissions budget.
Expected GHG Emissions Projection	The company's projected emissions until 2050 after accounting for management. It is calculated by applying a management adjustment to the company's baseline GHG emissions.
Exposure (Low Carbon Transition)	The implied temperature rise, expressed in degrees Celsius, for a company if it simply follows current stated policies and takes no additional management actions that would increase or decrease emissions. The implied temperature rise specifies to what degree the world would warm if all companies' emissions differed from their net-zero budgeted emissions to the same degree as this company.
GHG Emissions Budget Projection	The company's budgeted emissions from all scopes of emissions to 2050. The company's budgeted emissions are determined by combining information on the company's location of operations, starting point of emissions and the trajectory specified by a specific pathway (within the LCTR, this is the IPR Net-Zero Pathway).
GHG Emissions Gap	The difference between GHG emissions projections as compared to the GHG Emissions budget. There are two types of GHG Emissions Gap: the Baseline GHG Emissions Gap and the Expected GHG Emissions Gap.
Global Emissions Budget	The cumulative amount of GHG emissions, in gigatonnes, that can be emitted by anthropogenic sources while maintaining global warming below a certain level. Morningstar Sustainalytics' Global Emissions Budget is focused on limiting warming to 1.5° by 2050, with the budget derived from calculations provided by the Intergovernmental Panel on Climate Change (IPCC).

Low Carbon Transition Rating	An implied temperature alignment that specifies what degree the world is expected to warm if all company's emissions differed from their net-zero budgeted emissions to the same degree as this company.
Management Score (Low Carbon Transition)	A score that indicates the strength of the company's management systems for managing its exposure to the low carbon transition.
Pathway	A trajectory of the amount of GHG emissions that will occur based on specific assumptions about the economy, population, energy consumption and land use. Technically, they are referred to as Representative Concentration Pathways (RCPs).
Scope 1	Scope 1 refers to direct emissions that are from company-owned and controlled resources.
Scope 2	Scope 2 refers to indirect emissions that are from the generation of purchased energy, from a utility provider.
Scope 3 Downstream	Scope 3 Downstream refers to indirect emissions that are generated downstream from the company's production of goods and services (when the company's products are used).
Scope 3 Upstream	Scope 3 Upstream refers to indirect emissions that are generated upstream from the company's production of goods and services (in the supply chain).
Scope of Emissions	The Scope of GHG emissions under consideration, includes Scope 1 (direct operations), Scope 2 (indirect operations), Scope 3 Upstream (supply chain) and Scope 3 Downstream (products and services).
TCFD Disclosure Sufficiency	A percentage that indicates what proportion of TCFD-related indicators the company is disclosing upon.

Endnotes

- ¹ The authors would like to thank the following people for their comments on earlier drafts of this report: Hendrik Garz, Cristina Zabalaga. Cristina Zabalaga performed editorial review.
- ² Text that is highlighted in bold teal indicates a term that is explained in the Glossary of terms in the Appendix.

Change Log

Version	Date	Initiator	Main items that changed	Comment / Rational
1.0	09.03.2023	Methodology & Product Architecture	N/A	N/A
1.2	05.10.2023	Clients	Revised text about investment alignment indicator regarding the default score (67.4)	Definition in previous version did not adequately describe how the calculation was being done.
1.3	09.02.2024	Methodology & Product Architecture	Updated to include LCT-VaR.	In support of LCTe1.1 enhancements.
1.4	26.4.2024	ESG Methodology	Updated to included additional Scenarios	In support of LCTe1.2.

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