

METHODOLOGY DESCRIPTION

Portfolio Low Carbon Transition Metrics

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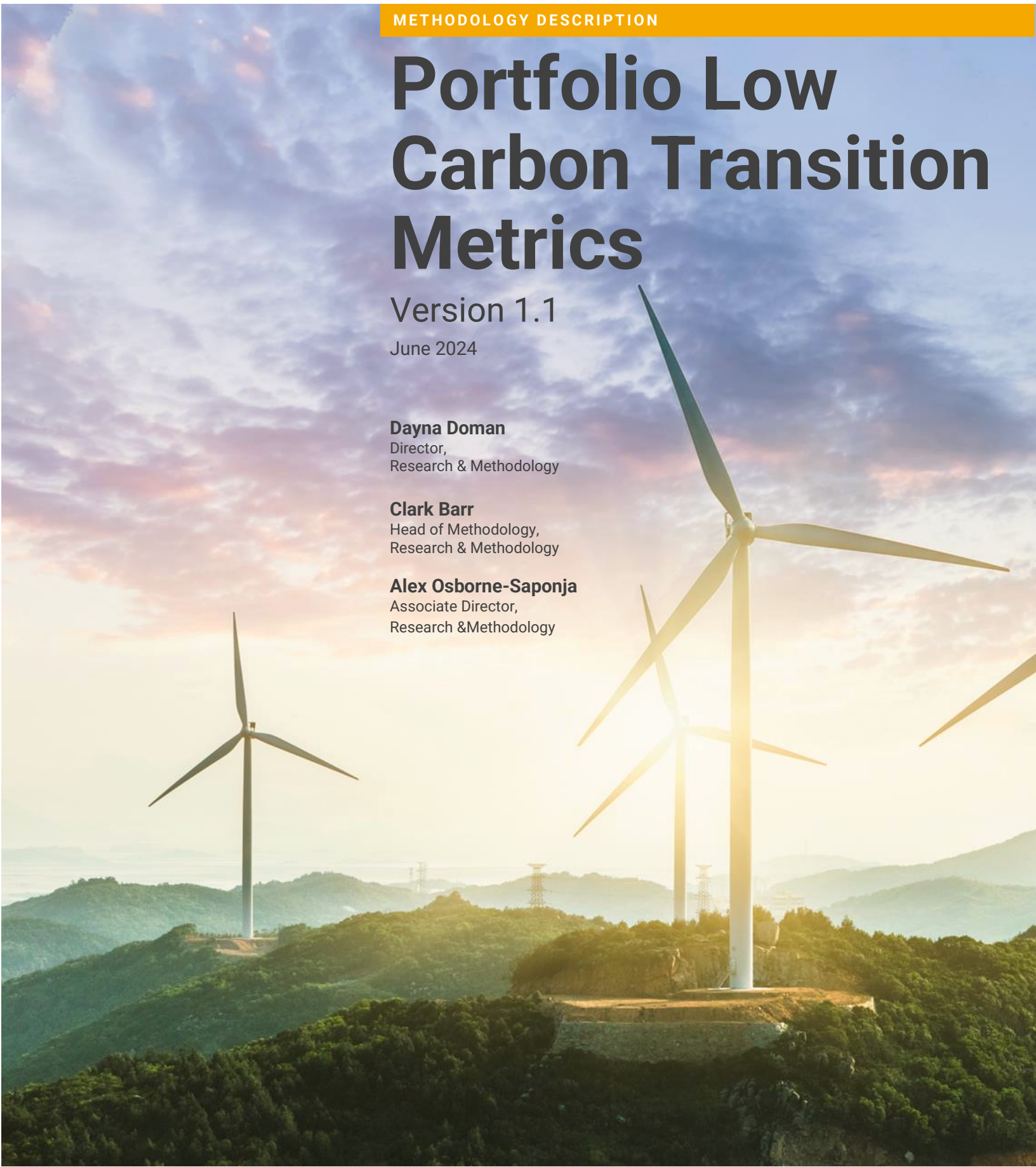
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Portfolio Low Carbon Transition Metrics

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Morningstar Sustainalytics' **Portfolio Low Carbon Transition Metrics** enable investors to understand the degree to which the greenhouse gas (GHG) emissions—attributable to a portfolio—differ from its fair-share GHG emissions budget. These portfolio metrics are based on the company-level **Low Carbon Transition Rating**. The primary output of the company 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?' This concept is reflected by aggregating the GHG emissions projections of underlying holdings, and then following the same steps as the Low Carbon Transition Rating to determine the portfolio's **Implied Temperature Rise**. These metrics measure to what degree the portfolio, via the underlying holdings, is aligned to a 1.5 degrees Celsius target. It is, in part, a way to quantify the exposure and preparedness of underlying companies towards a **Low Carbon Transition** aiming to help investors to create and implement broader climate strategies such as net zero emissions alignment.

Highlights

- The Portfolio Low Carbon Transition Metrics aims to reflect alignment to an IPR **Net Zero Pathway** at a portfolio-level.
- The main output is the **Portfolio Implied Temperature Rise Score All Scopes**, which quantifies the overshoot or undershoot of the portfolio's **Owned GHG Emissions** in degrees Celsius. It is calculated using an equity ownership approach and company-level expected GHG emissions projections that consider emissions projections up to 2050 and are based on the principle that companies are expected to limit their emissions to meet a net zero budget.
- Although the primary signals are connected to a 2050-time horizon, emissions projections are also calculated for the period up to 2030.
- A situation in which underlying companies take no action to reduce emissions is also assessed: The **Portfolio Greenhouse Gas Emissions Exposure Score All Scopes**. It is calculated using company-level baseline GHG emissions projections.
- The **Portfolio GHG Emissions Management Scores** are calculated using scores of underlying companies to provide insights on how prepared a company is to manage its emissions.
- A **Portfolio Low Carbon Transition Value at Risk** signal provides a portfolio level financial assessment of the transition related policy and market risks faced by companies held in the portfolio, indicating the potential cost impacts between now and 2050 and is calculated using an ownership approach similar to aggregated emissions of underlying companies.

Introduction

Global net zero needs to be achieved by 2050 to limit the increase in temperatures to 1.5 degrees Celsius

Morningstar Sustainalytics' Portfolio Low Carbon Transition data set supports investors to understand the degree to which the greenhouse gas (GHG) emissions attributable to a portfolio differ from a corresponding fair-share GHG emissions budget. Further, it enables investors to get a better understanding on how the portfolio's investment in corporate securities (companies) align with meeting a **Global Emissions Budget** that limits the increase in global surface temperatures to 1.5 degrees Celsius above pre-industrial levels by 2050. The year 2050 is considered a milestone by which net zero emissions must be achieved to limit the increase in temperatures to 1.5 degrees Celsius, an objective of the 2015 Paris Agreement.

At its core, it is a measure of how much the GHG emissions the portfolio 'owns' (by way of investing in companies) will overshoot or undershoot the corresponding GHG emissions budget.

Arriving at an implied temperature rise measured in degrees Celsius

The main output is converting this overshoot or undershoot into an implied temperature rise measured in degrees Celsius. Our approach to calculate an implied temperature rise at the portfolio level is to aggregate the underlying components, namely the GHG emissions budget and the amount of expected GHG emissions each company is projected to have. We then follow the same calculation steps that are used to determine an implied temperature rise for an individual company. The basis of this equity ownership approach is that the portfolio GHG emissions projections and resulting implied temperature rise reflect the full footprint of the emissions which can be attributed to the portfolio.

Methodology Description

Inputs

For a summary of inputs see Exhibit 11 in the Appendix.

Company GHG Emissions Projections

The implied temperature rise uses company-level GHG emissions projections that are cumulative to 2030 or 2050

Portfolio implied temperature rise calculations are based on a projection of expected GHG emissions and a projection of the GHG emissions budget, both of which are calculated for the portfolio using the company-level GHG emissions projections from Morningstar Sustainalytics.

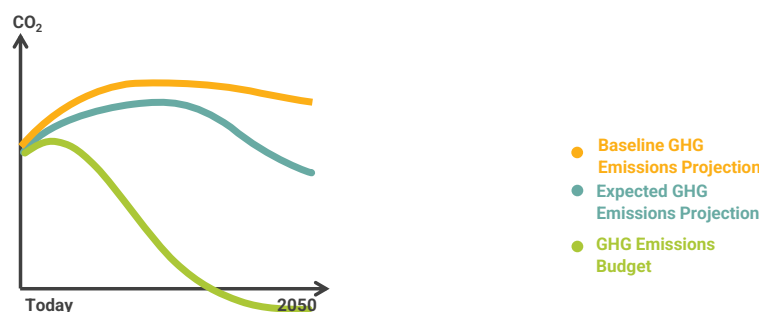
The **Cumulative GHG Emissions Budget** represents the maximum amount of emissions a company is allowed to have from all scopes of emissions to a given time horizon, while being aligned to 1.5 degrees Celsius pathway. This alignment—often referred to as 'net zero' alignment—is based on companies cutting GHG 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.

The **Cumulative Baseline GHG Emissions Projection** represents the emissions a company is expected to have if it takes no actions to manage its emissions for all years for a given time horizon. The Baseline GHG Emissions is represented by the orange line in Exhibit 1.

The **Cumulative Expected GHG Emissions Projection** represents the emissions a company is expected to have for all years for a given time horizon based on its preparedness for a transition to a low carbon economy. Strong management suggests that expected emissions will be lower than the baseline emissions, while weak management suggests that expected emissions will be higher than the baseline emissions. The Expected GHG Emissions is represented by the teal line in Exhibit 1.

Three company GHG emissions projections: Baseline, Expected and Budget

Exhibit 1: Low Carbon Transition Rating Emissions Projections



Source: Morningstar Sustainalytics

GHG Emissions Scopes

Individual and GHG emissions scopes

Company GHG emissions and budget projections are available for individual scopes, as well as for all emissions scopes:

- **Scope 1** refers to direct emissions that are from company-owned and controlled resources.
- **Scope 2** refers to indirect emissions that are from the generation of purchased energy, from a utility provider.
- **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** refers to indirect emissions that are generated upstream from the company’s production of goods and services (in the supply chain).
- **All Scopes** indicates that all GHG emissions are under consideration, and includes Scope 1, Scope 2, Scope 3 Upstream and Scope 3 Downstream.

Global Emissions Budget

Morningstar Sustainalytics’ Global Emissions Budget is focused on limiting warming to 1.5° by 2050

The Global Emissions Budget is the cumulative amount of GHG emissions, in gigatons, which 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).² This value is universal across all companies and portfolios.

Transient Climate Response to Cumulative Carbon Emissions

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. It is used to derive an implied temperature rise. This value is universal across all companies and portfolios.

Enterprise Value Including Cash (EVIC)

The value of the company is used to determine the percent of the company the portfolio owns

The value of the company is used to determine the portfolio's ownership of a company, and consequently, the projected GHG emissions and budget 'owned' by the portfolio. Morningstar provides the entire value of the company as **Enterprise Value Including Cash (EVIC)**. This is calculated by summing the market capitalization, the total preferred stock/units/securities, the noncontrolling/minority interests in equity, and the total debt.

Management Quality Scores

More than 80 available management indicators to assess the company Low Carbon Transition Rating

Morningstar Sustainalytics' company-level Management Score indicates the strength of the company's preparedness for managing a shift to a low carbon economy ('low carbon transition'). The scores are derived for individual GHG emissions scopes, as well as for all GHG emissions scopes overall. They are determined by assessments of over 80 indicators, which may or may not be applied to each company based on its business model. Management scores range from 0-100 with 0 considered the weakest measure of management, and 100 the strongest.

TCFD Management Quality Scores

Management quality score by TCFD thematic area: Governance, strategy, Risk Management and Metrics & Targets, and Other Management

TCFD Management Quality is derived by Morningstar Sustainalytics following a similar approach as the Management Scores. TCFD Management Quality scores provide additional context relative to TCFD's key thematic areas: Governance, Strategy, Risk Management and Metrics & Targets. Given that all Sustainalytics indicators do not fit within those thematic areas, there is a fifth thematic area known as 'Other Management'. Each indicator is assigned to one of the thematic areas to determine the scores, which ranges from 0-100 with 0 being considered the weakest measure of GHG emissions management, and 100 the strongest

TCFD Disclosure Sufficiency

TCFD Disclosure Sufficiency explains to what degree the company is reporting on topics recommended by the TCFD. It is derived by Morningstar Sustainalytics by assessing how many of the recommended management preparedness indicators the company is expected to disclose upon and how many of those expected indicators are disclosed upon. It is expressed as a 0-100% range, with 0% indicating none of the expected indicator disclosure has been accomplished

by the company, and 100% indicating that all expected indicators have been disclosed on.

Company Low Carbon Transition – Value at Risk

Company-level Low Carbon Transition Risk - Value at Risk for Policy Risk, Market Risk, and Overall Risk are used as inputs

The Portfolio Low Carbon Transition Value at Risk calculations are based on the company-level **Low Carbon Transition – Value at Risk (LCT-VaR)** provided by Morningstar Sustainalytics. LCT-VaR assesses the potential financial loss that a company may experience due to risks associated with transitioning to a low carbon economy. Morningstar Sustainalytics determines the LCT-VaR by considering both policy and market risk, with the final LCT-VaR (the 'overall') being the combined value of policy and market risk.

LCT-VaR – Policy Risk

Low Carbon Transition VaR – Value at Risk – Policy Risk (LCT – VaR Policy Risk) is a measure of the potential absolute financial loss the company may experience from policy risk from a transition to a low carbon economy. Policy Risk is the risk that government policies, legislation and regulation will increase costs of carbon taxes are an example of a policy risk. It is calculated as the sum of the present value of cash flows at risk, related to policy risk, to the year 2050 and the present value of the terminal value at year 2050. The policy risk model is a hybrid approach, combining bottom up and top-down data to generate an annual value associated with expected policy costs between now and up to 2050.

LCT-VaR – Market Risk

Low Carbon Transition VaR – Value at Risk – Market Risk (LCT – VaR Market Risk) is a measure of the potential absolute loss in value the company may experience from market risk from a transition to a low carbon economy. Market Risk is the risk that market behavior evolves such that there is less demand for fossil fuel-based products. It is calculated as the sum of the present value of cash flows at risk, related to market risk, to the year 2050 and the present value of the terminal value at year 2050. Market Risk associated with a low carbon transition can be >0 only for companies in the oil and gas Producing sector only. This is because it is based on the revenue risk associated with global demand changes for oil and gas production.

LCT - VaR– Overall Risk

The final LCT – VaR also referred to as Overall Risk, is the sum of the Policy Risk and Market Risk

Low Carbon Transition VaR - Value at Risk - Overall Risk is a measure of the potential absolute loss in value the company may experience from a transition to a low carbon economy. It is calculated as the sum of the present value of cash flows at risk, related to market and policy risks to the year 2050 and the present value of the terminal value at year 2050.

If applicable, a fund of fund portfolio will be 'flattened' to leverage the holdings level data

Portfolio 'Look Through'

Morningstar 'looks through' any funds that are held by the portfolio to find underlying, indirectly held holdings. The 'look through' function goes up to 10 portfolios 'deep'—that is, when a portfolio holds a fund and in turn that fund holds other funds, the 'look through' process will assess 10 'levels' of portfolios. The exception to this rule is for funds that are synthetically replicated; for the purpose of the Low Carbon Transition calculations, they are treated as being equivalent to a portfolio holding derivatives. The derivative holding is not 'looked through' and for the purposes of the calculations are treated as 'other holdings'—that is, neither corporate nor sovereign holdings.

Portfolio Weights

The adjusted portfolio is considered the starting portfolio for calculations

The calculation starts with a net long portfolio, also referred to as the **Adjusted Portfolio**. We calculate portfolio weights based on the following steps:

1. Any securities that have both long and short positions is 'netted out'. The short position weight will be subtracted from the long position weight.
2. Any remaining net short positions will be removed.
3. Any currency offsets will be removed.
4. The portfolio weight will then be recalculated on the netted-out long positions only.

The rescaled weight of a holding in the adjusted portfolio is calculated as the holding's original portfolio weight, divided by sum of the original portfolio weights of the netted-out long, noncash offset holdings.

Adjusted Portfolio Weight

[C.1]

$$W_i^R = \frac{Portfolio\ Weight_i}{\sum_{i=1}^n PortfolioWeight_i}$$

where:

W_i^R	=	The net long rescaled weight of the holding, which for each holding is calculated as the original portfolio weight divided by the weight of the net long portfolio.
$Portfolio\ Weight_i$	=	Original portfolio weight.
$i=1, n$	=	All long, noncash offset holdings.

Coverage Calculations

Low Carbon Transition metrics are applicable (eligible) for corporate securities

Coverage statistics are calculated for the Portfolio Low Carbon Transition data set to enable users to understand the proportion of the adjusted portfolio that is eligible and covered. These metrics are calculated for the data set as a whole, for an underlying company to be considered covered, it must have all underlying data. A separate set of coverage statistics is calculated for each Portfolio Low Carbon Transition Value at Risk (Market, Policy, and Overall), since an individual company’s coverage of LCT-VaR for given type of risk is dependent of availability of underlying metrics. In the case of oil and gas companies, Market VaR and consequently the overall LCT-VaR can only be calculated if the company reported annual production in Barrel of Oil Equivalents (BOE).

The initial step of the process is to identify the portion of the adjusted portfolio’s holdings that can potentially contribute the required data to calculate the Low Carbon Transition metrics. These are known as **Eligible Holdings**. In the context of Portfolio Low Carbon Transition Metrics, the **Low Carbon Transition Eligible Holding Type** means corporate entities, such as equities and corporate bonds. Next, we identify which holdings have coverage of the required company-level data. **Covered Holdings** are the subset of eligible holdings that have relevant input data available. A field indicating the **Number of Holdings Covered** (that is, that have the required underlying data to calculate the portfolio level metrics) are also be calculated.

Coverage is based on the companies covered by Morningstar Sustainalytics for the Low Carbon Transition Rating

To start, the proportions of the adjusted portfolio that are eligible, not eligible, covered, and not covered are calculated.

The **Low Carbon Transition Percentage of Portfolio Eligible** and **Low Carbon Transition Percentage of Portfolio Not Eligible** will sum to the total adjusted portfolio (100%).

Low Carbon Transition Percentage of Portfolio Eligible

The adjusted portfolio reflected as eligible and non-eligible percentages which will sum to 100%

[C.2]

$$PortfolioEligible_R = \sum_{i=1}^E W_i^R$$

where:

$PortfolioEligible_R$	=	The proportion of the adjusted (net long) portfolio that is composed of eligible holdings.
W_i^R	=	The net long rescaled weight of the holding.
$i = 1, E$	=	All long, eligible holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type.

Low Carbon Transition Percentage of Portfolio Not Eligible

[C.3]

$$PortfolioNotEligible_R = \sum_{i=1}^{NE} W_i^R$$

where:

$PortfolioNotEligible_R$	=	The proportion of the adjusted (net long) portfolio that is composed of Noneligible Holdings .
W_i^R	=	The net long rescaled weight of the holding.
$i = 1, NE$	=	All long, noneligible holdings. These are securities in the adjusted (net long) portfolio that are not of the relevant holding type.

The **Low Carbon Transition Percentage of Portfolio Covered** and **Low Carbon Transition Percentage of Portfolio Not Covered** will sum to the total adjusted portfolio (100%).

Low Carbon Transition Percentage of Portfolio Covered

[C.4]

$$PortfolioCovered_R = \sum_{i=1}^{EC} W_i^R$$

where:

$PortfolioCovered_R$	=	The proportion of the adjusted (net long) portfolio that is composed of covered holdings—that is, securities for which the underlying data is available for the calculation.
W_i^R	=	The net long rescaled weight of the holding.
$i = 1, EC$	=	All eligible, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and for which the relevant underlying data is known (covered, C).

Low Carbon Transition Percentage of Portfolio Not Covered

[C.5]

$$PortfolioNotCovered_R = \sum_{i=1}^{NC} W_i^R$$

where:

$PortfolioNotCovered_R$	=	The proportion of the adjusted (net long) portfolio that is composed of Noncovered Holdings —that is, securities for which the underlying data is not available for the calculation.
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The adjusted portfolio reflected as covered and not covered percentages which will sum to 100%

Not covered includes holdings where company-level data is not applicable (not eligible)

W_i^R	=	The net long rescaled weight of the holding.
$i = 1, NC$	=	All noncovered holdings. These are securities in the adjusted (net long) portfolio for which relevant underlying data is not available.

The percentage of portfolio not covered will include lack of coverage due to the holding being not having underlying data, but also includes holdings where underlying data does not apply (i.e., are not eligible), such as cash or sovereign bonds. To further distinguish only the proportion of the adjusted portfolio that is eligible for underlying data, but does not have coverage, we calculated an additional metric: **Low Carbon Transition Percentage of Portfolio Eligible Not Covered**.

Low Carbon Transition Percentage of Portfolio Eligible Not Covered

The percentage of the adjusted portfolio that is eligible but not covered

[C.6]

$$PortfolioEligibleNotCovered_R = \sum_{i=1}^{ENC} W_i^R$$

where:

$PortfolioEligibleNotCovered_R$	=	The proportion of the adjusted (net long) portfolio that is composed of eligible holdings and for which the underlying data is not available for the calculation.
W_i^R	=	The net long rescaled weight of the holding.
$i = 1, ENC$	=	All eligible, noncovered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and for which relevant underlying data is not available (noncovered, NC).

Next, the proportions of the eligible part of the adjusted portfolio where the relevant data is known (covered) and not known (not covered) are calculated.

This is calculated by taking the proportion of the adjusted portfolio that is covered (or not covered) and dividing it by the proportion of the portfolio that is eligible.

Low Carbon Transition Percentage of Eligible Portfolio Covered

The eligible portfolio reflected as covered and not covered percentages which will sum to 100%

[C.7]

$$EligiblePortfolioCovered_R = \frac{PortfolioCovered_R}{PortfolioEligible_R}$$

where:

$$EligiblePortfolioCovered_R = \text{The proportion of only the eligible part of the adjusted portfolio where the underlying data is available for the calculation.}$$

$$PortfolioCovered_R = \text{The proportion of the adjusted portfolio that is composed of covered holdings.}$$

$$PortfolioEligible_R = \text{The proportion of the adjusted portfolio that is composed of eligible holdings.}$$

Low Carbon Transition Percentage of Eligible Portfolio Not Covered

The percentage of holdings within the eligible portfolio that are not covered

[C.8]

$$EligiblePortfolioNotCovered_R = \frac{PortfolioEligibleNotCovered_R}{PortfolioEligible_R}$$

where:

$$EligiblePortfolioNotCovered_R = \text{The proportion of only the eligible part of the adjusted portfolio where the underlying data is not available for the calculation.}$$

$$PortfolioEligibleNotCovered_R = \text{The proportion of the adjusted portfolio that is composed of eligible holdings and for which the underlying data is not available.}$$

$$PortfolioEligible_R = \text{The proportion of the adjusted portfolio that is composed of eligible holdings.}$$

Low Carbon Transition Number of Holdings Covered

The Number of Holdings Covered is also calculated

[C.9]

$$Number\ of\ Holdings\ Covered = \text{A simple count of the holdings in the adjusted portfolio where the underlying data is available.}$$

LCT-VaR Coverage Calculations

Separate coverage metrics are calculated for Portfolio LCT-VaR, for each Low Carbon Transition Risk Type

The same coverage calculations outlined in equations C2 through C8 are calculated for each **Low Carbon Transition Risk Type**. It is possible for a company to have coverage for one type of LCT – VaR but not all three. For example, if a company in the oil and gas producing sector does not have the information to determine its Market Risk but does have the information to determine its Policy Risk, the LCT – VaR Policy Risk will be published, but the LCTR – VaR Market Risk and Overall Risk both will not. This is because Market Risk is required to accurately determine the Overall Risk of an oil and gas producing sector company. It is also possible for a company to have coverage of a Low Carbon Transition Rating (and consequently the emissions projections underpinning it), but not LCT-VaR coverage.

Exhibit 2 lists a summary of the coverage metrics for Portfolio Low Carbon Transition Value at Risk.

Exhibit 2: Summary of Portfolio Low Carbon Transition Value at Risk Coverage Calculations

Coverage Metric	Transition Risk Type	Calculation Formula
Low Carbon Transition Value at Risk Eligible Holding Type	Overall	Corporate Entities
	Market	
	Policy	
Low Carbon Transition Value at Risk Percentage of Portfolio Eligible	Overall	see C.2
	Market	
	Policy	
Low Carbon Transition Value at Risk Percentage of Portfolio Not Eligible	Overall	see C.3
	Market	
	Policy	
Low Carbon Transition Value at Risk Percentage of Portfolio Covered	Overall	see C.4
	Market	
	Policy	
Low Carbon Transition Value at Risk Percentage of Portfolio Not Covered	Overall	see C.5
	Market	
	Policy	
Low Carbon Transition Value at Risk Percentage of Portfolio Eligible Not Covered	Overall	see C.6
	Market	
	Policy	
Low Carbon Transition Value at Risk Percentage of Eligible Portfolio Covered	Overall	see C.7
	Market	
	Policy	
Low Carbon Transition Value at Risk Percentage of Eligible Portfolio Not Covered	Overall	see C.8
	Market	
	Policy	
Low Carbon Transition Value at Risk Number of Holdings Covered	Overall	see C.9
	Market	
	Policy	

Full definitions of all coverage metrics in the above table can be found in the Glossary of Terms section.

Portfolio Implied Temperature Rise Calculations

Allowing investors to easily understand the GHG emissions overshoot or undershoot a company is projected to have

The implied temperature rise calculation measures to what degree the world is expected to warm if the GHG emissions of all companies differed from their net zero budgeted GHG emissions to the same extent as the emissions of the company or portfolio being evaluated. It allows investors to easily understand the GHG emissions overshoot or undershoot a company is projected to have in the context of limiting global warming to an increase of 1.5 degrees Celsius compared to pre-industrial levels.

For a portfolio, it is a measure of how much the GHG emissions attributable to the portfolio (by way of investing in companies) will overshoot or undershoot the corresponding GHG emissions budget attributable to that portfolio.

Our approach to calculate an implied temperature rise at the portfolio level is to aggregate the underlying GHG emissions and GHG emissions budget, and then follow the same steps that are used to calculate an implied temperature rise for an individual company:

The Low Carbon Transition Rating (LCTR) calculation for an individual company

[C.10]

$$\begin{aligned} \text{Implied Temperature Rise (}^\circ\text{C)} &= \\ &1.5^\circ\text{C} + \text{GHG Emissions Gap Percentage} \\ &\quad * \text{Global Emissions Budget} * \text{TCRE Factor} \end{aligned}$$

where:

<i>Implied Temperature Rise (°C)</i>	= A measure of surface temperature rise based on the given GHG emissions of a given company or portfolio.
<i>GHG Emissions Gap Percentage</i>	= The relative percentage difference between the GHG emissions being evaluated (either Expected or Baseline) and the corresponding net zero aligned GHG emissions budget to 2050.
<i>Global Emissions Budget</i>	= The cumulative amount of GHG emissions, in gigatons, that can be emitted to limit warming to 1.5 degrees.
<i>TCRE Factor</i>	= The Transient Climate Response to Cumulative Carbon Emissions is an IPCC derived factor that determines the amount of radiative forcing (warming) as degree Celsius (°C) per megaton (Mt) of GHG emissions.

Exhibit 3: Example of Determining Company LCTR

GHG Emissions – Expected	2.954
GHG Emissions– IPR Net Zero Budget[CB1] [DD2]	573
GHG Emissions Gap – Expected	2.381
GHG Emissions Gap Percentage – Expected	416%
LOW CARBON TRANSITION RATING	2.9°C

Source: Morningstar Sustainalytics

Deriving a portfolio implied temperature rise based on owned emissions and budget

Following the example for company-level LCTR steps in Exhibit 3, the steps reflected for a portfolio are as follows:

1. Aggregate portfolio GHG emissions from underlying companies.
2. Aggregate portfolio GHG emissions budget from underlying companies. Calculate a GHG emissions gap and GHG gap percentage between the GHG emissions and the GHG emissions budget being evaluated.
3. Calculate the final implied temperature rise using the GHG emissions gap percentage within the formula outlined above [C.10].

Two types of final implied temperature rise metrics calculated for portfolios

There are two types of final implied temperature rise metrics calculated for portfolios. The first is based on projections which assume a situation where companies take no action to change how they manage the intensity of their emissions for each unit of production between now and 2050 ‘baseline GHG emissions’. This contributes to the calculation of an additional metric that is called the **Portfolio GHG Emissions Exposure Score All Scopes**.

The second is based on projections which assumes companies are expected to manage emissions between now and 2050 ‘expected GHG emissions’. This metric is called the Portfolio Implied Temperature Rise Score All Scopes and is considered the main output of the Portfolio Low Carbon Transition data set.

Both are calculated for all GHG emissions scopes (‘all scopes’), but certain underlying components will be calculated for individual scopes of GHG emissions as well.

Portfolio GHG Emissions Projections

All three emissions projections aggregated at the portfolio are cumulative to 2050

There are three types of GHG emissions projections: cumulative baseline GHG emissions, cumulative expected GHG emissions and the cumulative GHG emissions budget. Each of these three GHG emission projections are aggregated for Scope 1, Scope 2, Scope 3 Upstream and Scope 3 Downstream GHG emissions, as well as for all scopes.

For a portfolio, it is calculated as the portion of a company the portfolio owns (using holding size and EVIC), multiplied by the company’s cumulative GHG emissions and summed for all covered companies within the portfolio:

Portfolio Cumulative GHG Emissions

[C.11]

$$Portfolio\ GHG\ Emissions = \sum_{i=1}^{EC} \frac{holding\ size_i\ (USD)}{issuer's\ EVIC_i\ (USD)} * issuer's\ GHG\ emissions_i$$

where:

<i>Portfolio Emissions</i>	= The applicable GHG emissions that is attributable to the portfolio for a given GHG emissions projection type and scope.
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$holding\ size_i(USD)$	=	The amount in millions of U.S. dollars the portfolio has invested in the relevant underlying covered company. The sum of all holding sizes will be the covered portion of the portfolio.
$issuer's\ EVIC_i(USD)$	=	The entire value of the company (enterprise value including cash) in millions of U.S. dollars. This is calculated by summing the market capitalization, the total preferred stock/units/securities, the noncontrolling/minority interests in equity, and the total debt.
$i = 1, EC$	=	All long, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and where the relevant underlying data is known (covered, C).

GHG emissions can be calculated for different time horizons for a portfolio, but only the IPR Net Zero Cumulative to 2050 scenario and time horizon will be used in a subsequent portfolio implied temperature rise score. See 'Scenario Analysis' section and Exhibit 9 for all time horizons and GHG emissions scenarios.

Exhibit 4 below summarizes the company GHG emissions projection data used for each portfolio calculation for the IPR Net Zero scenario and cumulative to 2050-time horizon: The **Portfolio Baseline Cumulative GHG Emissions 2050**, **Portfolio Net Zero Budget Cumulative Emissions 2050**, and **Portfolio Expected Cumulative GHG Emissions 2050**. See the Appendix for the aggregated portfolio's calculation formulas for the three distinct types of GHG emissions.

Exhibit 4: Summary of Portfolio GHG Emissions Projections

GHG Emissions Type	GHG Emissions Scope	Portfolio Calculation
GHG Emissions Budget	Scope 1	Portfolio Net Zero Budget Cumulative Emissions 2050 Scope 1
	Scope 2	Portfolio Net Zero Budget Cumulative Emissions 2050 Scope 2
	Scope 3 Upstream	Portfolio Net Zero Budget Cumulative Emissions 2050 Scope 3 Downstream
	Scope 3 Downstream	Portfolio Net Zero Budget Cumulative Emissions 2050 Scope 3 Upstream
	All Scopes	Portfolio Net Zero Budget Cumulative Emissions 2050 All Scopes
Baseline GHG Emissions	Scope 1	Portfolio Baseline Cumulative GHG Emissions 2050 Scope 1
	Scope 2	Portfolio Baseline Cumulative GHG Emissions 2050 Scope 2
	Scope 3 Upstream	Portfolio Baseline Cumulative GHG Emissions 2050 Scope 3 Downstream
	Scope 3 Downstream	Portfolio Baseline Cumulative GHG Emissions 2050 Scope 3 Upstream
	All Scopes	Portfolio Baseline Cumulative GHG Emissions 2050 All Scopes
Expected GHG Emissions	Scope 1	Portfolio Expected Cumulative GHG Emissions 2050 Scope 1
	Scope 2	Portfolio Expected Cumulative GHG Emissions 2050 Scope 2
	Scope 3 Upstream	Portfolio Expected Cumulative GHG Emissions 2050 Scope 3 Downstream
	Scope 3 Downstream	Portfolio Expected Cumulative GHG Emissions 2050 Scope 3 Upstream
	All Scopes	Portfolio Expected Cumulative GHG Emissions 2050 All Scopes

Source: Morningstar Sustainalytics

Portfolio Implied Temperature Rise

The Portfolio Implied Temperature Rise Score All Scopes is considered the main output of the Portfolio Low Carbon Transition data set

The portfolio implied temperature rise calculation follows the same steps as the company-level calculation using the portfolio GHG emissions projections.

This starts by first calculating a cumulative GHG emissions gap and gap percentage, which represent the emissions overshoot/undershoot in both absolute and relative terms. We then use the gap percentage for all emissions scopes within the implied temperature rise formula.

There are two resulting implied temperature rise calculations for a portfolio:

- The Portfolio GHG Emissions Exposure Score All Scopes is the implied temperature alignment that specifies what degree would the world warm if the GHG emissions of all companies differed from their net zero budgeted GHG emissions to the same degree as the portfolio’s baseline cumulative GHG emissions.
- The Portfolio Implied Temperature Rise Score All Scopes is the implied temperature alignment that specifies to what degree would the world warm if the GHG emissions of all companies differed from their net zero budgeted GHG emissions to the same degree as the portfolio’s cumulative expected GHG emissions.

Exhibit 5 below summarizes the input data used for each portfolio calculation. Formulas for the two types of implied temperature rise metrics calculated can be found in the Appendix.

Exhibit 5: Summary of Portfolio GHG Emissions Projections

Temperature Alignment	GHG Emissions Scope	Components
Portfolio Implied Temperature Rise Score	All Scopes	Portfolio Baseline Cumulative GHG Emissions Gap 2050
		Portfolio Baseline Cumulative GHG Emissions Gap Percentage 2050
		Global Emissions Budget
		Transient Climate Response to Cumulative Carbon Emissions
Portfolio GHG Emissions Exposure Score	All Scopes	Portfolio Expected Cumulative GHG Emissions Gap 2050
		Portfolio Expected Cumulative GHG Emissions Gap Percentage 2050
		Global Emissions Budget
		Transient Climate Response to Cumulative Carbon Emissions

Source: Morningstar Sustainalytics

Portfolio GHG Emissions Gap

The overshoot/undershoot of portfolio GHG emissions in absolute terms

The portfolio GHG emissions gap is the absolute difference between the portfolio GHG emissions (either expected or baseline) and the portfolio GHG emissions budget.

GHG emissions gaps can be calculated for different time horizons and GHG emissions scenarios for a portfolio, but only the IPR Net Zero Cumulative to 2050 scenario and time horizon will be used in a subsequent portfolio implied temperature rise score. See 'Scenario Analysis' section and Exhibit 9 for all time horizons and GHG emissions scenarios.

The **Portfolio Baseline Cumulative GHG Emissions Gap 2050** reflects baseline GHG emissions, while the **Portfolio Expected Cumulative GHG Emissions Gap 2050** reflects expected GHG emissions.

Portfolio Cumulative GHG Emissions Gap 2050

[C.12]

$$Portfolio\ GHG\ Emissions\ Gap = Portfolio\ GHG\ Emissions - Portfolio\ NetZero\ Budget$$

where:

<i>Portfolio GHG Emissions Gap</i>	=	The difference between the portfolio's owned GHG emissions and the portfolio's owned net zero aligned GHG emissions budget to 2050 for a given GHG emissions scope.
<i>Portfolio GHG Emissions</i>	=	The sum of the GHG emissions (cumulative to 2050) the portfolio owns for a given GHG emissions scope.
<i>Portfolio Net – Zero Budget</i>	=	The Inevitable Policy Response (IPR) Net Zero Budget (cumulative to 2050) attributable to the portfolio for a given GHG emissions scope.

Overshoot/undershoot of portfolio GHG emissions in relative terms

Portfolio GHG Emissions Gap Percentage

The portfolio cumulative GHG emissions gap percentage is the relative percentage difference between the portfolio's GHG emissions and the portfolio's GHG emissions budget for a given scope. It is calculated as the portfolio GHG emissions divided by the portfolio GHG emissions budget, minus 1.

GHG emissions gap percentages can be calculated for different time horizons and GHG emissions scenarios for a portfolio, but only the IPR Net Zero Cumulative to 2050 scenario and time horizon will be used in a subsequent portfolio implied temperature rise score.

The **Portfolio Baseline Cumulative GHG Emissions Gap Percentage 2050** reflects baseline GHG emissions while the **Portfolio Expected Cumulative GHG Emissions Gap Percentage 2050** reflects expected GHG emissions.

Portfolio Cumulative GHG Emissions Gap Percentage 2050

[C.13]

$$Portfolio\ GHG\ Emissions\ Gap\ \% = \frac{Portfolio\ GHG\ Emissions}{Portfolio\ NetZero\ Budget} - 1$$

where:

<i>Portfolio GHG Emissions Gap %</i>	=	The relative percentage difference between the portfolio's owned GHG emissions and the portfolio's owned net zero aligned GHG emissions budget to 2050 for a given GHG emissions scope.
<i>Portfolio Baseline Emissions</i>	=	The sum of the baseline (cumulative to 2050) GHG emissions the portfolio owns for a given GHG emissions scope.
<i>Portfolio Net – Zero Budget</i>	=	The Inevitable Policy Response (IPR) Net Zero Budget (cumulative to 2050) attributable to the portfolio for a given GHG emissions scope.

Translating the portfolio's GHG emissions gap into an implied temperature alignment/rise

Portfolio Implied Temperature Rise

The final implied temperature alignment specifies to what degree would the world warm if the GHG emissions of all companies differed from their net zero budgeted GHG emissions to the same degree as the portfolio's cumulative expected GHG emissions. It is calculated only for all GHG emissions scopes, as it is meant to quantify the effects of the total GHG emissions overshoot/undershoot.

It is calculated as 1.5 plus the sum of the portfolio baseline GHG emissions gap percentage from all scopes multiplied by the Global GHG Emissions Budget and the Transient Climate Response to Cumulative Carbon Emissions.

The Portfolio GHG Emissions Exposure Score All Scopes reflects baseline GHG emissions while the Portfolio Implied Temperature Rise Score All Scopes reflects expected GHG emissions.

Portfolio Implied Temperature Rise

[C.14]

$$\begin{aligned} \text{Portfolio Implied Temperature Rise (}^\circ\text{C)} &= \\ &1.5^\circ\text{C} + \text{Portfolio GHG Emissions Gap \%} \\ &* \text{Global Emissions Budget} * \text{TCRE Factor} \end{aligned}$$

where:

<i>Portfolio Implied Temperature Rise(°C)</i>	=	The implied temperature rise of the portfolio's GHG emissions relative to the portfolio's net zero aligned GHG emissions budget to 2050 for all emissions scopes.
<i>Portfolio GHG Emissions Gap % All Scopes</i>	=	The relative percentage difference between the portfolio's GHG emissions and the portfolio's net zero aligned GHG emissions budget to 2050 for all emissions scopes.
<i>Global Emissions Budget</i>	=	The cumulative amount of GHG emissions, in gigatons, that can be emitted to limit warming to 1.5 degrees.
<i>TCRE Factor</i>	=	The Transient Climate Response to Cumulative Carbon Emissions is an IPCC derived factor that determines the amount of radiative forcing (warming) as degree Celsius (°C) per megaton (Mt) of GHG emissions.

Baseline GHG Emissions Contribution by Scope

In addition to the Portfolio GHG Emissions Exposure Score, a breakdown of the contribution from each individual scope is calculated, so that the contribution for Scope 1, Scope 2, Scope 3 Downstream, and Scope 3 Upstream will sum to 100%.

The GHG emissions contributed by each scope within the baseline emissions of all scopes

Portfolio Baseline Cumulative GHG Emissions 2050 Contribution

[C.15]

$$\frac{\text{Portfolio Baseline Emissions Contribution}_S}{\text{Portfolio Baseline Emissions All Scopes}} = \frac{\text{Portfolio Baseline Emissions}_S}{\text{Portfolio Baseline Emissions All Scopes}}$$

where:

<i>Portfolio Baseline Emissions Contribution_S</i>	= The percent of baseline GHG emissions of an individual scope (S) contributing to the baseline emissions of all scopes.
<i>Portfolio Baseline Emissions_S</i>	= The sum of the baseline (cumulative to 2050) GHG emissions the portfolio owns for the individual scope, (S).
<i>Portfolio Baseline Emissions All Scopes</i>	= The sum of the baseline (cumulative to 2050) GHG emissions the portfolio owns for all emissions scopes.

Classifying the implied temperature rise outcome in terms of alignment

Portfolio Implied Temperature Rise Score Category

A categorical description of the Portfolio Implied Temperature Rise Score for all emissions scopes is determined according to the same temperature thresholds that are applied to individual companies. The possible values for the **Portfolio Implied Temperature Rise Score Category All Scopes** range from Aligned to Severely Misaligned and includes Moderately Misaligned, Significantly Misaligned, and Highly Misaligned as showcased by Exhibit 6.

This description is intended to classify how the resulting temperature rise aligns to global goals to reduce global warming to 1.5 degrees Celsius by 2050. It is not a peer based or comparative assignment across different portfolios.

Exhibit 6: Implied Temperature Rise Score Threshold Outcomes

Temperature Assessment Threshold (°C)	Exposure Category
<= 1.50	Aligned
>1.50 - 2.00	Moderately Misaligned
>2.00 - 3.00	Significantly Misaligned
>3.00 - 4.00	Highly Misaligned
>4.0	Severely Misaligned

Source: Morningstar Sustainalytics

Portfolio GHG Management

Management scores are aggregated using a weighted average approach

GHG emissions management is reflected at the portfolio level by aggregating the underlying company scores using a weighted average approach, as well as offering a classification of the score value for all emissions scopes. For individual companies, the management score indicates the strength of the company's management systems in regard to managing its exposure to the low carbon transition and is used to determine company-level expected GHG emissions projections.

GHG Management Scores & Category

Portfolio GHG Emissions Management Scores

For companies, GHG emissions management is applied to baseline emissions to derive the expected emissions

The **Portfolio GHG Emissions Management Score** reflects the portfolio's management quality for a given GHG emissions scope and is calculated as the asset-weighted average of the covered holdings' company-level management scores for a given GHG emissions scope within the portfolio. It is calculated for Scope 1, Scope 2, Scope 3 Upstream and Scope 3 Downstream GHG emissions, as well as for all scopes.

Portfolio GHG Emissions Management Score

[C.16]

$$Portfolio\ GHG\ Management\ Score = \sum_{i=1}^{EC} W_i^{RC} * GHG\ Management\ Score_i$$

where:

<i>Portfolio GHG Management Score</i>	=	The asset-weighted average of a company's GHG Management Score for all covered companies held in the portfolio.
W_i^{RC}	=	The rescaled weight of the covered holding, which for each covered holding is calculated as the original portfolio weight divided by the weight of the covered portfolio. The covered portfolio is the subset of eligible holdings that have relevant input data available.
<i>GHG Management Score_i</i>	=	GHG Management Score of covered holding.
<i>i = 1, EC</i>	=	All long, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and where the relevant underlying data is known (covered, C).

Classifying the management assessment outcome

Portfolio Greenhouse Gas Emissions Management Score Category

The **Portfolio Greenhouse Gas Emissions Management Score Category All Scopes** assigns a categorical description to the Portfolio GHG Emissions Management Score for all emissions scopes. Assignment is determined by the same management quality score thresholds as individual companies. The possible values range from Very Weak to Very Strong and include Weak, Average, and Strong, as illustrated by Exhibit 7.

This description is intended to bring context to the emissions management score. It is not a peer based or comparative assignment across different portfolios.

Exhibit 7: Management Score Threshold Outcomes

Management Score Range	Category Description
0 to <25	Very Weak
25 to <45	Weak
45 to <55	Average
55 to <75	Strong
75 to 100	Very Strong

Source: Morningstar Sustainalytics

Portfolio TCFD Management & Disclosure Sufficiency

Leveraging a globally recognized framework

The Taskforce of Climate-Related Financial Disclosure (TCFD) is a globally recognized framework to improve and increase reporting of climate-related financial information. Portfolio level metrics are calculated for the management quality of underlying companies for each of the key thematic areas noted within the TCFD, as well as for how sufficient the underlying companies' disclosure is in meeting TCFD recommendations.

TCFD Management Quality

Portfolio TCFD Management Quality Scores

An asset-weighted average of the Task Force on Climate Related Financial Disclosures (TCFD) management scores is calculated for a given TCFD theme, following the same method as Management Scores (see C.16).

For individual companies, this is a score that indicates the strength of the company's management systems about managing its exposure to the low carbon transition for indicators of a given TCFD theme. The **Portfolio TCFD Management Quality Score** is calculated only for all emissions scopes for the TCFD themes Governance, Metrics and Targets, Risk Management, and Strategy, as well Other Management which includes management indicators that do not fall under one of the TCFD themes, as follows:

- Portfolio TCFD Governance Score
- Portfolio TCFD Metrics and Targets Score

The management assessment outcome by TCFD theme

- Portfolio TCFD Risk Management Score
- Portfolio TCFD Strategy Score
- Portfolio TCFD Other Management Score

Portfolio TCFD Score Category

Classifying the management assessment outcome by TCFD theme

The **Portfolio TCFD Score Category** assigns a categorical description to the Portfolio TCFD Management Score for all emissions scopes. Assignment is determined by the same management quality score thresholds as individual companies (see Exhibit 7 above). The possible values range from Very Weak to Very Strong and include Very Weak, Weak, Average, Strong, and Very Strong.

It is calculated for the TCFD themes Governance, Metrics and Targets, Risk Management, and Strategy, as well Other Management which includes management indicators which do not fall under one of the TCFD themes:

- Portfolio TCFD Governance Score Category
- Portfolio TCFD Metrics and Targets Score Category
- Portfolio TCFD Risk Management Score Category
- Portfolio TCFD Strategy Score Category
- Portfolio TCFD Other Management Score Category

This description is intended to bring context to the TCFD theme emissions management scores. It is not a peer based or comparative assignment across different portfolios.

TCFD Disclosure Sufficiency

Portfolio TCFD Disclosure Sufficiency

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

The **Portfolio Taskforce on Climate Related Financial Disclosure (TCFD) Disclosure Sufficiency** is a portfolio-level measure of the percentage that indicates what proportion of TCFD related indicators covered companies are reporting on. It is calculated as a weighted average of the covered holdings' company-level TCFD Disclosure Sufficiency percentages. For each covered company, TCFD Disclosure Sufficiency is calculated as the number of indicators the company is reporting on divided by all the TCFD recommended indicators.

Portfolio TCFD Disclosure Sufficiency

[C.17]

$$Portfolio\ TCFD\ Disclosure\ Sufficiency = \sum_{i=1}^{EC} W_i^{RC} * TCFD\ Disclosure\ Sufficiency_i$$

where:

Portfolio TCFD Disclosure Sufficiency = The asset-weighted average of a company's TCFD Disclosure Sufficiency percent for all covered companies held in the portfolio.

W_i^{RC}	=	The rescaled weight of the covered holding, which for each covered holding is calculated as the original portfolio weight divided by the weight of the covered portfolio. The covered portfolio is the subset of eligible holdings that have relevant input data available.
$TCFD\ Disclosure\ Sufficiency_i$	=	TCFD Disclosure Sufficiency percent for the covered holding.
$i = 1, EC$	=	All long, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and where the relevant underlying data is known (covered, C).

TCFD Disclosure Sufficiency Grade

Portfolio TCFD Disclosure Sufficiency Grade

Classifying the TCFD disclosure sufficiency percent

The **Portfolio TCFD Disclosure Sufficiency Grade** assigns a letter grade between A+ and D that rates the portfolio's Task Force on Climate Related Financial Disclosures (TCFD) reporting sufficiency, where A+ indicates the highest (and better) possible grade and D indicates the lowest. As Exhibit 8 showcases, a higher grade is associated with a higher percent of underlying companies reporting on topics (indicators) recommended by the TCFD. Thresholds are based on the same parameters as how individual companies are classified under the Low Carbon Transition Rating methodology.

This description is intended to bring context to the TCFD theme emissions management scores. It is not a peer based or comparative assignment across different portfolios.

Exhibit 8: TCFD Disclosure Sufficiency Threshold Outcomes

TCFD Disclosure Sufficiency Threshold	Grade
<10	D
10 to <20	C-
20 to <30	C
30 to <40	C+
40 to <50	B-
50 to <60	B
60 to <70	B+
70 to <80	A-
80 to <90	A
90 to 100	A+

Source: Morningstar Sustainalytics

Portfolio Low Carbon Transition – Value at Risk

Adding a financial signal to transition risk between now and 2050

The Portfolio Low Carbon Transition Value at Risk quantifies the expected financial losses that a portfolio faces between now and 2050 due to the risks posed by transition to a low carbon economy. These include risks that regulatory action will increase costs through carbon pricing mechanisms (policy risk), as well as risks that market behavior evolves such that there is less demand for fossil fuel-based products (market risk), which together make up the overall risk. Morningstar Sustainalytics' determines a forward-looking metric on how low carbon transition risk may impact the future value of individual companies for both policy and market risks via an LCT-VaR for each, which are then added together to reflect the overall LCT-VaR.

Value at Risk is calculated for three Transition Risk Types: Policy, Market and Overall

Portfolio Low Carbon Transition Value at Risk is the sum of the company-level LCT-VaR for corporate holdings that are owned or financed by the portfolio, such that it represents the LCT-VaR that is attributable to the portfolio. It is calculated for policy risk, market risk, as well as for both ('overall').

Two normalized versions are available to allow for inter-portfolio comparison

In addition to the absolute portfolio LCT-VaR amounts, two normalized versions are calculated, allowing for inter-portfolio comparison.

The **Portfolio Low Carbon Transition Value at Risk Percent of Covered Holding Value** expresses the portfolio's LCT-VaR as a percentage of the total assets of all covered holdings. **Portfolio Low Carbon Transition Value at Risk per Currency Unit Invested** expresses the portfolio LCT-VaR for a given currency and amount of the portfolios invested assets, such as 'per million USD'.

Portfolio metrics are available in 8 different currencies

Morningstar Sustainalytics provides Portfolio Low Carbon Transition Value at Risk metrics in eight currencies:

- Australian Dollar (AUD)
- Swiss Franc (CHF)
- Euro (EUR)
- Pound Sterling (GBP)
- Hong Kong Dollar (HKD)
- New Zealand Dollar (NZD)
- Singapore Dollar (SGD)
- United States Dollar (USD)

It is important to note that company-level LCT-VaR is expressed in USD, where the portfolio level non-USD currencies are calculated by converting USD values within the portfolio calculation steps. Please see Appendix for additional details on currency conversion methodology.

Portfolio Low Carbon Transition Value at Risk

Portfolio LCT-VaR is based on the amount the portfolio owns of finances corporate holdings

The Portfolio Low Carbon Transition Value at Risk is calculated as the portion the portfolio owns (using holding size and EVIC), multiplied by the company's

LCT – VaR and summed for all covered companies in the portfolio. It is calculated for three Transition Risk Types: Market, Policy, and Overall:

[C.18]

$$Portfolio\ LCT\ VaR_c = \sum_{i=1}^{EC} \frac{holding\ size_i\ (USD)}{issuer's\ EVIC_i\ (USD)} * issuer's\ LCT\ VaR_c$$

where:

<i>Portfolio LCT VaR_c</i>	= The Low Carbon Transition Value at Risk expressed in relevant currency (c) that is attributable to the portfolio
<i>issuer's LCT VaR_c</i>	= The company-level Low Carbon Transition Value at Risk for a given Transition Risk Type (Overall, Market, or Policy) in the relevant currency, (c)
<i>holding size_i(USD)</i>	= The amount in millions of U.S. dollars the portfolio has invested in the relevant underlying covered company. The sum of all holding sizes will be the covered portion of the portfolio.
<i>issuer's EVIC_i(USD)</i>	= The entire value of the company (enterprise value including cash) in millions of U.S. dollars. This is calculated by summing the market capitalization, the total preferred stock/units/securities, the noncontrolling/minority interests in equity, and the total debt.
<i>i = 1, EC</i>	= All long, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and where the relevant underlying data is known (covered, C).

Portfolio Low Carbon Transition Value at Risk Percent of Covered Holding Value

Normalizing Portfolio LCT-VaR as a percentage

Each Portfolio Low Carbon Transition Value at Risk metric is additionally expressed as a percentage of the portfolios covered holdings:

[C.19]

$$Portfolio\ LCT\ VaR\ \% \ of\ Covered\ Holdings = \frac{Portfolio\ LCT\ VaR_c}{\sum_{i=1}^{EC} holding\ size_{c_i}}$$

where:

<i>Portfolio LCT VaR % of Covered Holdings</i>	= The applicable Low Carbon Transition Value at Risk divided by the total holding value of all covered holdings
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$Portfolio\ LCT\ VaR_c$	= The Low Carbon Transition Value at Risk expressed in relevant currency (c) that is attributable to the portfolio.
$holding\ size_{c_i}$	= The total holding value of all covered holdings in the re
$i = 1, EC$	= All long, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and where the relevant underlying data is known (covered, C).

Portfolio Low Carbon Transition Value at Risk per Currency Unit Invested

Normalizing Portfolio LCT-VaR by a set amount of assets invested in covered in holdings.

The Portfolio Low Carbon Transition Value at Risk is additionally measured per a given amount of the portfolios invested assets in covered companies.

Morningstar Sustainalytics provides **Portfolio Low Carbon Transition Value at Risk per Unit Currency Invested** for eight currency units:

- Millions of Australian Dollars (AUDm)
- Millions of Swiss Francs (CHFm)
- Millions of Euros (EURm)
- Millions of Pounds Sterling (GBPm)
- Millions of Hong Kong Dollars (HKDm)
- Millions of New Zealand Dollars (NZDm)
- Millions of Singapore Dollars (SGDm)

Millions of United States Dollars (USDm)The applicable Portfolio LCT-VaR divided by the stated unit of assets invested in total by the portfolio for all covered companies:

[C.20]

$$Normalized\ Portfolio\ LCT\ VaR_{uc} = \frac{Portfolio\ LCT\ VaR_c}{\sum_{i=1}^{EC} holding\ size_{cu_i}}$$

where:

$Normalized\ Portfolio\ LCT\ VaR_{cu}$	= The portfolio’s applicable Low Carbon Transition Value at Risk normalized by the value of all covered holdings in the portfolio in the relevant unit (u) of currency (c).
$holding\ size_{cu_i}$	= The amount in relevant unit (u) of currency (c) held in the company by the portfolio.

$i = 1, EC$	= All long, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and where the relevant underlying data is known (covered, C).
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LCT-VaR Additional Scenarios

In addition to the IPR Net Zero **Greenhouse Gas Emissions Scenario** against which the Portfolio Implied Temperature Rise Score and Portfolio Low Carbon Transition Value at Risk are calculated, two additional scenarios have been added to aid regulatory reporting and support broader VaR analysis. (See next Section for more information on the specifics of the scenarios.) The additional scenarios are as follows:

- International Energy Agency’s (IEA) Net Zero Emissions Scenario
- Implied Policy Response’s (IPR) Forecast Policy Response Scenario.

Scenario specific Policy, Market and Overall LCT-VaR is available at the company-level for each of these additional scenarios. The same calculations are then applied to calculate Portfolio LCT-VaR for each additional scenario, as outlined in the previous section.

Scenario Analysis

Understanding additional Greenhouse Gas Emissions Scenarios

In addition to assessing the emissions gap of a portfolio against the IPR Net Zero scenario, carbon budgets have been calculated against an orderly scenario, the **IEA Net Zero Emissions Scenario (INZE)** and the disorderly **IPR FPS Pathway**. For IPR Net Zero, we additionally measure a cumulative to 2030 time horizon.

This allows clients to understand a portfolio’s misalignment in percentage and absolute terms against alternative scenarios, to support with broader scenario analysis and regulatory reporting. Portfolio metrics for all scenarios are underpinned by corresponding company-level data from Morningstar Sustainalytics.

The portfolio-level GHG emissions budgets for each scenario are calculated using the same methodology outlined in C.11.

An orderly scenario

The IEA NZE scenario is an orderly scenario, which assumes an immediate and smooth transition, which has been downscaled at a company level, using our proprietary budget methodology. The assumptions under this scenario are that there will be a fast change in low carbon technology uptake, and medium variation in policy uptake with a 50% chance of limiting warming to 1.5 degrees, based on the modelling of GHG emissions relating to the global energy system only

A disorderly scenario

The IPR FPS is a disorderly scenario that has been downscaled at a company-level, again using our proprietary budget methodology. It assumes a delayed

policy response, with regional variability in the pace of technology uptake, a temporary exceedance in the carbon budget, with a 66% chance of limiting warming to 1.8 degrees, considering both emissions from the energy system, and from land use, and land use change.

For additional detail of each scenario, refer to the Low Carbon Transition Rating methodology description.

Exhibit 9 summarizes the GHG emissions scenarios and time horizons in which portfolio level metrics are calculated:

Exhibit 9: Summary of Scenario Analysis for Portfolio Metrics

GHG Emissions Scenario	Time Horizon	Portfolio Metrics
IPR Net Zero	2050	Emissions and Emissions Gap/Gap % LCT-VaR Exposure, Management, Implied Temperature Rise
	2030	Emissions and Emissions Gap/Gap % LCT-VaR
IPR FPS	2050	Emissions and Emissions Gap/Gap % LCT-VaR
IEA Net Zero	2050	Emissions and Emissions Gap/Gap % LCT-VaR

Source: Morningstar Sustainalytics

Additional metric that allows a comparison with peer group average

Category Average

A category average is calculated for the main output of the Portfolio Low Carbon Transition data set, the Portfolio Implied Temperature Rise Score All Scopes to enable comparison of funds against their peer groups. The peer groups used are the standard Morningstar Categories.

Funds need to have at least 67% of their eligible portfolio covered to be included in the **Portfolio Implied Temperature Rise Score All Scopes Category Average** calculation. A category average is computed for a given Morningstar Category only when at least five funds meet the coverage requirement within this category.

Portfolio Implied Temperature Rise Score All Scopes Category Average

[C.21]

$$CategoryAverage_R = \frac{\sum_{i=1}^F PortfolioScore_f}{Number\ of\ Funds}$$

where:

<i>PortfolioScore_f</i>	=	The Portfolio Implied Temperature Rise Score for fund f.
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<i>Number of Funds</i>	=	The number of funds in the category that meet the relevant criteria to be included in the category average calculation.
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$i = 1, F$	=	All funds in the category that meet the relevant criteria.
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Benchmarking

The benchmark will follow the same requirements and steps of a portfolio

In addition to using the category average for assessment of a peer group average, applicable platforms will allow clients to view the Portfolio Low Carbon Transition Metrics for a client defined benchmark portfolio or a market index. In both cases, the benchmark or index will follow the same requirements and steps of a portfolio using the underlying constituents of the index as holdings.

Sector Calculations

Sector based calculations use the Morningstar GECS sector assignment

Applicable platforms will allow clients to derive the Implied Temperature Rise Score and additional calculations by sector for a client defined portfolio and benchmark or market index. Sectors are assigned based on the 11 sectors within the Morningstar Global Equity Classification Structure (GECS) methodology, as illustrated by Exhibit 10.

An additional 'unclassified' sector group is assigned for cases where a covered company does not have a GECS sector assignment.

Exhibit 10: GECS Sector Classifications

- Basic Materials
- Communication Services
- Consumer Cyclical
- Consumer Defensive
- Energy
- Financial Services
- Healthcare
- Industrials
- Real Estate
- Technology
- Utilities

Source: Morningstar

Implied temperature rise for a sector follows the same equity ownership method

The methodology to calculate an implied temperature rise for a sector is the same as that of the portfolio, but instead of calculating for the full portfolio of holdings, it is calculated for the subset of holdings in which the company is classified under a given sector. Notably, the absolute emissions and budget ascribed to the holdings within the sector are calculated using the same equity ownership approach as for the full portfolio. The absolute emissions are then used to determine the percentage gap between expected emissions and

budgeted emissions, which ultimately allows for the calculation of implied temperature rise for the sector.

It is important to note that although the portfolio's sector weights are calculated to provide context to the portfolio, this does not mean the sector Implied Temperature Rise Score is calculated by simply multiplying the portfolio level figure to the sector weight, since the total expected emissions and budgeted emissions will be unique to each sector.

Calculations that are derived as an asset weighted average for a portfolio will follow the same methodology for a sector. For example, the GHG emissions management quality scores for each sector are calculated as the asset-weighted average of the covered holdings' company-level scores for the subset of holdings classified under a given sector.

Frequency of Calculations

Calculations are run monthly

Portfolio Low Carbon Transition metrics will be issued monthly, one month and six business days after the reported as-of date for the company data from Morningstar Sustainalytics. The Portfolio Low Carbon Transition Metrics and Category Averages are issued as part of the same monthly cadence, calculated one month and six business days after their reported as-of date using the most recent portfolio. If an updated portfolio with the same as-of date as the company data has not been received by the calculation date, the most recent portfolio available will be used for score and ranking, provided the portfolio is less than 276 days old.

Appendix

Data Sources Summary

Exhibit 11: Data Sources for Key Portfolio Components

Portfolio Component	Input Data Used	Provider	Portfolio Aggregation Method Used
Portfolio Emissions Calculations	GHG Emissions Data	Morningstar Sustainalytics	Equity ownership
	Enterprise Value Including Cash (EVIC)	Morningstar	
	Holding size in net long portfolio	Portfolio provider	
Portfolio Implied Temperature Rise Score	Implied Temperature Rise Calculation	IPCC (6th assessment report)	N/A: portfolio level emissions inputs are aggregated, but the Implied Temperature Rise is not
Portfolio GHG Emissions Exposure Score	Implied Temperature Rise Calculation	IPCC (6th assessment report)	N/A: portfolio level emissions inputs are aggregated, but the Implied Temperature Rise is not
Portfolio Greenhouse Gas Management Calculations	Low Carbon Transition Ratings Management Score	Morningstar Sustainalytics	Weighted average
	TCFD Management Quality Score	Morningstar Sustainalytics	
	Holding weight in net long portfolio	Portfolio provider	
Portfolio TCFD Disclosure Sufficiency Calculations	TCFD Disclosure Sufficiency	Morningstar Sustainalytics	Weighted average
	Holding weight in net long portfolio	Portfolio provider	
Portfolio Low Carbon Transition Value at Risk Calculations	Low Carbon Transition - Value at Risk (LCT-VaR)	Morningstar Sustainalytics	Equity ownership
	Enterprise Value Including Cash (EVIC)	Morningstar	
	Holding size in net long portfolio	Portfolio provider	

Source: Morningstar Sustainalytics

Additional Formulas

Portfolio Net Zero Budget Cumulative Emissions 2050

The cumulative emissions budget 'owned' by the portfolio

[C.22]

$$\text{Portfolio Net – Zero Budget} = \frac{\sum_{i=1}^{EC} \frac{\text{holding size}_i \text{ (USD)}}{\text{issuer's EVIC}_i \text{ (USD)}} * \text{issuer's net – zero budget}_i}{\sum_{i=1}^{EC} \text{holding size}_i \text{ (USD)}}$$

where:

<i>Portfolio Net – Zero Budget</i>	=	The Inevitable Policy Response (IPR) Net Zero Budget (cumulative to 2050) attributable to the portfolio for a given GHG emissions scope.
<i>holding size_i (USD)</i>	=	The amount in millions of U.S. dollars the portfolio has invested in the relevant underlying covered company. The sum of all holding sizes will be the covered portion of the portfolio.
<i>issuer's EVIC_i (USD)</i>	=	The entire value of the company (enterprise value including cash) in millions of U.S. dollars. This is calculated by summing the market capitalization, the total preferred stock/units/securities, the noncontrolling/minority interests in equity, and the total debt.
<i>issuer's net – zero budget_i</i>	=	The Inevitable Policy Response (IPR) Net Zero Budget (cumulative to 2050) for the company for a given GHG emissions scope.
<i>i = 1, EC</i>	=	All eligible, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and for which the relevant underlying data is known (covered, C).

Portfolio Baseline Cumulative GHG Emissions 2050

The baseline emissions 'owned' by the portfolio

[C.23]

$$\text{Portfolio Baseline Emissions} = \frac{\sum_{i=1}^{EC} \frac{\text{holding size}_i \text{ (USD)}}{\text{issuer's EVIC}_i \text{ (USD)}} * \text{issuer's baseline emissions}_i}{\sum_{i=1}^{EC} \text{holding size}_i \text{ (USD)}}$$

where:

<i>Portfolio Baseline Emissions</i>	=	The sum of the baseline (cumulative to 2050) GHG emissions the portfolio owns for a given GHG emissions scope.
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$holding\ size_i(USD)$	= The amount in millions of U.S. dollars the portfolio has invested in the relevant underlying covered company. The sum of all holding sizes will be the covered portion of the portfolio.
$issuer's\ EVIC_i(USD)$	= The entire value of the company (enterprise value including cash) in millions of U.S. dollars. This is calculated by summing the market capitalization, the total preferred stock/units/securities, the noncontrolling/minority interests in equity, and the total debt.
$issuer's\ baseline\ emissions_i$	= The baseline (cumulative to 2050) GHG emissions for the company for a given GHG emissions scope.
$i = 1, EC$	= All eligible, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and for which the relevant underlying data is known (covered, C).

Portfolio Expected Cumulative GHG Emissions 2050

The expected emissions “owned” by the portfolio

[C.24]

Portfolio Expected Emissions

$$= \frac{\sum_{i=1}^{EC} holding\ size_i(USD) * issuer's\ expected\ emissions_i}{\sum_{i=1}^{EC} holding\ size_i(USD)}$$

where:

<i>Portfolio Expected Emissions</i>	= The sum of the expected (cumulative to 2050) GHG emissions the portfolio owns for a given GHG emissions scope.
$holding\ size_i(USD)$	= The amount in millions of U.S. dollars the portfolio has invested in the relevant underlying covered company. The sum of all holding sizes will be the covered portion of the portfolio.
$issuer's\ EVIC_i(USD)$	= The entire value of the company (enterprise value including cash) in millions of U.S. dollars. This is calculated by summing the market capitalization, the total preferred stock/units/securities, the noncontrolling/minority interests in equity, and the total debt.

<i>issuer's baseline emissions_i</i>	=	The expected (cumulative to 2050) GHG emissions for the company for a given GHG emissions scope.
<i>i = 1, EC</i>	=	All eligible, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and for which the relevant underlying data is known (covered, C).

Portfolio Baseline Cumulative GHG Emissions Gap 2050

[C.25]

$$\begin{aligned} & \text{Portfolio Baseline Emissions Gap} \\ & = \text{Portfolio Baseline Emissions} - \text{Portfolio Net - Zero Budget} \end{aligned}$$

where:

<i>Portfolio Baseline Emissions Gap</i>	=	The difference between the Portfolio Baseline Cumulative Greenhouse Gas Emissions 2050 and Portfolio Net Zero Budget Cumulative Emissions 2050 for a given GHG emissions scope
<i>Portfolio Baseline Emissions</i>	=	The sum of the baseline GHG emissions (cumulative to 2050) the portfolio owns for a given GHG emissions scope.
<i>Portfolio Net - Zero Budget</i>	=	The Inevitable Policy Response (IPR) Net-Zero Budget (cumulative to 2050) attributable to the portfolio for a given GHG emissions scope.

Portfolio Baseline Cumulative GHG Emissions Gap Percentage 2050

[C.26]

$$\text{Portfolio Baseline Emissions Gap \%} = \frac{\text{Portfolio Baseline Emissions}}{\text{Portfolio Net - Zero Budget}} - 1$$

where:

<i>Portfolio Baseline Emissions Gap %</i>	=	The relative percentage difference between the portfolio's owned baseline GHG emissions and the portfolio's owned net zero aligned GHG emissions budget to 2050 for a given GHG emissions scope.
<i>Portfolio Baseline Emissions</i>	=	The sum of the baseline (cumulative to 2050) GHG emissions the portfolio

	=	owns for a given GHG emissions scope.
<i>Portfolio Net Zero Budget</i>	=	The Inevitable Policy Response (IPR) Net Zero Budget (cumulative to 2050) attributable to the portfolio for a given GHG emissions scope.

Portfolio GHG Emissions Exposure Score All Scopes

[C.27]

$$\begin{aligned}
 & \text{Portfolio GHG Exposure (}^\circ\text{C)} = \\
 & 1.5^\circ\text{C} + \text{Portfolio Baseline Emissions Gap \% All Scopes} \\
 & \quad * \text{Global Emissions Budget} * \text{TCRE Factor}
 \end{aligned}$$

where:

<i>Portfolio GHG Exposure (}^\circ\text{C)} =</i>	=	The implied temperature rise of the portfolio's baseline GHG emissions relative to the portfolio's net zero aligned GHG emissions budget to 2050 for all emissions scopes.
<i>Portfolio Baseline Emissions Gap \% All Scopes</i>	=	The relative percentage difference between the portfolio's baseline GHG emissions and the portfolio's net zero aligned GHG emissions budget to 2050 for all emissions scopes.
<i>Global Emissions Budget</i>	=	The cumulative amount of GHG emissions, in gigatons, that can be emitted to limit warming to 1.5 degrees.
<i>TCRE Factor</i>	=	The Transient Climate Response to Cumulative Carbon Emissions is an IPCC derived factor that determines the amount of radiative forcing (warming) as degree Celsius (}^\circ\text{C)} per megaton (Mt) of GHG emissions.

Portfolio Baseline Cumulative GHG Emissions Gap Percentage 2050

[C.28]

$$\text{Portfolio Expected Emissions Gap \%} = \frac{\text{Portfolio Expected Emissions}}{\text{Portfolio Net - Zero Budget}} - 1$$

where:

<i>Portfolio Expected Emissions Gap %</i>	=	The relative percentage difference between the portfolio's owned expected
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	GHG emissions and the portfolio's owned net zero aligned GHG emissions budget to 2050 for a given GHG emissions scope
<i>Portfolio Expected Emissions</i>	= The sum of the expected (cumulative to 2050) GHG emissions the portfolio owns for a given GHG emissions scope.
<i>Portfolio Net Zero Budget</i>	= The Inevitable Policy Response (IPR) Net Zero Budget (cumulative to 2050) attributable to the portfolio for a given GHG emissions scope.

Portfolio Implied Temperature Rise Score All Scopes

[C.29]

$$\begin{aligned}
 & \text{Portfolio Implied Temperature Rise (}^\circ\text{C)} = \\
 & 1.5 + \text{Portfolio Expected Emissions Gap \% All Scopes} \\
 & \quad * \text{Global Emissions Budget} * \text{TCRE Factor}
 \end{aligned}$$

where:

<i>Portfolio Implied Temperature Rise (}^\circ\text{C)}</i>	= The implied temperature rise of the portfolio's expected GHG emissions relative to the portfolio's net zero aligned GHG emissions budget to 2050 for all emissions scopes.
<i>Portfolio Expected Emissions Gap \% All Scopes</i>	= The relative percentage difference between the portfolio's expected GHG emissions and the portfolio's net zero aligned GHG emissions budget to 2050 for all emissions scopes.
<i>Global Emissions Net Zero Budget</i>	= The cumulative amount of GHG emissions, in gigatons, that can be emitted to limit warming to 1.5 degrees.

<i>TCRE Factor</i>	= The Transient Climate Response to Cumulative Carbon Emissions is an IPCC derived factor that determines the amount of radiative forcing (warming) as degree Celsius (°C) per megaton (Mt) of GHG emissions.
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Portfolio TCFD Management Score

[C.30]

$$\text{Portfolio TCFD Management Score} = \sum_{i=1}^{EC} W_i^{RC} * \text{TCFD Management Score}_i$$

where:

<i>Portfolio TCFD Management Score</i>	= The asset-weighted average of a company's Management Score for a given TCFD theme for all covered companies held in the portfolio.
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W_i^{RC}	= The rescaled weight of the covered holding, which for each covered holding is calculated as the original portfolio weight divided by the weight of the covered portfolio. The covered portfolio is the subset of eligible holdings that have relevant input data available.
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<i>TCFD Management Score_i</i>	= TCFD Management Quality Score for a given theme of covered holding.
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$i = 1, EC$	= All long, covered holdings. These are securities in the adjusted (net long) portfolio that are of the relevant holding type (eligible, E) and where the relevant underlying data is known (covered, C).
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Currency Translation

The financial implications on investment portfolio posed by the transition to a low carbon economy transcend geographical boundaries, which necessitates the need to assess Portfolio Low Carbon Transition Value at Risk in multiple currencies.

Currency conversion occurs in one or more steps for the following metrics:

1. Portfolio Low Carbon Transition Value at Risk

2. Portfolio Low Carbon Transition Value at Risk per Currency Unit Invested

Currency Translation for Portfolio Low Carbon Transition Value at Risk

When deriving portfolio expected loss amounts, currency conversion is used in two steps. Company EVIC and portfolio holding size are both converted to USD to determine the proportion of the company the portfolio owns or finances. Company-level LCT-VaR figures, which are published in US dollars, are translated into additional currencies for the purpose of making the portfolio level LCT-VaR metrics available in multiple currencies.

Company EVIC and Portfolio Holding Value

Portfolio LCT-VaR is aggregated based on the amount of a company a portfolio owns or finances, where the share of each company a portfolio owns is calculated as the holding size of the company (market value for equities and nominal value for bonds) divided by the enterprise value including cash (EVIC) of the company, as-of the portfolio date. The holding size and company EVIC values are converted to USD where necessary, using the applicable foreign exchange spot rate as-of the portfolio date.

Once calculated, the share of a company a portfolio owns is currency-agnostic. The share of a company the portfolio owns will be the same regardless of currency as both the holding size and EVIC are as-of the same date and would use the same foreign exchange spot rate.

Company LCT-VaR Input

Because Morningstar Sustainalytics publishes company LCT-VaR in US dollars, it is necessary to first translate the values to other currencies in order to aggregate at the portfolio-level in multiple currencies. .

Company level LCT-VaR metrics are converted to USD on a quarterly basis; therefore, the spot rate exchange rate as of that same conversion date (i.e. the most recent quarter end date) is used to convert those metrics into the portfolio currency.

For example, Portfolio Low Carbon Transition metrics with an as-of January 2024 would use the spot rate exchange rate as-of December 2022.

Morningstar Sustainalytics provides Portfolio Low Carbon Transition Value at Risk in the following eight currencies:

- Australian Dollar (AUD)
- Swiss Franc (CHF)
- Euro (EUR)
- Pound Sterling (GBP)
- Hong Kong Dollar (HKD)
- New Zealand Dollar (NZD)

- Singapore Dollar (SGD)
 - United States Dollar (USD)

Currency Translation for Portfolio Low Carbon Transition Value at Risk per Currency Unit Invested

When deriving normalized portfolio LCT-VaR, currency conversion is used to convert to the unit of currency.

Portfolio Holding Size of All Covered Holdings

Portfolio Low Carbon Transition Value at Risk per Unit Currency Invested represents the portfolio LCT-VaR normalized per unit currency invested, where unit currency invested is defined as the holding size of all covered holdings in the relevant currency units. A portfolio's covered holding size represents the amount invested in the covered companies as-of the portfolio date. As such, portfolio covered holding size is converted using the applicable foreign exchange spot rate as-of the portfolio date.

Morningstar Sustainalytics provides Portfolio Low Carbon Transition Value at Risk per Unit Currency Invested for eight currency units:

- Millions of Australian Dollars (AUDm)
- Millions of Swiss Francs (CHFm)
- Millions of Euros (EURm)
- Millions of Pounds Sterling (GBPm)
- Millions of Hong Kong Dollars (HKDm)
- Millions of New Zealand Dollars (NZDm)
- Millions of Singapore Dollars (SGDm)
- Millions of United States Dollars (USDm)

Glossary of Terms

Adjusted Portfolio	The portfolio after the removal of any net short position. Therefore, this can be seen as the portfolio composed of long positions only.
All Scopes	The term used to indicate that all GHG emissions are under consideration, and includes Scope 1 (direct operations), Scope 2 (indirect operations), Scope 3 Upstream (supply chain) and Scope 3 Downstream (products and services).
Covered Holdings	Refers to the subset of eligible holdings that have relevant input data available.
Cumulative Baseline GHG Emissions Projection	The company's baseline emissions for all years until 2050. The baseline emissions assume that the company has not taken any steps to actively manage its emissions.
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 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).
Eligible Holdings	Refers to the holdings that can potentially contribute the required data to derive a given portfolio metric. In the case of Portfolio Low Carbon Transition Metrics, eligible holdings refer to long positions in securities issued by corporate entities, such as equities and corporate bonds.
Enterprise Value Including Cash (EVIC)	Refers to the entire value of a company, calculated by summing the market capitalization, the total preferred stock/units/securities, the noncontrolling/minority interests in equity, and the total debt.
Global Emissions Budget	The cumulative amount of GHG emissions, in gigatons, 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).
Greenhouse Gas Emissions Scenario	The pathway that forms the basis of the GHG emissions budget.
Implied Temperature Rise	A type of calculation which measures to what degree the world expected to warm if all company's emissions differed from their net zero budgeted emissions to the same degree as a given company or portfolio or corporate securities.
IPR FPS Pathway	The Inevitable Policy Response Forecast Policy Scenario (IPR FPS) is a pathway to net zero that was modelled based on the premise that forecasted policy developments will result in a reduction in GHG emissions to hold global temperature increases to a 1.7° outcome.
IEA Net Zero Emissions Scenario (NZE)	The International Energy Agency Net Zero Emissions Scenario (IEA Net Zero or IEA NZE) is a pathway developed by the International Energy Agency that is based on policies and technological interventions to bring about net zero GHG emissions by 2050.
IPR Net Zero Pathway	The Inevitable Policy Response (IPR) Pathway is a pathway to net zero that was modelled based on the premise that future policy developments must accelerate emissions reduction to hold global temperature increases to a 1.5° outcome. The pathway model was commissioned by the UN Principles for Responsible Investment and forms the basis of the GHG emissions budgets for the company Low Carbon Transition Rating.
Low Carbon Transition	A term used to describe the global shift (transition) to a lower carbon economy.
Low Carbon Transition – Value at Risk (LCT-VaR)	A measure of the potential absolute loss in value the company may experience from a transition to a low carbon economy. It is calculated as the sum of the present value of cash flows at risk, related to market and policy risks to the year 2050 and the present value of the terminal value at year 2050.

Low Carbon Transition Eligible Holding Type	An indication of which of the Corporate, Sovereign or Other classifications is eligible for calculations. In the case of Low Carbon Transition calculations, only the long corporate portion of the portfolio is eligible.
Low Carbon Transition Number of Holdings Covered	The number of the long holdings of the portfolio that had the relevant underlying data for the calculation of the Low Carbon Transition data.
Low Carbon Transition Percentage of Eligible Portfolio Covered	The percentage of the long, eligible portfolio with the relevant underlying data for the Low Carbon Transition calculations. This represents the percentage within the eligible portion of the portfolio that has underlying data.
Low Carbon Transition Percentage of Eligible Portfolio Not Covered	The percentage of the long, eligible portion of the portfolio that does not have the relevant underlying data for the Low Carbon Transition calculations. This represents the percentage within the eligible portion of the portfolio that does not have underlying data.
Low Carbon Transition Percentage of Portfolio Covered	The percentage of the long-only portfolio with relevant underlying data for the Low Carbon Transition calculations. This represents the percentage of the portfolio that could and does have the relevant underlying data for the calculation.
Low Carbon Transition Percentage of Portfolio Eligible	The percentage of the long-only portfolio that is considered eligible for the Low Carbon Transition calculations. This represents the percentage of the portfolio that could have the relevant underlying data for the calculation, regardless of whether the relevant underlying data is available.
Low Carbon Transition Percentage of Portfolio Eligible Not Covered	The percentage of the long-only portfolio that is eligible for the Low Carbon Transition calculations, but for which the relevant underlying data is not available. This represents the percentage of the portfolio that could have relevant underlying data for the calculation, but where the underlying data is not available.
Low Carbon Transition Percentage of Portfolio Not Covered	The percentage of the long-only portfolio that does not have relevant underlying data for the Low Carbon Transition calculations. This represents the percentage of the portfolio that does not have the underlying data available, including both the percentage of the portfolio that is not eligible for the calculation, as well as the percentage of the portfolio that is eligible but for which underlying data is not available.
Low Carbon Transition Percentage of Portfolio Not Eligible	The percentage of the long-only portfolio that is not considered eligible for the Low Carbon Transition calculations. This represents the percentage of the portfolio that could not have the relevant underlying data because the data is not applicable to that holding type.
Low Carbon Transition Risk Type	An indication of whether the Portfolio Low Carbon Transition Value at Risk metric is a measure of policy risk (the risk that regulatory action will increase costs through carbon pricing mechanisms), market risk (the risk that market behavior evolves such that there is less demand for fossil fuel-based products), or both.
Low Carbon Transition Rating (LCTR)	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.
Low Carbon Transition Value at Risk Eligible Holding Type	An indication of which of the Corporate, Sovereign or Other classifications of portfolio holding types is eligible for calculations. In the case of Low Carbon Transition Value at Risk calculations, only the long corporate portion of the portfolio is eligible.
Low Carbon Transition Value at Risk Number of Holdings Covered	The number of the long holdings of the portfolio that had the relevant underlying data for the calculation of the Low Carbon Transition Value at Risk data for a given Low Carbon Transition Risk type.
Low Carbon Transition Value at Risk Percentage of Eligible Portfolio Covered	The percentage of the long, eligible portfolio with the relevant underlying data for the Low Carbon Transition Value at Risk calculations for a given Low Carbon Transition Risk type. This represents the percentage within the eligible portion of the portfolio that has underlying data.

Low Carbon Transition Value at Risk Percentage of Eligible Portfolio Not Covered	The percentage of the long, eligible portion of the portfolio that does not have the relevant underlying data for the Low Carbon Transition Value at Risk calculations for a given Low Carbon Transition Risk type. This represents the percentage within the eligible portion of the portfolio that does not have underlying data.
Low Carbon Transition Value at Risk Percentage of Portfolio Covered	The percentage of the long-only portfolio with relevant underlying data for the Low Carbon Transition Value at Risk calculations for a given Low Carbon Transition Risk type. This represents the percentage of the portfolio that could and does have the relevant underlying data for the calculation.
Low Carbon Transition Value at Risk Percentage of Portfolio Eligible	The percentage of the long-only portfolio that is considered eligible for the Low Carbon Transition Value at Risk calculations. This represents the percentage of the portfolio that could have the relevant underlying data for the calculation, regardless of whether the relevant underlying data is available. In the case of Low Carbon Transition Value at Risk calculations, the long corporate portion is eligible.
Low Carbon Transition Value at Risk Percentage of Portfolio Eligible Not Covered	The percentage of the long-only portfolio that is eligible for the Low Carbon Transition Value at Risk calculations, but for which the relevant underlying data is not available for a given Low Carbon Transition Risk type. This represents the percentage of the portfolio that could have relevant underlying data for the calculation, but where the underlying data is not available.
Low Carbon Transition Value at Risk Percentage of Portfolio Not Covered	The percentage of the long-only portfolio that does not have relevant underlying data for the Low Carbon Transition Value at Risk calculations for a given Low Carbon Transition Risk type. This represents the percentage of the portfolio that does not have the underlying data available, including both the percentage of the portfolio that is not eligible for the calculation, as well as the percentage of the portfolio that is eligible but for which underlying data is not available.
Low Carbon Transition Value at Risk Percentage of Portfolio Not Eligible	The percentage of the long-only portfolio that is not considered eligible for the Low Carbon Transition Value at Risk calculations. This represents the percentage of the portfolio that could not have the relevant underlying data because the data is not applicable to that holding type.
Low Carbon Transition Value at Risk (LCT-VaR)	A measure of the potential absolute loss in value the company may experience from a transition to a low carbon economy,
Low Carbon Transition VaR – Value at Risk – Market Risk (LCT – VaR Market Risk)	A measure of the potential absolute loss in value the company may experience from market risk from a transition to a low carbon economy. It is calculated as the sum of the present value of cash flows at risk, related to market risk, to year 2050 and the present value of the terminal value at year 2050.
Low Carbon Transition VaR - Value at Risk - Overall Risk	A measure of the potential absolute loss in value the company may experience from a transition to a low carbon economy. It is calculated as the sum of the present value of cash flows at risk, related to market and policy risks to the year 2050 and the present value of the terminal value at year 2050.
Low Carbon Transition VaR – Value at Risk – Policy Risk (LCT – VaR Policy Risk)	A measure of the potential absolute loss in value the company may experience from policy risk from a transition to a low carbon economy. The sum of the present value of cash flows at risk, related to policy risk, to year 2050 and the present value of the terminal value at year 2050.
Portfolio Low Carbon Transition Value at Risk	The sum of the potential absolute losses in value that underlying companies owned or financed by the portfolio may experience from a transition to a low carbon economy. Derived as the portion the portfolio owns or finances of a company multiplied by the applicable company-level Low Carbon Transition Value at Risk and summed for all covered companies within the portfolio. It is a measurement of a company's exposure to future cashflow impacts, in present value terms, stemming from policy risk (the risk that regulatory action will increase costs through carbon pricing mechanisms), market risk (the risk that market behavior evolves such that there is less demand for fossil fuel-based products), or both.

Portfolio Low Carbon Transition Value at Risk per Currency Unit Invested	The Portfolio Low Carbon Transition Value at Risk, measured per a given amount of the portfolios invested assets in covered companies. Derived as the portion the portfolio owns or finances of a company multiplied by the applicable company-level Low Carbon Transition Value at Risk and summed for all covered companies within the portfolio. This is then divided by the stated unit of assets invested in total by the portfolio for all covered companies.
Portfolio Low Carbon Transition Value at Risk Percent of Covered Holding Value Noncovered Holdings	The Portfolio Low Carbon Transition Value at Risk expressed as a percentage of the portfolios covered holdings, for a given Low Carbon Transition Risk Type. Refers to the subset of holdings that do not have relevant input data available. This will include lack of coverage due to the holding being not having underlying data, but also includes holdings where underlying data does not apply (i.e., are not eligible).
Noneligible Holdings	Refers to the holdings that cannot potentially contribute the required data to derive a given portfolio metric.
Number of Holdings Covered	The number of the long, eligible holdings with the relevant underlying data available.
Owned GHG Emissions	A term used to describe the GHG emissions that are attributable to the portfolio, i.e., owned via its investment in underlying companies. It is derived by determining the portion of the company a portfolio owns, and then multiplying this by the company's own GHG emissions.
Portfolio Baseline Cumulative GHG Emissions 2050	The sum of the baseline (cumulative to 2050) GHG emissions the portfolio owns for a given GHG emissions scope. Derived as the portion the portfolio owns of a company multiplied by the company-level Cumulative Baseline GHG Emissions Projection and summed for all covered companies within the portfolio. It is derived for GHG emissions Scope 1 (direct operations), Scope 2 (indirect operations), Scope 3 Upstream (supply chain) and Scope 3 Downstream (products and services), as well as for all scopes.
Portfolio Baseline Cumulative GHG Emissions 2050 Contribution	The percent of a given scope's baseline emissions contributing to the total baseline emissions, derived as the Portfolio Baseline Cumulative Greenhouse Gas Emissions 2050 for a given scope divided by the Portfolio Baseline Cumulative Greenhouse Gas Emissions 2050 for a given scope.
Portfolio Baseline Cumulative GHG Emissions Gap 2050	The absolute difference between the portfolio baseline GHG emissions and the portfolio GHG emissions budget for a given scope. It is derived for GHG emissions Scope 1 (direct operations), Scope 2 (indirect operations), Scope 3 Upstream (supply chain) and Scope 3 Downstream (products and services), as well as for all scopes.
Portfolio Baseline Cumulative GHG Emissions Gap Percentage 2050	The relative percentage difference between the portfolio's baseline GHG emissions and the portfolio's GHG emissions budget for a given scope. It is calculated as the portfolio baseline GHG emissions divided by the portfolio GHG emissions budget, minus 1. It is derived for GHG emissions Scope 1 (direct operations), Scope 2 (indirect operations), Scope 3 Upstream (supply chain) and Scope 3 Downstream (products and services), as well as for all scopes.
Portfolio Expected Cumulative GHG Emissions 2050	The sum of the expected (cumulative to 2050) GHG emissions the portfolio owns for a given GHG emissions scope. Derived as the portion the portfolio owns of a company multiplied by the company-level Cumulative Expected GHG Emissions Projection and summed for all covered companies within the portfolio. It is derived for GHG emissions Scope 1 (direct operations), Scope 2 (indirect operations), Scope 3 Upstream (supply chain) and Scope 3 Downstream (products and services), as well as for all scopes.
Portfolio Expected Cumulative GHG Emissions Gap 2050	The absolute difference between the portfolio's expected GHG emissions and the portfolio's GHG emissions budget for a given scope. It is derived for GHG emissions Scope 1 (direct operations), Scope 2 (indirect operations), Scope 3 Upstream (supply chain) and Scope 3 Downstream (products and services), as well as for all scopes.

Portfolio Expected Cumulative GHG Emissions Gap Percentage 2050	The relative percentage difference between the portfolio's expected GHG emissions and the portfolio's GHG emissions budget for a given scope. It is calculated as the portfolio expected GHG emissions divided by the portfolio GHG emissions budget, minus 1. It is derived for GHG emissions Scope 1 (direct operations), Scope 2 (indirect operations), Scope 3 Upstream (supply chain) and Scope 3 Downstream (products and services), as well as for all scopes.
Portfolio GHG Emissions Exposure Score All Scopes	The implied temperature alignment that specifies what degree would the world warm if the baseline GHG emissions of all companies differed from their net zero budgeted GHG emissions to the same degree as the portfolio. The Portfolio GHG Emissions Exposure Score All Scopes is measured as 1.5 plus the sum of the portfolio baseline GHG emissions gap percentage from all scopes multiplied by the Global GHG Emissions Budget and the Transient Climate Response to Cumulative Carbon Emissions.
Portfolio GHG Emissions Management Score	The portfolio's management quality score for a given GHG emissions scope. For individual companies, the management score indicates the strength of the company's management systems in regard to managing its exposure to the low carbon transition. At the portfolio level, it is derived as the asset-weighted average of the covered holdings' company-level management scores for a given GHG emissions scope within the portfolio. It is derived for GHG emissions Scope 1 (direct operations), Scope 2 (indirect operations), Scope 3 Upstream (supply chain) and Scope 3 Downstream (products and services), as well as for all scopes.
Portfolio Greenhouse Gas Emissions Exposure Score All Scopes	The implied temperature alignment that specifies what degree would the world warm if the baseline GHG emissions of all companies differed from their net zero budgeted GHG emissions to the same degree as the portfolio. The Portfolio GHG Emissions Exposure Score All Scopes is measured as 1.5 plus the sum of the portfolio baseline GHG emissions gap percentage from all scopes multiplied by the Global GHG Emissions Budget and the Transient Climate Response to Cumulative Carbon Emissions.
Portfolio Greenhouse Gas Emissions Management Score Category All Scopes	The categorical description of the portfolio's management quality score for all GHG emissions scopes. Assignment is determined by the same management quality score thresholds as individual companies. The possible values range from Very Weak to Very Strong and include Very Weak, Weak, Average, Strong, and Very Strong.
Portfolio Implied Temperature Rise Score All Scopes	The implied temperature alignment that specifies what degree would the world warm if the expected GHG emissions of all companies differed from their net zero budgeted GHG emissions to the same degree as the measured portfolio. The Portfolio Implied Temperature Rise Score All Scopes is measured as 1.5 plus the sum of the portfolio expected GHG emissions gap percentage from all scopes multiplied by the Global GHG Emissions Budget and the Transient Climate Response to Cumulative Carbon Emissions.
Portfolio Implied Temperature Rise Score All Scopes Category Average	The average Portfolio Implied Temperature Rise Score for all emissions scopes for funds within the Morningstar category.
Portfolio Implied Temperature Rise Score Category All Scopes	The categorical description of the Portfolio Implied Temperature Rise Score for all emissions scopes. Assignment is determined by the same temperature thresholds as individual companies. The possible values range from Aligned to Severely Misaligned and includes Aligned, Moderately Misaligned, Significantly Misaligned, Highly Misaligned, and Severely Misaligned.
Portfolio Low Carbon Transition Metrics	The set of derived data points which aim to measure the GHG emissions attributable to a portfolio relative to its fair share GHG emissions budget.
Portfolio Net Zero Budget Cumulative Emissions 2050	The sum of the Inevitable Policy Response (IPR) Net Zero Budget (cumulative to 2050) the portfolio owns for a given GHG emissions scope. Derived as the portion the portfolio owns of a company multiplied by the company-level Cumulative GHG Emissions Budget and summed for all covered companies within the portfolio. It is derived for GHG emissions Scope 1 (direct operations), Scope 2 (indirect operations), Scope 3 Upstream (supply chain) and Scope 3 Downstream (products and services), as well as for all scopes.

Portfolio Taskforce on Climate Related Financial (TCFD) Disclosure Sufficiency	A portfolio-level measure of the percentage that indicates what proportion of Task Force on Climate Related Financial Disclosures (TCFD) related indicators covered companies are reporting on. It is calculated as a weighted average of the covered holdings' company-level TCFD Disclosure Sufficiency percentages. For each covered company, TCFD Disclosure Sufficiency is calculated as the number of indicators the company is reporting on divided by all the TCFD recommended indicators.
Portfolio TCFD Disclosure Sufficiency Grade	A letter grade between A+ and D that rates the portfolio's Task Force on Climate Related Financial Disclosures (TCFD) reporting sufficiency, where A+ indicates the highest (and better) possible grade and D indicates the lowest. A higher grade is associated with a higher percent of TCFD recommended indicators being reported by covered companies within a portfolio.
Portfolio TCFD Management Quality Score	The asset-weighted average of the Task Force on Climate Related Financial Disclosures (TCFD) management scores for a given TCFD theme, for covered companies within the long-only portion of the portfolio. For individual companies, this is a score that indicates the strength of the company's management systems in regard to managing its exposure to the low carbon transition for indicators of a given TCFD theme. It is derived only for all emissions scopes for Governance, Metrics and Targets, Risk Management, and Strategy, as well Other Management which includes management indicators which do not fall under one of the TCFD themes.
Scope 1	Refers to direct emissions that are from company-owned and controlled resources.
Scope 2	Refers to indirect emissions that are from the generation of purchased energy, from a utility provider.
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	Refers to indirect emissions that are generated upstream from the company's production of goods and services (in the supply chain).
TCFD Disclosure Sufficiency	A percentage that indicates what proportion of TCFD-related indicators the company is disclosing upon.
Transient Climate Response to Cumulative Carbon Emissions Factor (TCRE)	The Transient Climate Response to Cumulative Carbon Emissions Factor (TCRE) is an IPCC derived factor that determines the amount of radiative forcing (warming) as degree Celsius per megaton (Mt) of GHG emissions.

Endnotes

- ¹ The authors would like to thank the following people for their comments on earlier drafts of this report: Hendrik Garz. The editorial review was performed by Cristina Zabalaga.
- ² The global average surface temperature change that is expected to result per ton of GHG emissions, according to the Intergovernmental Panel on Climate Change (IPCC).

Change Log

Version	Date	Initiator	Main items that changed	Comment / Rational
1.0	04.08.2023	Methodology & Product Architecture	N/A	N/A
1.1	03.06.2024	Methodology & Product Architecture	<ul style="list-style-type: none"> ▪ Added new cumulative to 2030 year for IPR Net Zero emissions metrics. ▪ Added Portfolio Low Carbon Transition Value at Risk for IPR Net Zero. ▪ Updated figure and calculation numbers ▪ Scenario Analysis for LCT-VaR. ▪ Scenario Analysis for emissions gap analysis. Added appendix reference on currency conversion. 	Updated document to align with Portfolio Low Carbon Transition Metrics 1.1 and 1.2 release updates.