# Implied Temperature Rise Methodology

MSCI ESG Research

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## Contents



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# Executive summary

## Background

The Implied Temperature Rise metric provides an indication of how companies and investment portfolios align to global climate targets. Some institutional investors would like to understand if their portfolios are 2°C-aligned, referring to the Paris Agreement goal of limiting to below 2°C the global mean temperature increase in the year 2100, compared with pre-industrial levels. Another important target is the 1.5°C limit, the maximal objective of the Paris Agreement. This limit has been advocated strongly by small island states, which are most threatened by sea-level rise in a world with temperatures exceeding a rise of 1.5°C.

Key to understanding the Implied Temperature Rise (ITR) is the concept of a carbon budget, i.e., how much the world can emit so that global warming doesn't exceed 2°C by 2100 and, by analogy, how much a company can emit for its fair share of global decarbonization. Indeed, Implied Temperature Rise is about extrapolating the global implied temperature rise (at horizon 2100) *as if* the whole economy "overshot/undershot" its budget in the same way as the given company (or portfolio) overshoots/undershoot its specific company-specific carbon budget.

A company whose projected emissions are below budget can be said to "undershoot" while those whose projected emissions exceed the budget "overshoot."

We use Intergovernmental Panel on Climate Change (IPCC) guidance to understand how much global carbon budget is left. The next step is to derive company-level carbon budgets consistent with this. Then we calculate companies' projected emissions out over the next five decades based on their emissions track record, stated reduction targets and other data.

## Company Implied Temperature Rise

The calculation of the company-level Implied Temperature Rise involves four key steps:

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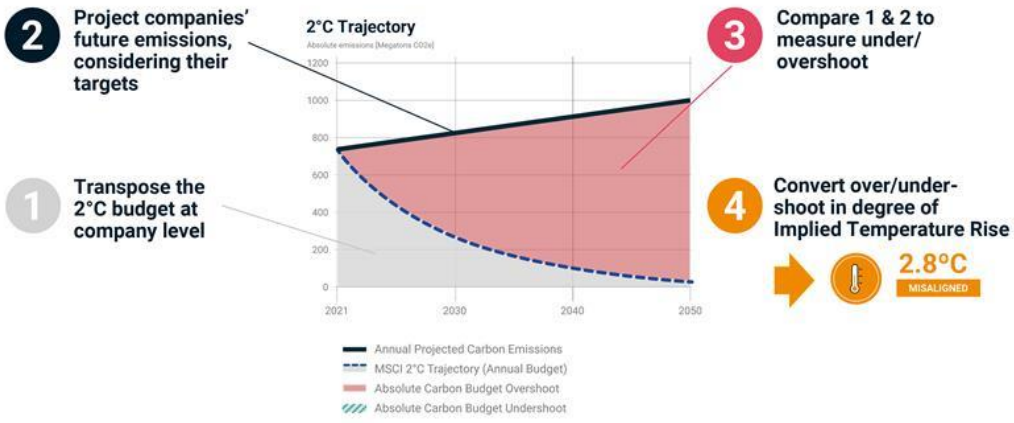
**Exhibit 1. Modeling steps to compute a company's Implied Temperature Rise.**




*Source: MSCI ESG Research*

1. **Transpose a 2°C carbon budget at company level**
   Each year, we calculate a global 2°C carbon budget based on the global remaining carbon budget available to limit warming to 2°C, obtained from the IPCC.[1] Consistent with this global budget, we derive decarbonization pathways and company-specific carbon budgets expressed in absolute terms.. We account for sector, country and business activities in determining a company's "fair share."

2. **Project companies' future emissions, considering their targets**
   Using companies' current emissions and reported emissions reduction targets, we project an absolute emissions timeseries for each company until 2070 for Scopes 1, 2 and 3 emissions.

3. **Calculate the companies' over/undershoot of their carbon budgets**
   We compute each company's carbon budget over-/undershoot by calculating the difference between each company's projected carbon emissions and its allocated 2°C budget. We then express this as a relative over-/undershoot of the 2°C budget of the company (X% of the budget has been over-/undershot).

4. **Convert the relative over/undershoot to a degree of temperature rise**
   We apply the relative emissions over-/undershoot to the global budget and convert the impact in degrees of warming (Celsius) using the science-based Transient Climate Response to Cumulative Emissions (TCRE) approach:

[1] The IPPC Special Report on 1.5 °C provides the remaining global carbon budget for different temperature rises and probabilities (https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter2_Low_Res.pdf (in Table 2.2).

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*Implied Temperature Rise = 2°C + company level relative over/undershoot × Global 2°C Budget × TCRE Factor.*

We perform this analysis on each scope of emissions (Scopes 1, 2 and 3) to capture both direct and indirect contributions to global warming. Additionally, we provide both the Implied Temperature Rise on each scope and an aggregated Implied Temperature Rise for each company. This allows users to understand the contribution of each scope.

## Portfolio Implied Temperature Rise

A portfolio's Implied Temperature Rise measures, in aggregate, a portfolio's temperature alignment (in °C) to keeping the world's temperature rise to 2°C by 2100. The calculation uses an aggregated budget approach that compares the sum of financed emission budget overshoot against the sum of financed carbon emission budgets for the underlying portfolio holdings. The total portfolio carbon emission over/undershoot is then converted to a degree of temperature rise using the science-based ratio approach of TCRE.

The allocation base used to define the amounts of a portfolio's financed emissions and carbon budgets is company value (for listed companies, we use Enterprise Value including Cash [EVIC] at fiscal year-end; for unlisted companies, we use Total Equity + Debt at fiscal year-end[2]). In short, the portfolio's "owned" emissions and budget for a given company are determined by the portfolio holding relative to the value of that company.

It is worth noting that the *Implied Temperature Rise* methodology has limited exposure to the issue of double counting that arises when considering emissions beyond Scope 1. This is because it focuses indeed on the *relative* over/undershoot of emissions compared with their scope benchmark (see Double Counting Section for more information).

### Transient Climate Response to Cumulative Carbon Emissions

The Transient Climate Response to Cumulative Carbon Emissions (TCRE) was established by the IPCC and provides a relationship that links each additional unit of emissions emitted beyond the available remaining global 2°C carbon budget to degrees of additional warming. We use a TCRE factor of 0.000545°C warming per

[2] Equity is defined as total balance sheet equity including cash. In cases where the total company equity value according to the balance sheet is negative, this shall be set as total equity to 0. Debt is defined as all interest bearing, capitalized lease and operating lease obligations on the balance sheet. This includes both current and long-term debt on the balance sheet. Both definitions are as of fiscal year-end. These definitions are consistent with the PCAF framework.

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Gt $CO_2$.[3] In other words, for each $GtCO_2$ exceeding the global 2°C carbon budget, we can expect an additional ~0.000545°C warming over 2°C.

This relationship is used in the Implied Temperature Rise methodology to convert a company's or portfolio's allocated carbon budget over-/undershoot into a degree of warming.[4] The Implied Temperature Rise estimates an answer to the following question: What is the additional warming if the whole economy over/-undershoots the global 2°C carbon budget at the same proportion as the company or portfolio analyzed? As described in the 2021 Measuring Portfolio Alignment report, the relationship from above can be used to derive following formula:

*Additional Warming = Relative company-level over/undershoot × Global 2°C Budget × TCRE Factor*

To then calculate the Implied Temperature Rise, we need to add the additional warming to the base temperature of 2°C:

***Implied Temperature Rise = 2°C + Relative company-level over/undershoot × Global 2°C Budget × TCRE Factor***

To illustrate, consider a hypothetical company overshooting its allocated carbon budget by 50%, and subsequently assume the whole economy overshoots at the same rate. Using the above formula, a TCRE factor of 0.000545°C/Gt $CO_2$ and a global 2°C budget of 1491Gt $CO_2e$[5], we estimate the Implied Temperature Rise to be 2.42°C (2°C + 50%×1491 Gt $CO_2e$×0.000545°C/Gt $CO_2$ = 2.4°C).

**Incorporating a company's emission-reduction targets into the Implied Temperature Rise model**

MSCI ESG Research has developed an approach to analyze and compare emission-reduction targets reported by companies, despite differences in target metrics and time frames. The methodology provides an assessment by scope and allows us to project the absolute emissions of a company, assuming its targets are fully met.

[3] The 2020 Measuring Portfolio Alignment Report recommends a TCRE factor of 0.000545°C warming per Gt CO2 which is based on IPCC 2013 The Physical Science Basis report (https://www.tcfdhub.org/wp-content/uploads/2020/10/PAT-Report-20201109-Final.pdf).

[4] Based on the relationship presented in the 2021 Portfolio Alignment Team's report, "Measuring Portfolio Alignment: Technical Considerations." (https://www.tcfdhub.org/wp-content/uploads/2021/10/PAT_Measuring_Portfolio_Alignment_Technical_Considerations.pdf)

[5] Please see the section Global 2°C carbon budget for more details.

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# Main modeling parameters and assumptions

As is the case for any model, the Implied Temperature Rise model makes certain assumptions. The table below outlines the main assumptions of our model, grouped under "Overall Assumptions", "Issuer Assumptions" and "Aggregation Assumptions.

**Exhibit 2. Main modeling parameters and assumptions of MSCI ESG Research's Implied Temperature Rise model**

| Model level | Key assumptions |
|---|---|
| Overall | The Global 2°C carbon budget (as of Jan. 1, 2021) is estimated to be 1,491Gt$CO_2$e.[6]<br>A pathway based on countries' Nationally Determined Commitments (NDCs), UNEP Goal levels and net-zero by 2070 is aligned with a Global 2°C Carbon Budget.[7] [8]<br>Emitted rates of all greenhouses gases need to be lowered at a similar rate as $CO_2$.<br>The TCRE factor is set at 0.000545°C/Gt$CO_2$e.[9]<br>Company and portfolio level Implied Temperature Rises are floored and capped at 1.3°C and 10°C.[10] |
| **Model level** | **Key assumptions** |
| Issuer level | Company-reported carbon emissions reduction targets will be met.<br>In the absence of decarbonization targets, each company's projected revenue *and* projected emissions grow at the same rate (1% per year) – carbon intensity is unchanged.[11] Another assumption is that the revenue and emissions grow at the same yearly 1% rate across all sectors and regions (assuming the company's current business mix remains constant). |

[6] Based on the remaining carbon budget as of Jan. 1, 2018, published in the IPCC Special Report on 1.5 °C (https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter2_Low_Res.pdf). To calculate the budget as of Jan. 1, 2021, reported emissions for the years 2018, 2019 and 2020 were subtracted. Please see the section *Global* 2°C carbon budget for more details.

[7] United Nations Environment Programme (2020). Emissions Gap Report 2020. Nairobi. (https://www.unep.org/emissions-gap-report-2020)

[8] According to the IPCC Special Report on 1.5 °C, net-zero emissions need to be reached around 2070 to limit warming to below 2°C (https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Headline-statements.pdf).

[9] We use a TCRE factor of 0.000545°C warming per Gt CO2 which is based on IPCC 2013 The Physical Science Basis report (https://www.tcfdhub.org/wp-content/uploads/2020/10/PAT-Report-20201109-Final.pdf).

[10] Please see the Section Flooring and capping more details.

[11] Based on average growth rate of emissions from the UNEP Gap Report (UN Environment Program, Emissions Gap Report: https://www.unep.org/emissions-gap-report-2020) adjusted for GDP based on data from the World Bank.

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| | |
|---|---|
| | Each company's 2°C Scope 1 carbon budget is allocated based on country and sectoral decarbonization pathways and using revenue volume and breakdown as a proxy for fair-share budget allocation. The country and sector budgets are informed by countries' NDCs. We assume that emissions need to be net-zero by 2070, based on the IPCC Special Report on 1.5 °C.<br>Each company's 2°C Scope 2 carbon budget is allocated based on global sectoral decarbonization pathways (based on GICS®[12] or equivalent) and using revenue volume as a proxy for fair-share budget allocation fair-share budget allocation. We assume that emissions need to be net-zero by 2070, based on the IPCC Special Report on 1.5 °C.<br>Each company's 2°C Scope 3 carbon budget is allocated based on a single global decarbonization pathway and using revenue volume as a proxy for fair-share budget allocation. We assume that emissions need to be net-zero by 2070, based on the IPCC Special Report on 1.5 °C |
| Aggregation | The same general approach to computing Implied Temperature Rise applies to issuers and portfolios.<br>The maximum budget overshoot (expressed in tCO2e) is capped at a level equivalent to a 10°C Implied Temperature Rise for a given company, for the purposes of portfolio aggregation. |

*Source: MSCI ESG Research*

[12] The Global Industry Classification Standard (GICS) is a global industry classification standard jointly developed by MSCI and Standard & Poor's.

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## Transient Climate Response to Cumulative $CO_2$ Emissions (TCRE)

The TCRE was established by the IPCC and provides a relationship that links each additional unit of emissions emitted beyond the available remaining 2°C carbon budget to degrees of additional warming. We use a TCRE factor of 0.000545°C warming per Gt $CO_2$.[13] In other words, for each $GtCO_2$ exceeding the global 2°C carbon budget, we can expect an additional ~0.000545°C warming over 2°C.

This relationship is used in the Implied Temperature Rise methodology to convert a company or portfolio's allocated carbon budget over-/undershoot into a degree of warming.[14] The Implied Temperature Rise answers the following question: What would be the additional warming if the whole economy over/-undershot the global 2°C carbon budget at the same proportion as the company or portfolio analyzed? As described in the 2021 Measuring Portfolio Alignment report, the relationship from above can be used to derive the following formula:

***Additional Warming = Relative company-level over/undershoot × Global 2°C Budget × TCRE Factor***

To then calculate the Implied Temperature Rise, we need to add the additional warming to the base temperature of 2°C:

***Implied Temperature Rise = 2°C + Relative company-level over/undershoot × Global 2°C Budget × TCRE Factor***

To illustrate, consider a hypothetical company overshooting its allocated carbon budget by 50%, and subsequently assume the whole economy overshoots at the same rate. Using the above formula, a TCRE factor of 0.000545°C/Gt $CO_2$ and a global 2°C budget of 1491Gt $CO_2e$[15], we estimate the Implied Temperature Rise to be 2.3°C (2°C + 50%×1491 Gt $CO_2e$×0.000545°C/Gt $CO_2$ = 2.4°C).

[13] The 2020 Measuring Portfolio Alignment Report recommends a TCRE factor of 0.000545°C warming per Gt CO2 which is based on IPCC 2013 The Physical Science Basis report (https://www.tcfdhub.org/wp-content/uploads/2020/10/PAT-Report-20201109-Final.pdf).

[14] Based on the relationship presented in the 2021 Measuring Portfolio Alignment Report (https://www.tcfdhub.org/wp-content/uploads/2021/10/PAT_Measuring_Portfolio_Alignment_Technical_Considerations.pdf)

[15] Please see the section Global 2°C carbon budget for more details.

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## Global 2°C carbon budget and pathway

The remaining global carbon budget available to limit global warming to 2°C was estimated by the IPCC to be 1,170 Gt $CO_2$ as of Jan. 1, 2018.[16] We assume that the emission of other greenhouse gases (GHG) will need to decrease at a similar rate to $CO_2$ to limit warming to 2°C. Using this assumption and subtracting emissions between 2018 and 2020, we find 1,491 Gt $CO_2e$ to limit warming to 2°C as of Jan. 1, 2021.[17] This calculation is updated annually.

Now we have established the global remaining carbon budget. But what is the global emission pathway aligned with this budget? There are multiple pathways to reduce emissions and ensure that the global carbon budget is not exceeded, and these can depend on many factors like socio-economic development, policies and technologies deployed. The IPCC Special Report on 1.5°C provides a set of mitigation pathways based on different socio-economic scenarios, projected energy use and amounts of Carbon Dioxide Removal (CDR).[18]

But setting one single pathway is a clear and transparent way to set out the pace of decarbonization the world needs to follow. MSCI ESG Research has constructed a single global pathway by combining global budget considerations with global 2°C emission levels, as defined in the 2020 UNEP Gap report, and a zero-emission assumption by 2070 to limit warming to 2°C[19], as presented in the IPCC Special Report on 1.5°C. [20] This global pathway, illustrated in Exhibit 3, is then used to derive 2°C pathways and carbon budgets at company level (explained in following sections).

[16] Table 2.2 in the IPCC Special Report on 1.5 °C (https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter2_Low_Res.pdf) outlines the remaining carbon budget for different temperature rises and probabilities calculated as of the 1.1.2018.

[17] To convert the global $CO_2$ budget to a global GHG budget, we assumed that other GHG emissions need to decarbonize at the same rates as $CO_2$ emissions.

[18] In the IPCC Special Report on 1.5 °C, FIGURE SPM.3A provides more details on the required reduction rates for $CO_2$ and other GHG gases (https://www.ipcc.ch/sr15/chapter/spm/spm-c/spm3a/) ; and FIGURE SPM.3B provides more details on different pathways to limit global warming to 1.5°C (https://www.ipcc.ch/sr15/chapter/spm/spm-c/spm3b/).

[19] United Nations Environment Programme (2020). Emissions Gap Report 2020. Nairobi. (https://www.unep.org/emissions-gap-report-2020)

[20] According to the IPCC Special Report on 1.5 °C, net-zero emissions need to be reached around 2070 to limit warming to below 2°C (https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Headline-statements.pdf).

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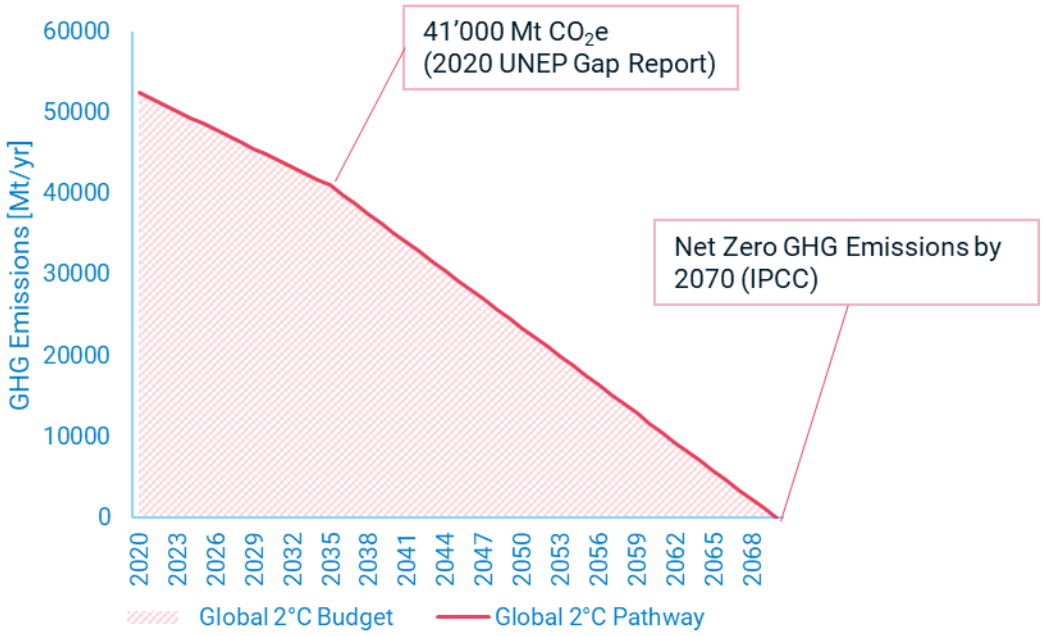
**Exhibit 3. Global 2°C pathway based on a net-zero assumption by 2070 and global emission levels as defined in the 2020 UNEP Gap report.**




*Source: MSCI ESG Research*

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## Company Implied Temperature Rise

This section provides a detailed description on the Implied Temperature Rise methodology for companies, including illustrative calculation examples. The methodology can be broken down into four main steps, outlined in the table below.

**Exhibit 4. Main modeling steps to compute companies' Implied Temperature Rise**

| Step | Description |
|---|---|
| **Step 1: 2°C carbon budget** | Calculate the Global 2°C Carbon Budget, i.e., the remaining carbon emissions (in $tCO_2e$) that can be emitted to be aligned with 2°C of warming at horizon 2100, and its pathway.<br><br>Distribute global and sector pathways to individual companies and convert those into company-level budgets using revenue as a proxy for fair-share budget allocation. |
| **Step 2: Projected carbon emissions** | Project companies' future emissions through 2070, considering their current level of emissions and their reported emissions-reduction targets. |
| **Step 3: Carbon budget overshoot** | Compare the companies' Cumulative Projected Carbon Emissions to their allocated Cumulative 2°C Carbon Budget to compute the Absolute Carbon Budget Overshoot.<br><br>***Absolute Carbon Budget Overshoot = Projected Carbon Emissions - 2°C Carbon Budget***<br><br>The Relative Carbon Budget Overshoot is the Absolute Carbon Budget Overshoot divided by the company-specific 2°C Carbon Budget.<br><br>***Relative Carbon Budget Overshoot = Absolute Carbon Budget Overshoot/2°C Carbon Budget*** |
| **Step 4: Implied Temperature Rise** | Extrapolate the Relative Carbon Budget Overshoot into degrees of global warming using the TCRE and the Global Carbon Budget.<br><br>***Implied Temperature Rise = 2°C + Relative Carbon Budget Overshoot * Global Carbon Budget * TCRE Factor*** |

*Source: MSCI ESG Research*

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## Step 1: 2°C Carbon Budget

We assign companies an absolute carbon budget for Scopes 1, 2 and 3 emissions by establishing global and sector carbon intensity pathways, and convert those into company-level budgets using revenue as a proxy for fair-share budget allocation.

This is done by first translating the global decarbonization pathway (illustrated in Exhibit 3) into *2°C Aligned Carbon Intensities* pathways for Scopes 1, 2 and 3 between the latest year (2021) and 2070. The *2°C Aligned Carbon Intensities* can be understood as a carbon intensity benchmark for each scope consistent with the global 2°C pathway. We deliberately start the pathways — therefore the Implied Temperature Rise assessment — from the latest year for which data is available. We do not penalize companies for their past behaviors, what matters is alignment on a forward-looking basis.

Depending on scope, these pathways account for country and/or sector specifics. Why? It may be unrealistic to hold a company in a hard-to-decarbonize sector and/or a developing country to the same decarbonization slope as a company in an easy-to-decarbonize sector and/or a developed country. So to some degree, we account for country and economic sector of the given company to reflect different abilities in decarbonization.

Subsequently, we apply these carbon intensity decarbonization pathways to the company's revenue: they cumulatively yield a company-specific pathway in *absolute* emissions ($CO_2e$/$ x $ = tCO2e) until 2070. We now have a cumulative carbon budget, *proportionate* to company size as measured by volume of USD revenue. It is important that companies are held accountable against absolute emissions reductions, as climate change is in the end a function of the stock of emissions in the atmosphere. The table below outlines these main modeling steps for the budget calculation. The modeling steps for Scopes 1, 2 and 3 are described in detail in the following sections.

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**Exhibit 5. Main modeling steps to allocate a carbon budget to companies**

| Step | Description |
|---|---|
| **Step 1.1: Define Global 2°C-aligned decarbonization pathway** | Global decarbonization pathway in line with the remaining 2°C global carbon budget.[21] |
| **Step 1.2: Translate for each scope the absolute budget into emission intensity pathways (annual 2°C aligned carbon intensity)** | Carbon intensity pathways required for a 2°C alignment are defined to allocate the global and sector budgets to companies using revenue as a proxy for a fair-share allowance. The carbon intensity pathways are defined for each scope individually:<br>- Scope 1: Emission intensity pathways are based on sector and country budgets by Emissions Sector and are informed by the NDCs[22]<br>- Scope 2: Emission intensity pathways are based on sector budgets by GICS® industry group<br>- Scope 3: Emission intensity pathways are based on the global budget |
| **Step 1.3: Distribute global and sector budgets to companies using revenue as a proxy for fair-share budget allocation (Cumulative 2°C carbon budget, per scope, company level)** | The total GHG emissions (in tCO2e) allocated to a company so that the global 2°C goal can be achieved. This is done by multiplying the *Annual 2°C Aligned Carbon Intensity* by the company revenue. (assuming 1% revenue growth per year)[23] and taking the cumulative resulting absolute emissions between now and 2070. |

*Source: MSCI ESG Research*

21 See Global 2°C carbon budget and pathway section above. The global remaining budget and pathway are recalculated annually.

22 The Emissions Sector classification system is a specific classification of activities designed by MSCI ESG Research to analyze companies' emissions as well as their exposure to climate policies. It differs from the GICS® classification and is particularly granular for carbon-intensive activities.

23 Based on average growth rate of emissions from the UNEP Gap Report (UN Environment Program, Emissions Gap Report: https://www.unep.org/emissions-gap-report-2020) adjusted for GDP based on data from the World Bank.

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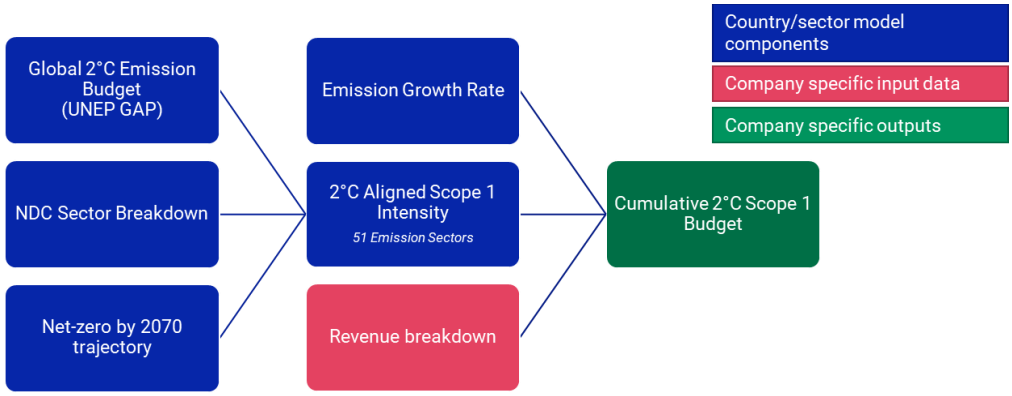
## Scope 1

Scope 1 designates direct emissions from owned or controlled sources.

Each company's Cumulative 2°C pathway is assigned based on its activity breakdown per Emissions Sector and country.[24] The 2°C-aligned sectoral and country-specific decarbonization rates are based on country and sectoral information from the NDCs and the 2°C emissions levels as reported in the UNEP Gap Report.[25] The inclusion of the NDC information allows for sectorial and regional differentiation and takes into account that not all sectors and countries have the same ability to decarbonize.

**Exhibit 6. Overview of the main inputs and model steps to assign companies their 2°C Scope 1 budget**




*Source: MSCI ESG Research*

### Step 1.1: Global Decarbonization Pathway

Please see the Global 2°C carbon budget and pathway section.

### Step 1.2: Annual 2°C Aligned Scope 1 Intensity Pathway

The *Annual 2°C Aligned Scope 1 Intensity* Pathway takes into account the relevant countries' 2030 NDC (adjusted for gaps with a 2° C pathway, as identified by the UN); and the relevant economic sector within those countries (MSCI ESG Research

[24] The Emissions Sector classification system is a specific classification of activities designed by MSCI ESG Research to analyze companies' emissions as well as their exposure to climate policies. It differs from the GICS® classification and is particularly granular for carbon-intensive activities.

[25] United Nations Environment Programme (2020). Emissions Gap Report 2020. Nairobi. (https://www.unep.org/emissions-gap-report-2020)

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Emissions sector classification is used here). These parameters influence the starting point and the slope of the pathway varies. First, the starting point: All companies are assessed against a starting global sector intensity (e.g., a European steel company will be benchmarked against the same starting average intensity as an American steel company). Second, the geographic parameters of the company determine how steep or smooth the decarbonization is supposed to be. All other things being equal, the slope in 15 years' time will be steeper for a company with a footprint in countries with more-ambitious country decarbonization targets. MSCI ESG Research Emissions sector classification is used here.

Exhibit 7 outlines the methodology for the different points in time. Between these points in time, the Annual 2°C Aligned Scope 1 Intensity is calculated by linear extrapolation.

**Exhibit 7. Methodology to define Annual 2°C Aligned Scope 1 Intensity**

| Timestep | Methodology |
|---|---|
| **STARTING POINT latest year (2021)** | Average emission intensity by emissions sector (global). |
| **INTERIM POINT in 2035** | *Annual 2°C Aligned Scope 1 Intensities* are based on country and sector reduction rates derived from country NDCs and the gap between the NDCs and 2°C as reported in the UNEP Gap Report for 2030.[26] The interim decarbonization point for 2035 is linearly inferred from this 2030 assessment.<br><br>Assumes that different countries and sectors will decarbonize at different rates based on information available in NDCs, adjusted to be aligned with a 2°C pathway, thanks to the UN Emissions Gap report.<br><br>Please see Appendix Scope 1 – Incorporation of NDC information for more details.<br><br>The *Annual 2°C Aligned Scope 1 Intensities* is calculated by multiplying the current intensity with the required reduction rate per country and sector, as described above. |
| **END POINT 2070** | Net-zero, based on IPCC Special Report on 1.5°C. |

*Source: MSCI ESG Research*

[26] United Nations Environment Programme (2020). Emissions Gap Report 2020. Nairobi. (https://www.unep.org/emissions-gap-report-2020)

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The three points in time are then used to construct a time series of *Annual 2°C Aligned Scope 1 Intensity*.

**Exhibit 8. Illustrative example of how the Annual 2°C Aligned Scope 1 Intensity is defined for different country and sector combinations for multiple points in time.**

| | Country X | | Country Y | |
|---|---|---|---|---|
| **How is this computed?** | **Sector 1** | **Sector 2** | **Sector 1** | **Sector 2** |
| **STARTING POINT Annual 2°C Aligned Scope 1 Intensity in 2021** | | | | |
| **Present-day sectoral average carbon intensity in 2021 [$tCO_2e$/USD million]** | **9 tCO2e/USDm** | **11 tCO2e/USDm** | **9 tCO2e/USDm** | **11 tCO2e/USDm** |
| **INTERIM POINT Annual 2°C Aligned Scope 1 Intensity in 2035** | | | | |
| **Country / sector emissions reduction needed based on NDCs, adjusted to make up for shortfalls with 2C goal as identified by UN (%)** | 40% | 99% | 12% | 8% |
| **Carbon intensity needed in 2035 based on country/sector reductions compared with 2021 [$tCO_2e$/USD million]** | **5.4 tCO2e/ USDm** (9 x (1-40%) ) | **0.1 tCO2e/ USDm** (11 x (1-99%)) | **7.9 tCO2e/ USDm** (9 x (1-12%)) | **10.1 tCO2e/ USDm** 11 x (1-8%)) |
| **END POINT Annual 2°C Aligned Scope 1 Intensity in 2070** | | | | |
| **Net zero in 2070 required to keep global warming to 2C [$tCO_2e$/USD million]** | **0 tCO2e/yr** | | | |

*Source: MSCI ESG Research*

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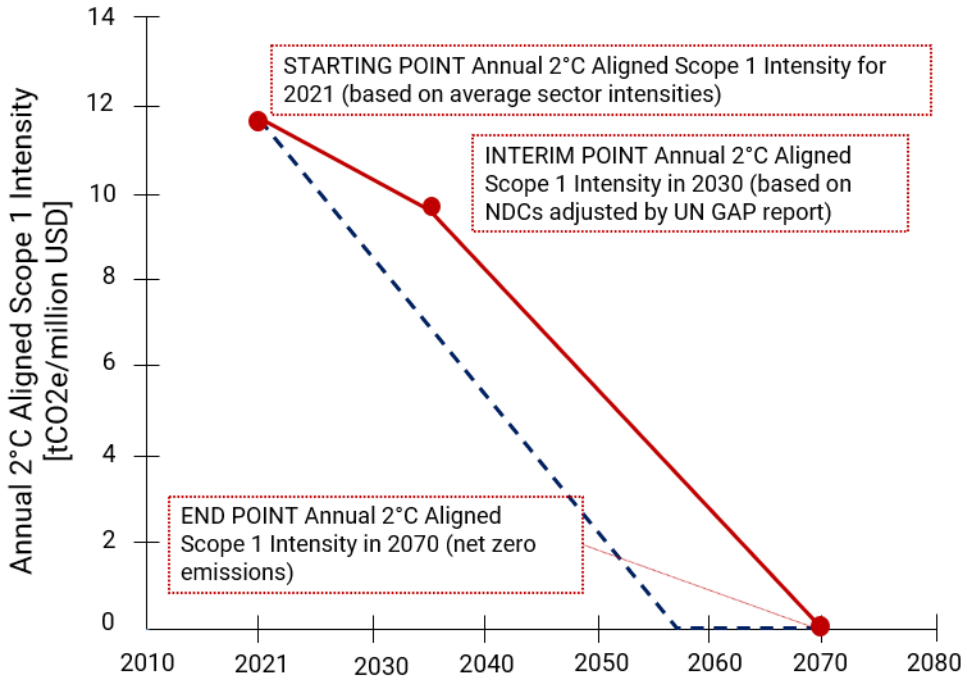
**Exhibit 9. Annual 2°C Aligned Scope 1 Intensity.**

*The solid line represents the country and sector combination (based on the NDC information) needed to keep global warming at the level of 2°C. The dashed line represents a company's emissions pathway compatible with this limit.*




*Source: MSCI ESG Research*

### Step 1.3: Cumulative 2°C Scope 1 budget

The company-level *Cumulative 2°C Scope 1 budget* is computed by multiplying the company's revenue breakdown by emissions sector and country with the *Annual 2°C Aligned Scope 1 Intensity* for each country / sector pair and taking the cumulative sum of the annual values.[27]

The example below illustrates the calculation steps for a hypothetical company that currently derives revenue from countries X and Y and emissions sectors 1 and 2. It illustrates how the budget emissions for the three points in time are computed:

[27] Assuming a 1% revenue growth rate across each country / sector segment. The 1% revenue growth assumption is based on the average growth rate of emissions (from the UNEP Gap Report (United Nations Environment Programme (2020). Emissions Gap Report 2020. Nairobi. (https://www.unep.org/emissions-gap-report-2020) adjusted for GDP based on data from the World Bank) and the assumption of constant emissions intensity.

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**Exhibit 10. Calculation example for a fictional company to compute *Cumulative 2°C Scope 1 budget*. The example illustrates the calculation for three points in time.**

| | Country X | | Country Y | |
|---|---|---|---|---|
| | **Sector 1** | **Sector 2** | **Sector 1** | **Sector 2** |
| **Calculation for 2021 – STARTING POINT** | | | | |
| **Current revenue [USD million]** | USD 0.5 m | USD 0.1 m | USD 0.2 m | USD 0.4 m |
| ***Annual 2°C Aligned Scope 1 Intensity* for 2021 [$tCO_2e$/USD million]** | **9 tCO2e/USDm** | **11 tCO2e/USDm** | **9 tCO2e/USDm** | **11 tCO2e/USDm** |
| **Current revenue x Annual 2°C Aligned Scope 1 Intensity for 2021 per Country and Sector [$tCO_2e$/yr]** | 4 tCO2e/yr (0.5 x 9) | 1 tCO2e/yr (0.1 x 11) | 2 tCO2e/yr (0.2 x 9) | 4 tCO2e/yr (0.4 x 11) |
| **Sum across all countries and sectors [tCO2e/yr]** | 12 tCO2e/yr (5 + 1 + 2 + 4) | | | |
| **Calculation for data in 2035 – INTERIM POINT** | | | | |
| **Revenue (including 1% growth assumption) [USD million][28]** | 0.58 USD m | 0.12 USD m | 0.23 USD m | 0.46 USD m |
| ***Annual 2°C Aligned Scope 1 Intensity* in 2035 years [$tCO_2e$/USD million]** | **5.4 tCO2e/ USDm** (9 x (1-0.4) ) | **0.1 tCO2e/ USDm** (11 x (1-0.99)) | **7.9 tCO2e/ USDm** (9 x (1-0.12)) | **10.1 tCO2e/ USDm** 11 x (1-0.08)) |
| **Revenue (including 1% growth assumption) x Annual 2°C Aligned Scope 1 Intensity in 2035 per country and sector [$tCO_2e$/yr]** | 3 tCO2e/yr (0.58 x 5.4) | 0 tCO2e/yr (0.12 x 0.1) | 2 tCO2e/yr (0.23 x 7.9) | 5 tCO2e/yr (0.46 x 10.1) |
| **Sum across all countries and sectors in 2035 [$tCO_2e$/yr]** | 10 tCO2e/yr (3 + 0 + 2 + 5) | | | |

[28] Assuming the business mix remains constant and revenue grows at the same rate across all sectors and regions.

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| Calculation for 2070 – END POINT | |
|---|---|
| **Total by 2070 [$tCO_2e$/yr]** | **0 tCO2e/yr** |
| ***Cumulative 2°C Scope 1 budget calculation*** | |
| **Taking the cumulative sum for all years** | **335 $tCO_2e$.** |

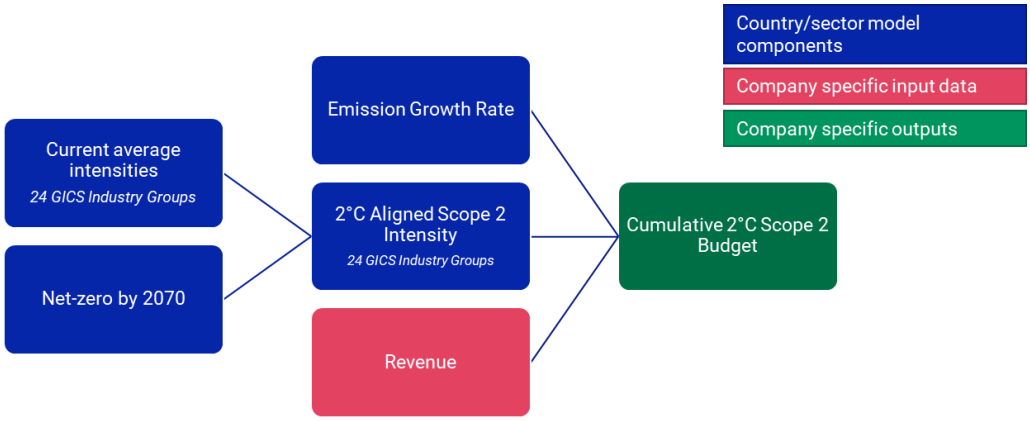
*Source: MSCI ESG Research*

## Scope 2

Scope 2 designates indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed.

Each company's *Annual 2°C Scope 2 Budget* is assigned based on its total revenue and primary GICS® Industry Group. The industry-specific approach allows for greater differentiation between companies within an industry and therefore the identification of industry leaders and laggards.

**Exhibit 11. Overview of the main inputs and model steps to assign companies their 2°C Scope 2 budget**




*Source: MSCI ESG Research*

### Step 1.1: Global Decarbonization Pathway

Please see the Global 2°C carbon budget and pathway section.

### Step 1.2 – Annual 2°C Aligned Scope 2 Intensity Pathway

The *Annual 2° C Aligned Scope 2 Intensity* pathway takes the economic sector into account – the starting point of the pathway is the global average carbon intensity of

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the given sector in 2021 (latest year). That means that, again, a company in a high-emitting sector will be benchmarked against a higher starting carbon intensity than companies in other sectors.

**Exhibit 12. Stylized example – Scope 2 Carbon Intensity Pathway breakdown**

| All countries | | |
|---|---|---|
| **How is this computed?** | **Sector 1** | **Sector 2** |
| **STARTING POINT Annual 2°C Aligned Scope 2 Intensity in 2021** | | |
| **Present-day sectoral average carbon intensity in 2021 [$tCO_2e$/USD million]** | **9 tCO2e/USDm** | **11 tCO2e/USDm** |
| **END POINT Annual 2°C Aligned Scope 2 Intensity in 2070** | | |
| **Net-zero in 2070 required to keep global warming to 2C [$tCO_2e$/USD million]** | **0 tCO2e/yr** | |

*Source: MSCI ESG Research*

### Step 1.3 – Cumulative 2°C Scope 2 Budget

The company-level *Cumulative 2°C Scope 2 Budget* is computed following a similar approach as was used for Scope 1. Instead of multiplying the company's revenue breakdown by emissions sector and country, we multiply the *Annual 2°C Aligned Scope 2 Intensity* of a company's primary GICS® industry by the company's total revenue. The table below shows an example calculation for a fictional company. The main GICS® industry group is Food, Beverage & Tobacco.

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**Exhibit 12. Calculation example for a fictional company to compute annual 2°C Scope 2 budgets**

| | |
|---|---|
| **Main GICS® Industry Group** | Food, Beverage & Tobacco |
| **Calculation for 2021 – STARTING POINT** | |
| Current revenue [USD million] | 1.2 USD million |
| **2021 *Annual 2°C Aligned Scope 2 Intensity* for Food, Beverage & Tobacco [tCO2e/USD million]** | **28 tCO2e/USD million** |
| Current revenue x Annual 2°C Aligned Scope 2 Intensity for 2021 [$tCO_2e$/yr] | 33.6 tCO2e/yr<br>(1.2 x 28) |
| **Calculation for 2070 – END POINT** | |
| **Total for 2070 [$tCO_2e$/yr] – Net Zero by 2070** | **0 tCO2e/yr** |
| ***Cumulative 2°C Scope 2 Budget Calculation*** | |
| **Taking the cumulative sum for all years** | **965 $tCO_2e$** |

*Source: MSCI ESG Research*

## Scope 3

Scope 3 designates all other indirect emissions that occur in a company's value chain.

The *Annual 2°C Aligned Scope 3 Intensity* global pathway is a single straight line from 2021 to 2070. That means that all companies' Scope 3 emissions are benchmarked against a slope defined by a single carbon-intensity starting point – the market cap weighted average Scope 3 emissions intensity estimates of the MSCI ACWI IMI universe in 2021 – and a single slope that ends by net-zero in 2070. Why is the Scope 3 intensity pathway not specific to sectors and countries? Because it represents the whole value chain of a company, and we look at the largest, multinational companies at MSCI. For these companies, supply chains and sales are global.

Moreover, using a single Scope 3 benchmark introduces some Implied Temperature Rise bias against the most-emitting sectors, which are compared with the same benchmark as least-emitting sectors. This enables the Implied Temperature Rise to

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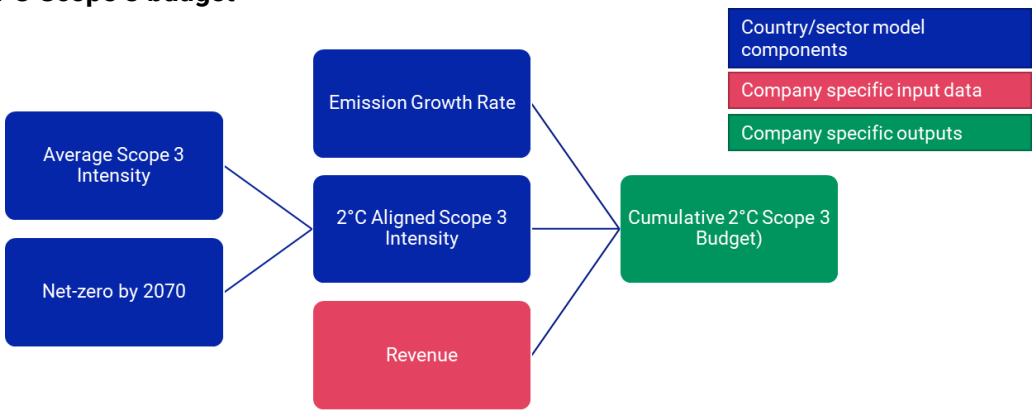
remain intuitive (i.e., it is harder for an oil and gas company be aligned with a good temperature score than it is for an IT company).

In setting such a benchmark, we implicitly assume that all companies need to meet the same carbon intensity pathway in their upstream and downstream value chain. Consequently, companies with particularly carbon-intensive value chains will have to decarbonize at a substantially higher rate than companies with a less-carbon-intensive value chain.

**Exhibit 13: Overview of the main inputs and model steps to assign companies their 2°C Scope 3 budget**




*Source: MSCI ESG Research*

### Step 1.1: Global Decarbonization Pathway

Please see the Global 2°C carbon budget and pathway section.

### Step 1.2 – Annual 2°C Aligned Scope 3 Intensity

The *Annual 2°C Aligned Scope 3 Intensity* is based on the global pathway and assumes a fair-share allocation using revenue as a proxy. The current Scope 3 emission intensity used as the starting point of the pathway is the market cap weighted average of all constituents of the MSCI ACWI Investible Market Index (IMI), based on estimated Scope 3 emissions.[29]

[29] This is updated on a regular basis to include the most recent set of constituents of the MSCI ACWI IMI.

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**Exhibit 14. Scope 3 carbon intensity pathway breakdown**

| How is this computed? | All countries, all sectors |
|---|---|
| **STARTING POINT Annual 3°C Aligned Scope 3 Intensity in 2021** | |
| **Market cap weighted average emission intensity of all constituents[1] of the MSCI ACWI Investible Market Index (IMI) in 2021 [$tCO_2e$/USD million]** | **815 tCO2e/USD million** |
| **END POINT Annual 2°C Aligned Scope 3 Intensity in 2070** | |
| ***Annual 2°C Aligned Scope 1 Intensity* in 2070 [$tCO_2e$/USD million]** | **0 tCO2e/USDm** |

*Source: MSCI ESG Research*

### Step 1.3 – Cumulative 2°C Scope 3 Budget

A company's *Cumulative 2°C Scope 3 Budget* is computed by multiplying its total revenue with the *Annual 2°C Aligned Scope 3 Intensity* for each year and taking the cumulative sum. The table below shows an example calculation for a fictional company.

**Exhibit 15: Calculation example for a fictional company to compute annual Scope 3 budgets**

| **Calculation for 2021 – STARTING POINT** | |
|---|---|
| Current revenue [USD million] | 1.2 USD million |
| **Annual 2°C Aligned Scope 3 Intensity for 2021 [tCO2e/USD million]** | **815 tCO2e/USD million** |
| Current revenue x Annual 2°C Aligned Scope 3 Intensity for 2021 [$tCO_2e$/yr] | 978 tCO2e/yr<br>(1.2 x 666) |
| **Calculation for 2070 – END POINT** | |
| **Total for 2070 [$tCO_2e$/yr] - Net-Zero by 2070** | **0 tCO2e/yr** |
| ***Cumulative 2°C Scope 3 Budget Calculation*** | |
| **Taking the cumulative sum for all years** | 22,966 $tCO_2e$ |

*Source: MSCI ESG Research*

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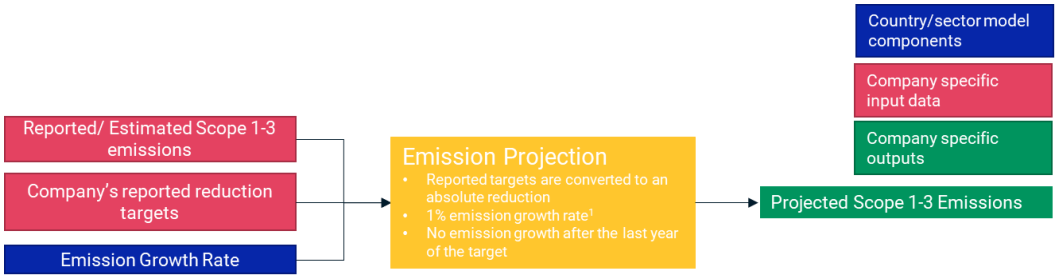
## Step 2: Projected Carbon Emissions

We project future absolute emissions until 2070 for Scopes 1, 2 and 3 emissions. The projection is based on an extrapolation until 2070 of present-day company emissions whose growth rate is determined by reduction targets. In the absence of reduction targets, we assume a 1%-per-year emissions growth to reflect business-as-usual. The main building blocks for the emissions projection are in Exhibit 17.

**Exhibit 16. Main building blocks of the emission projection**




*Source: MSCI ESG Research*

**Exhibit 17. Input to the emission projection**

| Input | Description |
|---|---|
| **Current company carbon emissions** | Scope 1 & 2: Reported emissions when available, when not available, use estimated emissions.<br>Scope 3: Estimated emissions are used to overcome inconsistencies in company reporting.[30] |
| **Default/business-as-usual emissions growth rate** | In the absence of company reduction targets, we assume a 1%- per-year emissions growth to reflect business-as-usual.[31] |
| **Company reduction targets** | MSCI ESG Research has developed an approach to analyze emission-reduction targets reported by companies. The methodology was employed to normalize reduction amounts to make them comparable across companies. The methodology provides an assessment by GHG scope and allows us to project the absolute emissions of a company, assuming that the target is fully met. |

*Source: MSCI ESG Research*

[30] See Bokern, D., Baker, B. and Panagiotopoulos, A. "A Major Step Forward for Scope 3 Emissions." MSCI ESG Research, October 2020.

[31] Based on average growth rate of emissions from the UNEP Gap Report (United Nations Environment Programme (2020). Emissions Gap Report 2020. Nairobi. (https://www.unep.org/emissions-gap-report-2020)) adjusted for GDP based on data from the World Bank.

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A company's projected emissions are determined by either company decarbonization targets or business-as-usual assumptions:

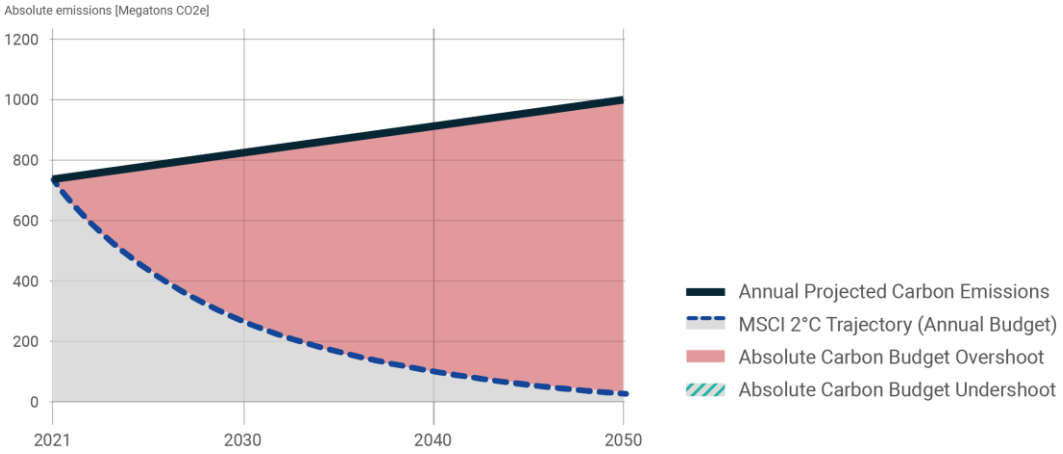
- If the company has a reported an emissions-reduction target covering the scope in question:
    - Apply the reported normalized reduction to the current emissions level for that scope
    - After the target year, we assume that emissions remain constant (0% emissions growth)
- If the company does not have a reported emission reduction target:
    - We assume 1%-per-year emissions growth to reflect business-as-usual.

More detailed information on the methodology to assess company's reported emission-reduction targets will be available in the Climate Change Metrics Methodology Document. For more detailed information on the methodology to estimate Scope 3 emissions, see Scope 3 Emissions Estimation Methodology.

## Step 3: Carbon budget overshoot

A company's carbon budget over/-undershoot is defined as the difference between a company's *Cumulative Projected Carbon Emissions* and its *Cumulative 2°C Carbon Budget,* expressed in tCO2e.

**Exhibit 18. Cumulative emissions and budget for a fictional company**




*Source: MSCI ESG Research.*

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Note that in MSCI charts, the shape of company carbon budgets ("MSCI 2°C Trajectory") looks quite different from one company to the other and is not linear. We use convex, concave and other carbon budget shapes (instead of quasi-straight-line shapes) to illustrate the point that a company might have *many ways* to meet its budget, e.g., sharp decarbonization now, slower in future years. Our software creates an original shape of the pathway (dotted blue line) while always respecting the Cumulative 2°C Carbon Budget (gray area).

We have made another visual design choice: The budget line never starts below the company's current footprint, regardless of whether a given company is overshooting it by a significant amount. Instead, a large overshoot will be reflected in a steep drop of the budget over the very next years. This is to illustrate the point that the company's most recent footprint is what is it — there is no point in building a counterfactual. The company will, however, have to envisage a very steep drop in annual carbon budget over the next few years.

Assessing a company's carbon budget over-/undershoot requires subtracting the company's *Cumulative Projected Carbon Emissions* (the whole area under the black line) to the company's *Cumulative 2°C Carbon Budget* (gray area). Detailed steps follow below.

A company's Cumulative Projected Carbon Emissions are the sum of its Annual Projected Carbon Emissions until 2070. In Exhibit 18, this is the total gray area below the black line. This is done for each scope individually, but also for the sum of all scopes for the aggregated calculations.

$$Cumulative\ Projected\ Emissions_{Scope\ X} = \sum Annual\ Projected\ Emissions_{Scope\ X, year\ i}$$

$$\begin{aligned} Cumulative\ Projected\ Carbon\ Emissions_{Agg} = & \sum Annual\ projected\ emissions_{Scope\ 1, year\ i} \\ & + Annual\ projected\ emissions_{Scope\ 2, year\ i} \\ & + Annual\ projected\ emissions_{Scope\ 3, year\ i} \end{aligned}$$

As described in the previous section, a company's Cumulative 2°C Carbon Budget is the gray area under the blue line in Exhibit 18.

$$Cumulative\ 2°C\ Carbon\ Budget_{Scope\ X} = \sum Annual\ 2°C\ \text{Carbon}\ budget_{Scope\ X, year\ i}$$

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$$Cumulative\ 2°C\ Carbon\ Budget_{Agg} = \sum Annual\ 2°C\ Carbon\ budget_{Scope\ 1,year\ i} + Annual\ 2°C\ Carbon\ budget_{Scope\ 2,year\ i} + Annual\ 2°C\ Carbon\ budget_{Scope\ 3,year\ i}$$

Finally, the *Absolute Carbon Budget Overshoot* is the difference between the company's *Cumulative Projected Carbon Emissions* and its *Cumulative 2°C Carbon Budget*:

$$Absolute\ Carbon\ Budget\ Overshoot_{Scope\ X} = Cumulative\ Projected\ Carbon\ Emissions_{Scope\ X} - Cumulative\ 2°C\ Carbon\ Budget_{ScopeX}$$

$$Absolute\ Carbon\ Budget\ Overshoot_{Agg} = Cumulative\ Projected\ Carbon\ Emissions_{Agg} - Cumulative\ 2°C\ Carbon\ Budget_{Agg}$$

**Exhibit 19. Calculation example for a fictional company to compute the absolute carbon budget over-/undershoot**

| | |
|---|---|
| **Cumulative Projected Carbon Emissions [tCO2e]** | 63,577 tCO2e |
| **Cumulative 2°C Carbon Budget [tCO2e]** | 24,266 tCO2e |
| **Absolute Carbon Budget Overshoot [tCO2][32]** | 39,311 tCO2e |

*Source: MSCI ESG Research*

To apply the assumption of "what if the world exceeded its budget by an equivalent amount," we transform the *Absolute Carbon Budget Overshoot* to a relative number per company (%). Specifically, we calculate how much over-/undershoot each

[32] Please see section "Double counting – how and why it's considered" for details on double counting.

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company has relative to its overall carbon budget. This can be done per scope, as well as aggregated on all three scopes by adding the overshoots and the budgets.

$$Relative\ Carbon\ Budget\ Overshoot_{Scope\ X} = \frac{Absolute\ Carbon\ Budget\ Overshoot_{Scope\_X}}{Cumulative\ 2°C\ \text{Carbon Budget}_{ScopeX}}$$

$$Relative\ Carbon\ Budget\ Overshoot_{Agg} = \frac{Absolute\ Carbon\ Budget\ Overshoot_{Agg}}{Cumulative\ \ 2°C\ \text{Carbon Budget}_{Agg}}$$

**Exhibit 20. Calculation example for a fictional company to compute the relative carbon budget over-/undershoot**

| | |
|---|---|
| **Absolute Carbon Budget Overshoot [tCO2e]** | 39,311 tCO2e |
| **Cumulative 2°C Carbon Budget [tCO2e]** | 24,266 tCO2e |
| **Relative Carbon Budget Overshoot** | 162% |

*Source: MSCI ESG Research*

## Step 4: Implied Temperature Rise

Now we come back to using the 2°C global carbon budget. In Step 1, we used its assumptions to build our Scopes 1, 2 and 3 pathways and thus a cumulative company-specific budget. We then projected the company-absolute emissions for every year until 2070 in Step 2. Now to compute the Implied Temperature Rise, we extrapolate the carbon overshoot of this company into the global economy overshooting its own carbon budget by the same amount.

In this thought experiment we are assuming the entire world economy behaves like our company. The baseline global warming is given by the global budget we have used throughout: 2°C. The world is now overshooting its remaining carbon budget (1,491 Gt CO2e) by X%. What does it mean in terms of additional warming? The transient climate response to cumulative emissions of carbon dioxide (TCRE) factor gives us a linear approximation of additional °C warming corresponding to each additional unit of $CO_2e$.

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The *Implied Temperature Rise* is computed as described below.[33]

$$Implied\ Temperature\ Rise = 2°C + (Global\ Budget * Relative\ Carbon\ Budget\ Overshoot * TCRE\ factor)$$

**Exhibit 21. Implied Temperature Rise — calculation example for fictional company**

| Timestep | Aggregated |
|---|---|
| **Relative Carbon Budget Overshoot (company-level)** | 162% |
| **Global 2°C Carbon Budget** | 1,491 Gt $CO_2e$ |
| **TCRE Factor** | 0.000545°C/Gt CO2e |
| **Implied Temperature Rise** | **3.3°C** (2°C + 1,491 x 162% x 0.000545) |

*Source: MSCI ESG Research*

## Flooring and capping

The company's Implied Temperature Rise is floored and capped at 1.3°C and 10°C.

- We set the minimum warming at 1.3°C to represent a reasonable estimate of the additional warming that is already locked in due to past emissions. The current warming caused by human activities was estimated to be 1.0°C in 2017 and is further increasing 0.2°C per decade due to past and current emissions.[34] It is plausible to set the lower boundary at 1.3°C in the absence of a recognized, globally scalable carbon removal technology.

[33] Based on recommendations from the 2021 Measuring Portfolio Alignment Report (https://www.tcfdhub.org/wp-content/uploads/2021/10/PAT_Measuring_Portfolio_Alignment_Technical_Considerations.pdf).

[34] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. (https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf)

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- The highest temperature cited by the IPCC and other leading climate scientists in a worst-case climate scenario ranges between 5°C and 6°C. This 6°C temperature represents the average global warming of the planet if no efforts are made to curb global emissions.[35] However, it is conceivable that a single company could contribute more than 6°C to climate change through its activities. Indeed, the Implied Temperature Rise is built to extrapolate the implied temperature rise *as if* the company at hand was the world economy. So while the real world, made of diverse companies (with low as well as high carbon contributions), is not likely to face a mean temperature 6°C, *if the world economy* behaved like a single, misaligned company, the estimated temperature range would be pushed higher. For this reason, and to allow portfolio temperatures to reflect such high temperatures and optimize allocation in the presence of heavily emitting companies, we set the maximum temperature for a company at 10°C.

Additionally, the absolute overshoot by scope is capped at a level equivalent to 10°C for the purposes of portfolio aggregation.

The maximum absolute overshoot for each company is calculated with following formula:

$$\textbf{Absolute Carbon Budget Overshoot}_{Max} = (T_{max}\text{-}2°C)/(\text{TCRE Factor} * \text{Global Budget}) * \text{Cumulative 2°C Carbon Budget}$$

The capped absolute overshoot is the minimum of the *Absolute Carbon Budget Overshoot* and the *Absolute Carbon Budget Overshoot*$_{Max}$*:*

$$\textbf{Absolute Carbon Budget Overshoot}_{Capped} = \text{Min}(\text{Absolute Carbon Budget Overshoot}, \text{Absolute Carbon Budget Overshoot}_{Max})$$

[35] IPCC. Climate Change 2014 Synthesis Report Summary for Policymakers. (https://www.ipcc.ch/site/assets/uploads/2018/02/AR5_SYR_FINAL_SPM.pdf)

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# Portfolio Implied Temperature Rise

A portfolio's Implied Temperature Rise measures, in aggregate, a portfolio's temperature alignment (in °C) to keeping the world's temperature rise to 2°C by 2100. The calculation uses an aggregated budget approach that compares the sum of financed emissions against the sum of financed carbon emission budgets for the underlying portfolio holdings. The total portfolio carbon emission over/undershoot is then converted to a degree of temperature rise using the science-based ratio approach of TCRE.

The calculations are very similar to that of a company's *Implied Temperature Rise*, but this time we need to attribute what share of invested companies' projected emissions and budgets the portfolio "owns." The allocation base used to define the amounts of a portfolio's financed emissions and carbon budgets is company value (for listed companies, we use Enterprise Value including Cash (EVIC); for unlisted companies, we use Total Equity + Debt)[36]. This approach is based on the framework of the Partnership for Carbon Accounting Financials (PCAF).[37]

In short, the portfolio's "owned" emissions and budget for a given company are determined by the portfolio holding relative to the value of that company.

## Step 1: Allocation of company-level emissions and budgets

When computing the temperature increase related to a portfolio, it is necessary to allocate a share of the emissions and carbon budgets of underlying portfolio companies based on the market value of each position. We allocate the emissions and carbon budget of each constituent in the portfolio using the following equation:

*For listed companies:*

$$Ownership_{security} \frac{Portfolio\ Value * Weight_{security}}{EVIC_{issuer}}$$

*For unlisted companies:*

$$Ownership_{security} = \frac{Portfolio\ Value * Weight_{security}}{Total\ Equity + Debt_{issuer}}$$

[36] Equity is defined as total balance sheet equity including cash. In cases where the total company equity value according to the balance sheet is negative, this shall be set total equity to 0. Debt is defined as all interest bearing, capitalized lease and operating lease obligations on the balance sheet. This includes both current and long-term debt on the balance sheet. Both definitions are as of fiscal year-end. These definitions are consistent with the PCAF framework.

[37] See PCAF (2020). "The Global GHG Accounting and Reporting Standard for the Financial Industry."



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The outstanding amount invested can be defined as Portfolio Value * $\text{Weight}_{\text{Security}}$. When the portfolio value is not available, the portfolio value can be assumed to be 1. Because we compute the allocated overshoot in relative terms, the portfolio value does not affect the final calculation. For listed companies, we use EVIC (Enterprise Value Including Cash) to attribute emissions of companies to both equity and debt holders; for unlisted companies, we use Total Equity+Debt.

## Step 2: Portfolio budget and over-/undershoot

To compute a portfolio's carbon budget and over-/undershoot, the security-level financed carbon budget and financed carbon budget overshoot need to be computed. This is done by allocating the company's budget or over-/undershoot to the portfolio, as defined in the previous section:

$$Financed\ Budget_i = Ownership_i \cdot Company\ Cumulative\ 2°C\ Carbon\ Budget_i$$

$$Financed\ Over/Undershoot_i = Ownership_i \cdot Company\ Absolute\ Carbon\ Budget\ Over/Undershoot_i$$

**Exhibit 22. Calculation example for a fictional portfolio to compute the financed budgets and over-/undershoots**

| | Ownership | Company Cumulative 2°C Budget [Mt] | Company Absolute Carbon Budget Overshoot [Mt] | Financed Budget [Mt] | Financed Over/-Undershoot [Mt] |
|---|---|---|---|---|---|
| **Security A** | 0.02 | 500 Mt | 700 Mt | 10 Mt (0.02 x 500) | 14 Mt (0.02 x 700) |
| **Security B** | 0.05 | 10 Mt | -5 Mt | 0.5 Mt (0.05 x 10) | -0.25 Mt (0.05 x -5) |

*Source: MSCI ESG Research*

A portfolio's budget and over-/undershoot are computed with the following formula. This can be calculated for each scope separately, as well as for the aggregation of all scopes:

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Per Scope:

$$Portfolio\ Budget_{Scope\ X} = \sum Financed\ Budgets_{i,Scope\ X}t$$

$$Portfolio\ Overshoot_{Scope\ X} = \sum Financed\ Over/-Undershoots_{i,Scope\ X}$$

Aggregated:

$$Portfolio\ Budget_{Agg} = \sum Financed\ Budgets_{i,Agg}$$

$$Portfolio\ Overshoot_{Agg} = \sum Financed\ Over/-Undershoots_{i,Agg}$$

**Exhibit 23. Calculation example for a fictional portfolio to compute the portfolio budget and portfolio over-/undershoots**

| | Ownership | Company Cumulative 2°C Budget [Mt] | Company Absolute Carbon Budget Overshoot [Mt] | Financed Budget [Mt] | Financed Over/-Undershoot [Mt] |
|---|---|---|---|---|---|
| **Security A** | 0.02 | 500 Mt | 700 Mt | 10 Mt (0.02 x 500) | 14 Mt (0.02 x 700) |
| **Security B** | 0.05 | 10 Mt | -5 Mt | 0.5 Mt (0.05 x 10) | -0.25 Mt (0.05 x -5) |
| **Portfolio Budget [Mt]** | | | | 10.5 Mt (10 + 0.5) | |
| **Portfolio Carbon Budget Overshoot [Mt]** | | | | | 13.75 Mt (14 – 0.25) |

*Source: MSCI ESG Research*

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## Step 3: Relative Over-/Undershoot

The portfolio-level relative over-/undershoot follows the same logic as described in the previous section for companies:

$$Porfolio\ Relative\ Overshoot_{Scope\ X} = \frac{Portfolio\ Overshoot_{Scope\ X}}{Portfolio\ Budget_{Scope\ X}}$$

$$Porfolio\ Relative\ Overshoot_{Agg} = \frac{Portfolio\ Overshoot_{Agg}}{Portfolio\ Budget_{Agg}}$$

**Exhibit 24. Calculation example for a fictional portfolio to compute the portfolio relative overshoot**

| | |
|---|---|
| **Portfolio Absolute Carbon Budget Overshoot [Mt]** | 13.75 Mt |
| **Portfolio Budget [Mt]** | 10.5 Mt |
| **Portfolio Relative Carbon Budget Overshoot [%]** | 131% |

*Source: MSCI ESG Research*

## Step 4: Portfolio Implied Temperature Rise

The Portfolio Implied Temperature Rise is computed following the same equation as described above. We assume that the relative over-/undershoot applies to the entire economy, and use the TCRE equation to compute the temperature rise above 2°C.

$$Portfolio\ ITR_{Scope\ X} = 2^{\circ}\ C + Portfolio\ Relative\ Carbon\ Budget\ Overshoot_{Scope\ X} * \text{Global Budget*TCRE}$$

$$Portfolio\ ITR_{Agg} = 2^{\circ}\ C + Portfolio\ Relative\ Carbon\ Budget\ Overshoot_{Agg} * \text{Global Budget*TCRE}$$

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The Portfolio Implied Temperature Rise is floored and capped at 1.3°C and 10°C, respectively (equivalent to the company Implied Temperature Rise).

For the fictional example above, this would lead to a Portfolio Implied Temperature Rise of 3.1°C.

Please see the Portfolio Implied Temperature Rise Calculation Guide for a sample calculation.

## Implied Temperature Rise bands

The *Implied Temperature Rise* output is a continuous variable. For ease of comparison among various Implied Temperature Rises, MSCI uses *Implied Temperature Rise Bands* that encompass temperate ranges with clear alignment labels, from "1.5°C aligned" to "Strongly Misaligned."

Alignment is defined by the two temperature thresholds set by the Paris Agreement climate objectives (+1.5°C, +2°C global mean temperature compared with pre-industrial levels).[38] Misalignment, consequently, corresponds to any Implied Temperature Rise output exceeding those thresholds. We distinguish two categories of misalignment:

- **Misaligned**, defined by a business-as-usual emissions profile; and
- **Strongly Misaligned**, for outputs that fall short even of today's insufficient country policies.

The NGFS REMIND "Current Policies" scenario that corresponds to the first category of misalignment yields a (rounded) 3.2°C temperature at horizon 2100, which helps us draw the line with the second category.[39]

The table below describes the Implied Temperature Rise Bands as well as what they mean.

[38] See Article 2 of the Paris Agreement (https://unfccc.int/sites/default/files/english_paris_agreement.pdf)

[39] NGFS Climate Scenario Database. Technical Documentation (2020). (https://www.ngfs.net/sites/default/files/ngfs_climate_scenario_technical_documentation_final.pdf)

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**Exhibit 26. Overview of Implied Temperature Rise Bands**

| | ITR Band | Range (°C) | Comment |
|---|---|---|---|
| MISALIGNED | **Strongly Misaligned** | > 3.2 | This company/portfolio is misaligned even by business-as-usual standards. Its contribution to catastrophic climate change is higher than most companies'/portfolios'. |
| | **Misaligned** | > 2.0 – 3.2 | This company/portfolio does not comply with the Paris Agreement goals. Its pace of decarbonization is too slow to mitigate catastrophic climate change. The threshold is determined by the NGFS REMIND "Current policies" scenario yielding an estimated 3.24°C at the 2100 horizon (rounded 3.2°C). |
| ALIGNED | **2°C Aligned** | > 1.5 – 2.0 | This company/portfolio meets the Paris Agreement's minimum objective[40] of +2°C global mean temperature compared with pre-industrial levels. It is engaged in the low-carbon transition. |
| | **1.5°C Aligned** | <=1.5 | This company/portfolio is in line with the Paris Agreement's maximal objective of keeping global mean temperature to +1.5°C compared with pre-industrial levels. It is a transition leader, significantly contributing to mitigating catastrophic climate change. |

*Source: MSCI ESG Research.*

## Implied Temperature Rise data updates

To best reflect the current state of the world, Implied Temperature Rise scores may evolve as new data becomes available. For instance, when a company sets a new decarbonization target, we take that into account and recalculate the company's projected emissions, which will, in turn, change the company's Implied Temperature Rise.

We run a regular update cycle: biweekly for targets inputs and quarterly for the rest of the data inputs. However, the total cycle from the moment primary data is available (e.g., the company has announced a new target) to the moment the Implied Temperature Rise integration is finalized can take more time.

The regular cycle for updating key data points is summarized in the table below, with indicative timelines.

[40] See article 2 of the Paris Agreement (https://unfccc.int/sites/default/files/english_paris_agreement.pdf)

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**Exhibit 27. Implied Temperature Rise data update cycles**

| | First step: Regular ITR data update cycle | Second step: Computation and quality assurance | Total update lag |
|---|---|---|---|
| **Climate Target Data** | 14 days | Up to 15 days | **Up to 1 month** |
| **Reported Emission data (Scopes 1 and 2)** | 3 months | Up to 1 month | **Up to 4 months** |
| **Revenue/ Segment breakdown/ Geo breakdown** | 3 months | Up to 1 month | **Up to 4 months** |
| **GICS** | 3 months | Up to 1 month | **Up to 5 months** |
| **Estimated Scope 3 Footprints** | 3 months | Up to 1 month | **Up to 4 months** |

*Source: MSCI ESG Research.*

These timelines take into account the fact that client queries may lead us to correct data inputs at various speeds, depending on the type of input.[41]

In general, 99% of client queries will be addressed within 10 days. Following that, amendments will show at the end of the relevant Implied Temperature Rise data update cycle.

## Double counting – how and why it is considered

Double counting of GHG emissions refers to adding the same emissions more than once. It occurs predominantly when aggregating comprehensive company carbon footprints (Scopes 1, 2 and 3) together within investment portfolios. The GHG Protocol suggests that Scope 3 emissions be excluded from such institutional investment climate practices.[42]

First, MSCI ESG Research acknowledges that precisely removing double counting from a Scope 3 data set is impossible. The most challenging issue is that the level of double counting may be very different for individual companies.

Second, double counting is not a material challenge for the Implied Temperature Rise methodology. This is because in this methodology, the question is not about the absolute amount of emissions financed in the portfolio; it is instead about whether

[41] For more information on targets data update, please consult MSCI Climate Targets and Commitments Methodology; for more information on emissions data update, see MSCI Carbon Emissions Estimation Methodology.

[42] World Resources Institute and World Business Council for Sustainable Development, September 2011. "Corporate Value Chain (Scope 3) Accounting and Reporting Standard."

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companies are meeting their Scopes 1, 2 and 3 emissions budgets, and to what extent.

We compute the relative over-/undershoot of each company and portfolio by summing up the over-/undershoots and budgets of a company or portfolio in all three scopes. Whether Companies A and B in the portfolio have overlapping Scope 3 emissions or not is not relevant to the Implied Temperature Rise of the portfolio. What matters is whether they limit and decrease their Scope 3 emissions in line with a 2C pathway.

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# Appendix

## Definitions

### Exhibit 8. General definitions of Implied Temperature Rise

| | Definition |
|---|---|
| **Company Implied Temperature Rise** | Estimates the global Implied Temperature Rise (at horizon 2100 or later) if the whole economy had the same carbon budget over-/undershoot level as the company analyzed, based on its projected Scopes 1, 2 and 3 emissions. The metric compares the company's projected GHG emissions against its carbon budget. The total estimated carbon budget over-/undershoot is then converted to a degree of temperature rise using the science-based ratio approach of the TCRE. For example, an Implied Temperature Rise of 2.5°C would indicate that the company is exceeding its fair share of the global carbon budget, and that if the whole economy exceeded its 2°C by a similar proportion, we would end up in a world with ~2.5°C of warming. |
| **Portfolio Implied Temperature Rise** | A portfolio's Implied Temperature Rise measures, in aggregate, a portfolio's temperature alignment (in °C) to keeping the world's temperature rise to 2°C by 2100. The calculation uses an aggregated budget approach that compares the sum of financed projected carbon emissions against the sum of financed carbon emission budgets for the underlying portfolio holdings. This provides an estimation of the total carbon budget under-/overshoot of the portfolio. The total portfolio carbon emission over/undershoot is then converted to a degree of temperature rise using the science-based ratio approach of the TCRE. For example, an Implied Temperature Rise of 2.5°C assigned to a given portfolio would indicate that the portfolio is exceeding its fair share of the global carbon budget. If the whole economy exceeded its 2°C fair shares by a similar proportion, we would end up in a world with ~2.5°C of warming. |

*Source: MSCI ESG Research*

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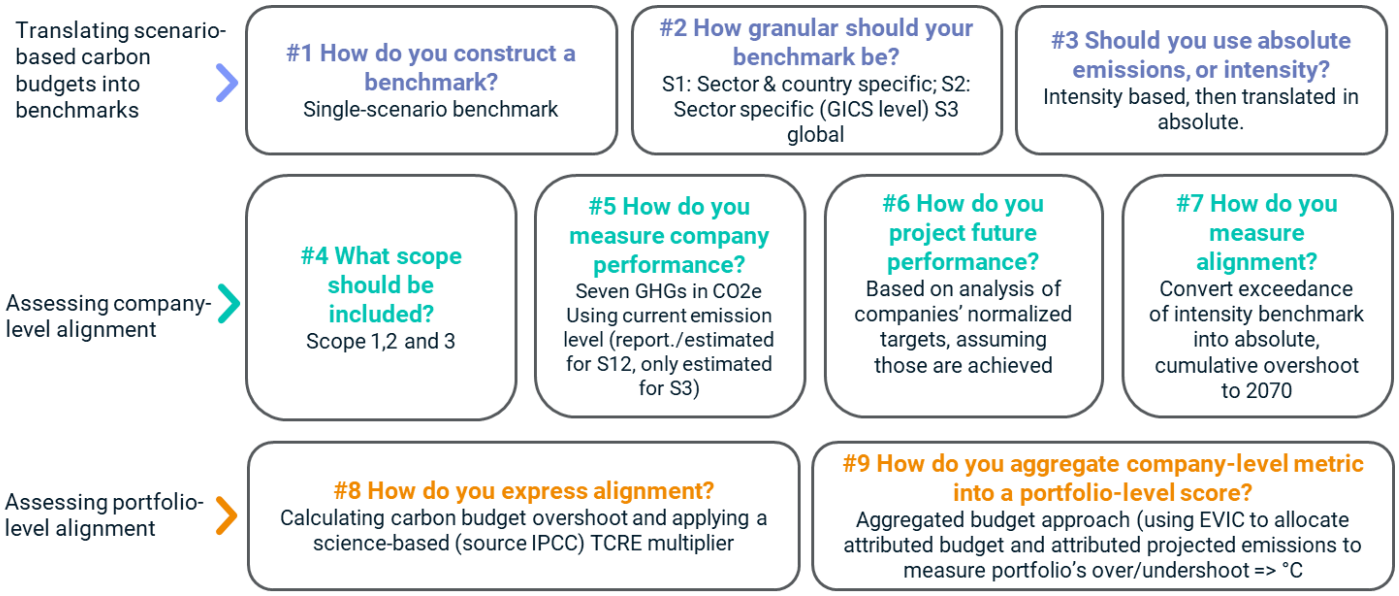
## Alignment of MSCI Implied Temperature Rise to the nine design judgments from the TCFD Measuring Portfolio Alignment: Technical Supplement

9 provides a self-assessment on how we approach the nine design judgments from the TCFD Measuring Portfolio Alignment: Technical Supplement report.[43]

**Exhibit 9. Key judgments from the TCFD Measuring Portfolio Alignment Report and MSCI ESG Research's approach (self-assessment)**




*Source: MSCI ESG Research and TCFD Portfolio Alignment Team*[44]

[43] Measuring Portfolio Alignment: Technical Supplement, June 2021 (https://assets.bbhub.io/company/sites/60/2021/05/2021-TCFD-Portfolio_Alignment_Technical_Supplement.pdf)

[44] Measuring Portfolio Alignment: Technical Supplement, June 2021 (https://assets.bbhub.io/company/sites/60/2021/05/2021-TCFD-Portfolio_Alignment_Technical_Supplement.pdf)

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# Main formulas

## Company Implied Temperature Rise

**Exhibit 25. Formulas to calculate the Implied Temperature Rise for companies**

| Metric | Relative Overshoot Formula | Implied Temperature Rise Formula[45] |
|---|---|---|
| **Scope 1 Implied Temperature Rise** | $Relative\ Scope\ 1\ Budget\ Overshoot = \frac{Absolute\ Scope\ 1\ Budget\ Overshoot}{\text{Cumulative 2°C Scope 1 } Budget}$ | $ITR_{Scope1} = 2°C + Relative\ Scope\ 1\ Budget\ Overshoot * Global\ Budget * TCRE$ |
| **Scope 2 Implied Temperature Rise** | $Relative\ Scope\ 2\ Budget\ Overshoot_{Scope2} = \frac{Absolute\ Scope\ 2\ Budget\ Overshoot}{\text{Cumulative 2°C Scope 2 } Budget}$ | $ITR_{Scope2} = 2°C + Relative\ Scope\ 2\ Budget\ Overshoot * Global\ Budget * TCRE$ |
| **Scope 3 Implied Temperature Rise** | $Relative\ Scope\ 3\ Budget\ Overshoot = \frac{Absolute\ Scope\ 3\ Budget\ Overshoot}{\text{Cumulative 2°C Scope 3 } Budget}$ | $ITR_{Scope3} = 2°C + Relative\ Scope\ 3\ Budget\ Overshoot * Global\ Budget * TCRE$ |
| **Aggregated Implied Temperature Rise** | $Relative\ Carbon\ Budget\ Overshoot = \frac{Absolute\ Scope\ 1\ Budget\ Overshoot + Absolute\ Scope\ 2\ Budget\ Overshoot + Absolute\ Scope\ 3\ Budget\ Overshoot}{Scope\ 1\ Budget + Scope\ 2\ Budget + Scope\ 3\ Budget}$ | $ITR_{Agg} = 2°C + Relative\ Carbon\ Budget\ Overshoot * Global\ Budget * TCRE$ |

*Source: MSCI ESG Research*

[45] Floored and capped at 1.3 and 10°C, respectively.



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## Portfolio Implied Temperature Rise

**Exhibit 26. Formulas to calculate the Implied Temperature Rise for portfolios**

| Portfolio Implied Temperature Rise Metric | Relative Portfolio Overshoot Formula | Implied Temperature Rise Formula[46] |
|---|---|---|
| **Portfolio Implied Temperature Rise Scope 1** | $Relative\ Portfolio\ Overshoot_{Scope1} = \frac{Portfolio\ Overshoot_{Scope1}}{Portfolio\ Budget_{Scope1}}$ | $ITR_{Scope1} = 2°C + Relative\ Portfolio\ Overshoot_{Scope1} * Global\ Budget * TCRE$ |
| **Portfolio Implied Temperature Rise Scope 2** | $Relative\ Portfolio\ Overshoot_{Scope2} = \frac{Portfolio\ Overshoot_{Scope2}}{Portfolio\ Budget_{Scope2}}$ | $ITR_{Scope2} = 2°C + Relative\ Portfolio\ Overshoot_{Scope2} * Global\ Budget * TCRE$ |
| **Portfolio Implied Temperature Rise Scope 3** | $Relative\ Portfolio\ Overshoot_{Scope3} = \frac{Portfolio\ Overshoot_{Scope3}}{Portfolio\ Budget_{Scope3}}$ | $ITR_{Scope3} = 2°C + Relative\ Portfolio\ Overshoot_{Scope3} * Global\ Budget * TCRE$ |
| **Portfolio Aggregated Implied Temperature Rise** | $Relative\ Portfolio\ Overshoot_{Agg} = \frac{Portfolio\ Overshoot_{Scope1} + Portfolio\ Overshoot_{Scope2} + Portfolio\ Oversho3t_{Scope1}}{Portfolio\ Budget_{Scope1} + Portfolio\ Budget_{Scope2} + Portfolio\ Budget_{Scope3}}$ | $ITR_{Agg} = 2°C + Relative\ Portfolio\ Overshoot_{Agg} * Global\ Budget * TCRE$ |

*Source: MSCI ESG Research*

[46] Floored and capped at 1.3°C and 10°C, respectively.



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## Scope 1 – Incorporation of NDC information

Nationally Determined Contributions (NDCs) are set by governments and provide insights into the pledged carbon reductions of countries, among other climate-related policies.

MSCI ESG Research analyzed all the submitted NDCs and performed normalization to arrive at consistent country-level reduction targets that can be used in the model. Additionally, MSCI ESG Research uses the information in the NDCs to estimate the sectoral "burden-sharing" of the national targets. Following this approach, we are then able to construct a table with absolute reduction amounts per country and sector, based on the NDCs.

According to the 2020 UNEP Gap Report, current policies are not ambitious enough to limit warming to 2°C.[47] The report presents the GHG gap between the 3°C, 2°C and 1.5°C global GHG-reduction scenarios. This means that to compute 2°C-aligned carbon intensity benchmarks per country and sector, the post-NDC national emission levels in 2030 must be linearly downscaled so that they meet a global 2°C emission level, as defined in the 2020 UNEP Gap Report (41,000 Mt/yr in 2030).

A decarbonization rate is calculated per country and sector. This is the relative difference between the NDC-based emissions and the 2°C emissions level (see 31 for an illustrative example).

**Exhibit 27. Calculation of 2°C decarbonization rates for the illustrative example**

*The decarbonization rate is calculated from the NDC emissions and the 2°C emission level per country and sector.*

| | Country A | | Country B | |
|---|---|---|---|---|
| | **Sector 1** | **Sector 2** | **Sector 1** | **Sector 2** |
| **NDC Emissions [Mt/yr]** | 1000 | 500 | 3000 | 4500 |
| **2°C Emission level [Mt/yr]** | 800 | 100 | 1000 | 3000 |
| **Decarbonization rate (1-(NDC-2°C emission level)/NDC** | 0.2 | 0.8 | 0.66 | 0.33 |

*Source: MSCI ESG Research*

[47] United Nations Environment Programme (2020). Emissions Gap Report 2020. Nairobi. (https://www.unep.org/emissions-gap-report-2020)



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In a next step, these decarbonization rates are applied to the current average emissions intensities by sector and country to compute the 2°C alignment carbon intensities (see Exhibit 32).

**Exhibit 28: Calculation of the 2°C alignment carbon intensities for the illustrative example**

| | Country A | | Country B | |
|---|---|---|---|---|
| | Sector 1 | Sector 2 | Sector 1 | Sector 2 |
| **Current average emission intensity [$t_{CO2e}$/mUSD]** | 100 | 2000 | 100 | 2000 |
| **Reduction rate** | (1-0.2) | (1-0.8) | (1-0.66) | (1-0.33) |
| **2°C alignment carbon intensities in 15 years [$t_{CO2e}$/mUSD]** | 80 | 400 | 33 | 1320 |

*Source: MSCI ESG Research.*

These 2°C-aligned carbon intensities are used to allocate the *Cumulative 2°C Scope 1 Budget* to companies, as described in Step 1: 2°C Carbon Budget.

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## Data points and definitions

### Exhibit 29. Implied Temperature Rise data factors and their definitions

| Factor Name | Factor | Definition |
|---|---|---|
| **TCRE Factor [°C/GtCO2e]** | TCRE | The Transient Response to Cumulative CO2 Emissions (TCRE) factor defines the relationship between the absolute additional emissions and temperature increase. This factor is used to compute the company- and portfolio-level temperature increase based on the company's or portfolio's emission budget overshoot. |
| **Global 2°C Carbon Budget [GtCO2e]** | GLOBAL_BUDGET | The Global 2°C Carbon Budget represents the total greenhouse gases available globally to limit global warming to 2°C from the modeling start year on. |
| **Implied Temperature Rise [°C]** | ITR | Implied Temperature rise (in the year 2100 or later), if the whole economy had the same over-/undershoot level of greenhouse gas emissions to the company analyzed, based on its most recent Scopes 1, 2 and 3 projected emissions. |
| **Implied Temperature Rise - Scope 1 [°C]** | S1_ITR | Implied temperature rise (in the year 2100 or later), if the whole economy had the same over-/undershoot level of greenhouse gas emissions to the company analyzed, based on its most recent Scope 1 projected emissions. |
| **Implied Temperature Rise - Scope 2 [°C]** | S2_ITR | Implied Temperature Rise (in the year 2100 or later), if the whole economy had the same over-/undershoot level of greenhouse gas emissions to the company analyzed, based on its most recent Scope 2 projected emissions. |
| **Implied Temperature Rise - Scope 3 [°C]** | S3_ITR | Implied Temperature Rise (in the year 2100 or later), if the whole economy had the same over-/undershoot level of greenhouse gas emissions to the company analyzed, based on its most recent Scope 3 projected emissions. |
| **Cumulative Projected Carbon Emissions (Scope 1, 2 and 3) with Targets [tCO2e]** | TOTAL_PROJECTED_EMISSIONS | A company's projected total greenhouse gas emissions until the year 2070 from the modeling start year onward. A company's emissions are projected by taking the current emissions (Scopes 1, 2 and 3, when available reported or estimated when not available) and, when available, the company's pledged climate targets into account. It is assumed that the targets will be met. |
| **Cumulative Projected Scope 1 Emissions with Targets [tCO2e]** | S1_PROJECTED_EMISSIONS | A company's projected total Scope 1 greenhouse gas emissions until the year 2070 from the modeling start year on. A company's emissions are projected by taking the current Scope 1 emissions (when available reported or estimated when not available) |



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| | | |
|---|---|---|
| | | and, when available, the company's pledged climate target to reduce Scope 1 emissions into account. It is assumed that the target will be met. |
| **Cumulative Projected Scope 2 Emissions with Targets [tCO2e]** | S2_PROJECTED_EMISSIONS | A company's projected total Scope 2 greenhouse gas emissions until the year 2070 from the modeling start year on. A company's emissions are projected by taking the current Scope 2 emissions (when available reported or estimated when not available) and, when available, the company's pledged climate target to reduce Scope 2 emissions into account. It is assumed that the target will be met. |
| **Cumulative Projected Scope 3 Emissions with Targets [tCO2e]** | S3_PROJECTED_EMISSIONS | A company's projected total Scope 3 greenhouse gas emissions until the year 2070 from the modeling start year on. A company's emissions are projected by taking the current estimated Scope 3 emissions and, when available, the company's pledged climate target to reduce Scope 3 emissions into account. It is assumed that the target will be met. |
| **Cumulative 2°C Carbon Budget (Scopes 1, 2 and 3) [tCO2e]** | TOTAL_BUDGET | The Cumulative 2°C Carbon Budget is the sum of total greenhouse gas emissions (Scopes 1, 2 and 3) available for the company to limit global warming to 2°C from the modeling start year on. |
| **Cumulative 2°C Scope 1 Budget [tCO2e]** | S1_BUDGET | The Cumulative 2°C Scope 1 Budget is the total Scope 1 greenhouse gas emissions available for the company to limit global warming to 2°C from the modeling start year on. The Cumulative 2°C Scope 1 Budget is derived by assessing a company's revenue breakdown using MSCI emission sector classification system. |
| **Cumulative 2°C Scope 2 Budget [tCO2e]** | S2_BUDGET | The Cumulative 2°C Scope 2 Budget is the total Scope 2 greenhouse gas emissions available for the company to limit global warming to 2°C from the modeling start year on. The Cumulative 2°C Scope 2 Budget is derived from an industry-specific (GICS® Industry Group) assessment. |
| **Cumulative 2°C Scope 3 Budget [tCO2e]** | S3_BUDGET | The Cumulative 2°C Scope 3 Budget is the total Scope 3 greenhouse gas emissions available for the company to limit global warming to 2°C from the modeling start year on. The Cumulative 2°C Scope 3 Budget is derived from sector-agnostic, revenue-based assessment. |
| **Relative Carbon Budget Overshoot [%]** | TOTAL_REL_OVERSHOOT | A company's relative carbon budget over/-undershoot for Scope 1, 2 and 3 emissions when comparing a company's projected Scope 1, 2 and 3 emissions to its emission budget available to limit global warming to 2°C. This is the difference of the Cumulative Projected Carbon Emissions with Targets compared with the Cumulative |

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| | | |
|---|---|---|
| | | 2°C Carbon Budget relative to the company's Cumulative 2°C Carbon Budget. A negative number corresponds to a budget undershoot and a positive number to a budget overshoot. |
| **Relative Scope 1 Budget Overshoot [%]** | S1_REL_OVERSHOOT | A company's relative Scope 1 budget over/-undershoot when comparing a company's projected Scope 1 emissions with its emission budget available to limit global warming to 2°C. This is the relative difference between the Cumulative Projected Scope 1 Emissions with Targets and the Cumulative 2°C Scope 1 Budget relative to the company's Cumulative 2°C Scope 1 Budget. A negative number corresponds to a budget undershoot and a positive number to a budget overshoot. |
| **Relative Scope 2 Budget Overshoot [%]** | S2_REL_OVERSHOOT | A company's relative Scope 2 budget over/-undershoot when comparing a company's projected Scope 2 emissions to its emission budget available to limit global warming to 2°C. This is the relative difference between the Cumulative Projected Scope 2 Emissions with Targets and the Cumulative 2°C Scope 2 Budget relative to the company's Cumulative 2°C Scope 2 Budget. A negative number corresponds to a budget undershoot and a positive number to a budget overshoot. |
| **Relative Scope 3 Budget Overshoot [%]** | S3_REL_OVERSHOOT | A company's relative Scope 3 budget over/-undershoot when comparing a company's projected Scope 3 emissions to its emission budget available to limit global warming to 2°C. This is the relative difference between the Cumulative Projected Scope 3 Emissions with Targets and the Cumulative 2°C Scope 3 Budget relative to the company's Cumulative 2°C Scope 3 Budget. A negative number corresponds to a budget undershoot and a positive number to a budget overshoot. |
| **Absolute Carbon Budget Overshoot [tCO2e]** | TOTAL_OVERSHOOT | A company's projected greenhouse gas emission over/-undershoot for Scopes 1, 2 and 3 emissions when comparing a company's projected Scope 1, 2 and 3 emissions with its emission budget available to limit global warming to 2°C. This is the difference in t CO2e between the Cumulative Projected Carbon Emissions with Targets and the Cumulative 2°C Carbon Budget. A negative number corresponds to a budget undershoot and a positive number to a budget overshoot. |
| **Absolute Scope 1 Budget Overshoot [tCO2e]** | S1_OVERSHOOT | A company's projected Scope 1 greenhouse gas emission over/-undershoot when comparing a company's projected Scope 1 emissions with its emission budget available to limit global warming to 2°C. This is the difference between the *Cumulative Projected Scope 1 Emissions with Targets* and the *Cumulative 2°C Scope 1* |

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| | | |
|---|---|---|
| | | *Budget*. A negative number corresponds to a budget undershoot and a positive number to a budget overshoot. |
| **Absolute Scope 2 Budget Overshoot [tCO2e]** | S2_OVERSHOOT | A company's projected Scope 2 greenhouse gas emission overshoot when comparing a company's projected Scope 2 emissions to its emission budget available to limit global warming to 2°C. This is the difference between the *Cumulative Projected Scope 2 Emissions with Targets* and the *Cumulative 2°C Scope 2 Budget*. A negative number corresponds to a budget undershoot and a positive number to a budget overshoot. |
| **Absolute Scope 3 Budget Overshoot [tCO2e]** | S3_OVERSHOOT | A company's projected Scope 3 greenhouse gas emission over/-undershoot when comparing a company's projected Scope 3 emissions to its emission budget available to limit global warming to 2°C. This is the difference between the *Cumulative Projected Scope 3 Emissions with Targets* and the *Cumulative 2°C Scope 3 Budget*. A negative number corresponds to a budget undershoot and a positive number to a budget overshoot. |
| **Implied Temperature Rise – Start-Year Model Horizon** | ITR_START_DATE | This is the first modeling year for the Implied Temperature Rise model. Both carbon budgets and emissions are projected from this year on. |
| **Implied Temperature Rise Band** | ITR_BANDS | ITR bands help classify ITR outputs by temperature ranges with clear alignment labels, from "1.5°C aligned" to "Strongly Misaligned." See relevant section in Implied Temperature Rise Methodology document for further detail on the design and rationale of these bands. |

*Source: MSCI ESG Research*

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