



# Implied Temperature Rise Methodology

MSCI ESG Research

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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 Intergovernmental Panel on Climate Change (IPCC) goal of limiting the global temperature increase in the year 2100, compared to pre-industrial levels, to 2°C.<sup>1</sup> Another important target is the 1.5°C limit, which was also popularized by 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.<sup>2</sup>

Key to understanding the Implied Temperature Rise is the concept of a carbon budget: how much the world can emit and, by extension, how much a company can emit (across Scopes 1, 2 and 3) and remain within the limitations required to meet a 2°C warming scenario by 2100. We use IPCC guidance to understand what the budgets need to be. Then we calculate companies' projected emissions out over the next five decades based on their emissions track record, stated reduction targets, and other data. A company whose projected emissions are below budget can be said to "undershoot" while those whose projected emissions exceed the budget "overshoot". The Implied Temperature Rise, expressed in degrees Celsius (°C), estimates the global implied temperature rise (in the year 2100 or later) if the whole economy had the same carbon budget over-/undershoot level as the company (or portfolio) in question.

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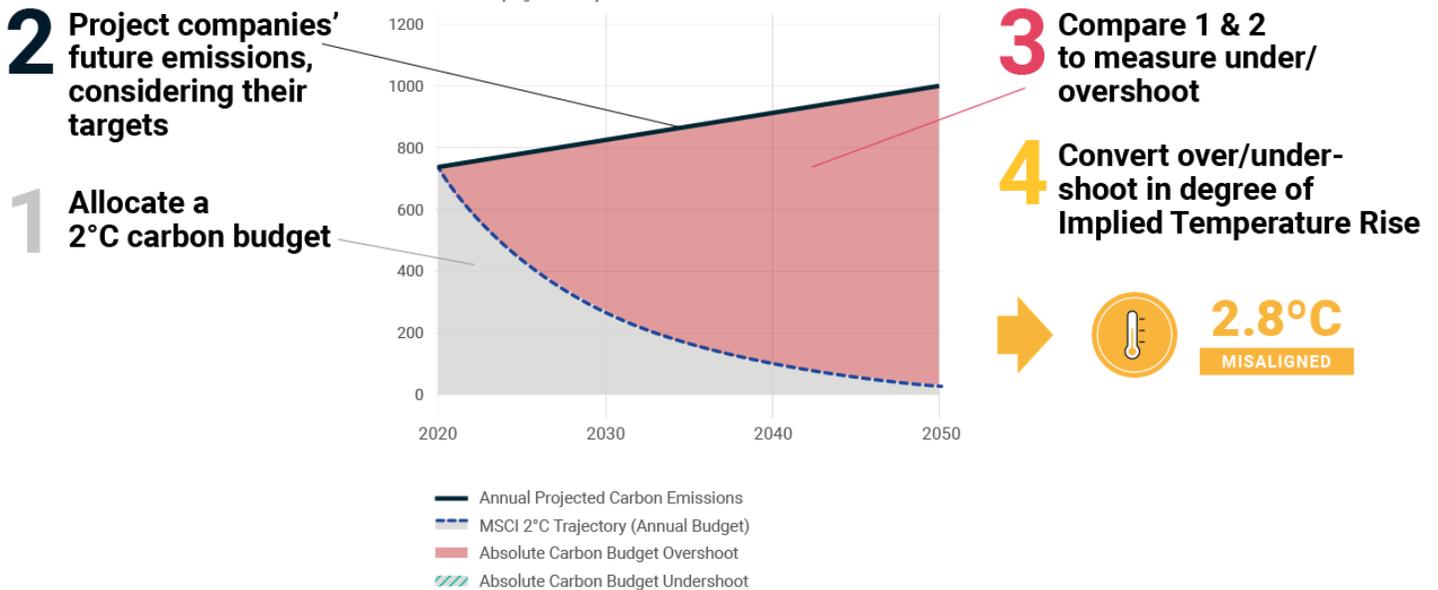
<sup>1</sup> Jessop, S., Green, M. "Climate change pushes investors to take their temperature." *Reuters*, Jan. 20, 2020

<sup>2</sup> Center for International Climate Research – The story of 1.5°C. (<https://cicero.oslo.no/en/understanding-one-point-five/the-story-of-15>)

## Company Implied Temperature Rise

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

**Exhibit 1: Modelling steps to compute the company Implied Temperature Rise.**



Source: MSCI ESG Research.

### 1. Allocate a 2°C carbon budget

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.<sup>3</sup> We allocate this global budget to individual companies based on their sector, country and business activities to determine 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 its carbon budget

We compute each company's carbon budget over-/undershoot by calculating

<sup>3</sup> The IPCC 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](https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter2_Low_Res.pdf), (in Table 2.2).

the difference between each company’s projected carbon emissions and its allocated 2°C budget. We then transform this to a relative over-/undershoot by dividing it by the allocated 2°C budget of the company.

#### 4. Convert the relative over/undershoot to a degree of temperature rise

We convert the relative emissions over-/undershoot to degrees of warming (in Celsius) using the science-based Transient Climate Response to Cumulative Emissions (TCRE) approach: *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. It is worth noting that we correct for the issue of double counting that arises when considering emissions beyond Scope 1 by calculating the relative over/undershoot of emissions (see [Double Counting Section](#) for more information).

## Portfolio Implied Temperature Rise

The portfolio-level Implied Temperature Rise compares the sum of “owned” projected GHG emissions against the sum of “owned” carbon budgets for the underlying holdings. The portfolio’s total estimated carbon budget over-/undershoot is then converted to a degree of temperature rise using the TCRE. Enterprise Value including Cash (EVIC) is used as a base to allocate companies’ emissions to investment portfolios to enable analysis of both equity and corporate bond portfolios.

### 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 Gt CO<sub>2</sub>.<sup>4</sup> In other words, for each GtCO<sub>2</sub> exceeding the global 2°C carbon budget, we can expect an additional ~0.000545°C warming over 2°C.

<sup>4</sup> The 2020 Measuring Portfolio Alignment Report recommends a TCRE factor of 0.000545°C warming per Gt CO<sub>2</sub> which is based on IPCC 2013 The Physical Science Basis report (<https://www.tcfhub.org/wp-content/uploads/2020/10/PAT-Report-20201109-Final.pdf>).

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.<sup>5</sup> 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 2020 Measuring Portfolio Alignment Report, the relationship from above can be used to derive following formula:

$$\text{Additional Warming} = \text{Relative company-level over/undershoot} \times \text{Global 2°C Budget} \times \text{TCRE Factor}$$

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

$$\text{Implied Temperature Rise} = 2^\circ\text{C} + \text{Relative company-level over/undershoot} \times \text{Global 2°C Budget} \times \text{TCRE Factor}$$

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 above formula, a TCRE factor of 0.000545°C/Gt CO<sub>2</sub> and a global 2°C budget of 1551Gt CO<sub>2</sub>e<sup>6</sup>, we estimate Implied Temperature Rise to be 2.42°C (2°C + 50%×1551 Gt CO<sub>2</sub>e×0.000545°C/Gt CO<sub>2</sub> = 2.42°C).

## Incorporating 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 timeframes. The methodology provides an assessment by scope and allows us to project the absolute emissions of a company if the target is fully realized.

<sup>5</sup> Based on the relationship presented in the 2020 Measuring Portfolio Alignment Report (<https://www.tcfhub.org/wp-content/uploads/2020/10/PAT-Report-20201109-Final.pdf>)

<sup>6</sup> Please see the section [Global 2°C Carbon Budget](#) for more details.

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