Implied Temperature Rise Methodology

MSCI ESG Research LLC

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1. Introduction

1.1. Overview

Implied Temperature Rise (ITR) is a forward-looking temperature alignment metric for companies and portfolios. Specifically, our ITR methodology evaluates if companies and portfolios are aligned with the Paris Agreement temperature goals[1] — in particular, the maximal goal of limiting global mean surface temperature to an increase no more than 1.5°C in the year 2100 compared with preindustrial levels.[2]

Limiting global warming to 1.5°C may help mitigate the catastrophic impact of climate change,[3] particularly for small island states, which are most threatened by sea level rise.[4] According to the Intergovernmental Panel on Climate Change (IPCC), preventing this situation is conditioned on the world economy reaching net-zero emissions by the year 2050[5] — hence the shorthand term "net-zero" to designate a 1.5°C-aligned transition alignment of the global economy. Today, net-zero is the reference goal for both policymakers and the financial industry, as reflected, for instance, in the commitments of the Glasgow Financial Alliance for Net Zero (GFANZ), representing more than 650 financial institutions.

Our ITR methodology has been designed to align with net-zero and follow best practice recommendations on measuring portfolio alignment set out by GFANZ in November 2022.[6] Appendix I summarizes these recommendations, rationales for diverging on a few of them, and the overall ITR metric's alignment.

The ITR methodology ('the Methodology') is not primarily designed to reflect climate transition risk. It is first and foremost a portfolio alignment metric. This means it is focused on the alignment between the projected emissions of companies and portfolios and a science-based temperature scenario.[7]

1.2. Interpretation and usage

The key to understanding ITR is the concept of a carbon budget, that is, how much the world can emit so that global warming doesn't exceed 1.5°C by 2100 and, by extension, how much a company can emit to take its fair share of global decarbonization. Indeed, ITR is about

[1] The Paris Agreement is an international treaty on climate change adopted by 196 Parties at the United Nations (UN) Climate Change Conference (COP21) in Paris, France. Its overarching goal is to keep global warming to well below 2°C, and aim for 1.5°C, compared to preindustrial levels.

[2] See article 2 of the Paris Agreement.

[3] "Urgent climate action can secure a liveable future for all." IPCC, March 20th, 2023.

[4] "Introducing 1.5: Politics first." Center for International Climate Research, November 11th, 2016.

[5] "Special Report: Global Warming of 1.5 ºC." IPCC, 2018.

[6] "Measuring Portfolio Alignment." GFANZ, November 2022.

[7] For a detailed description of what our various climate metrics measure and their potential use cases, please refer to the paper "Understanding MSCI's Climate Metrics", which is available on MSCI.com > https://www.msci.com/www/research-report/understanding-msci-s-climate/03589573881

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extrapolating the global implied temperature rise at a 2100 horizon if the entire economy had the same carbon budget overshoot or undershoot as a given company or portfolio.

The Methodology does not factor in the costs associated with the transition to a low-carbon economy (e.g., changes in values, carbon pricing). The methodology also does not factor in avoided emissions. This is due to the current lack of appropriate counterfactual scenarios and accounting standardization.

Modelling steps

Exhibit 1 illustrates ITR's main modelling steps, which are explained in further detail below.

Step 1 – Compute and roll over Net Zero 2050 carbon budgets. Using science-based scenario models from the Network for Greening the Financial System (NGFS), company-specific 1.55°C-aligned carbon budgets over the period 2020-2050 are derived.[8] For this, NGFS-based CO_2 equivalent (CO_2e)/USD intensity pathways are assigned first to each Greenhouse Gas Protocol (GHGP) scope of a company. These pathways are differentiated by sectors and regions, reflecting science-based decarbonization abilities. Multiplying these pathways by a company revenue breakdown by sector and region yields an initial absolute carbon budget over the 2020-2050 time frame, tailored to the company's size and sectoral/regional profile. Note that the investment activities of financial institutions (loan book, assets under management) have their own decarbonization intensity pathways, which are turned into company budgets through investment values (this is further detailed in the next section). Year after year, this initial budget is rolled over, that is, adjusted by subtracting the latest realized emissions (which spend the budget) and by market share. This means that each company-level budget has its own reference year, which is the year following the latest company budget rollover — the "year of current Implied Temperature Rise."

[8] Strictly speaking, the NGFS pathways' data add up to 1.55°C global warming at the 2100 horizon. MSCI ESG Research has used 1.5°C as a shorthand term throughout this document, the same way that NGFS refers to the pathways in its publications.

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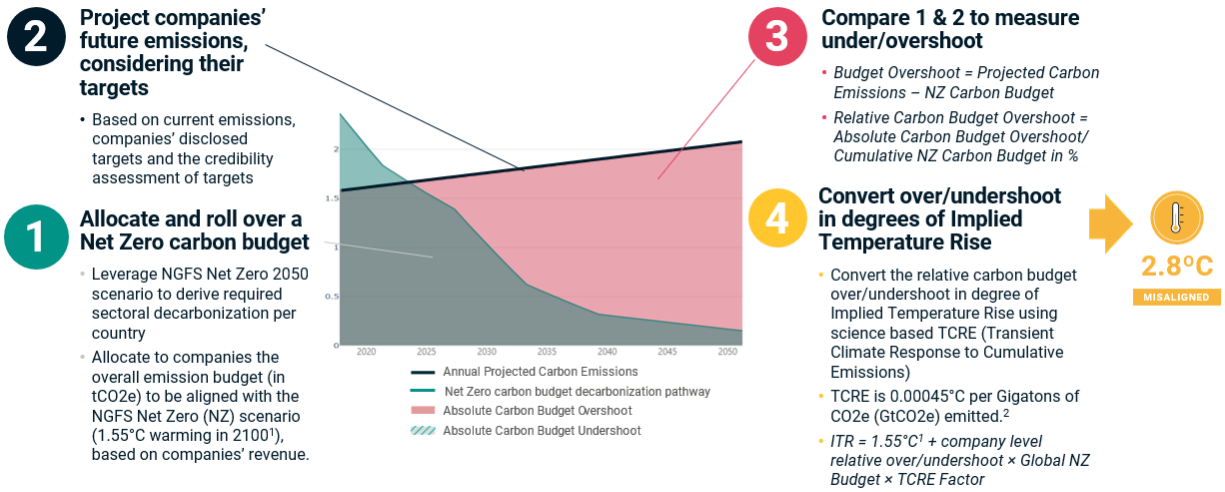
Exhibit 1: Key modelling steps of company-level ITR



Source: MSCI ESG Research. Note: This is an illustration, not based on actual data.
1) 1.55°C is the baseline temperature of the REMIND Net Zero 2050 NGFS scenario. Any overshoots/undershoots of the benchmark are relative to this 1.55°C baseline.
2) IPCC AR6 Report (Summary for Policymakers): "Each 1000 GtCO2 of cumulative CO2 emissions is assessed to likely cause a 0.27°C to 0.63°C increase in global surface temperature with a best estimate of 0.45°C"

Step 2 – Project company emissions with target credibility assessment. Here, future company emissions are projected. Emissions projections start from the year of current Implied Temperature Rise (e.g., 2021), and form a certain trajectory until 2050 based on company-stated climate targets (or lack thereof) and a credibility assessment. For company targets that are considered to lack credibility, future emissions are projected to be higher than what the company claims.

Step 3 – Calculate Net Zero 2050 budget over- or undershoot. The third modelling step is based on a simple alignment question– how a company's total projected emissions compare to its remaining budget. Companies whose projected emissions are cumulatively below the remaining carbon budget are said to "undershoot" while those with projected emissions exceeding the remaining budget "overshoot."

Step 4 – Convert into Implied Temperature Rise. The temperature impact of the company's over- or undershoot is extrapolated. The percentage of company budget over- or undershoot is applied to the global remaining carbon budget, and converted to a degree of temperature rise using the science-based transient climate response to cumulative emissions of carbon dioxide (TCRE) factor, expressed in °C/gigatons of CO_2 ($GtCO_2$).[9] The ITR output (in °C) estimates the likely level of global warming (in the year 2100 or later) if the global economy had the same carbon budget over- or undershoot level as the company, or portfolio, in question.[10] For example,

[9] "Special Report: Global Warming of 1.5 ºC." Intergovernmental Panel on Climate Change (IPCC), 2018.

[10] For more information on assumptions and interpretation of this value, see section 4.4.

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an ITR of 2.5°C indicates the company is exceeding its fair share of the remaining 1.5°C global carbon budget. If the whole economy exceeded the global budget by a similar proportion, the ITR methodology computes a global warming level of 2.5°C. Company-specific ITRs are meaningfully aggregable into a portfolio-level ITR based on the specific companies that constitute the portfolio. This portfolio-level ITR reflects the temperature contribution of all financed company overshoots weighted by the sum of all financed company budgets. An ITR for the entire portfolio is similarly derived through a TCRE factor.

This methodology document details the calculations behind each of these aspects.

ITR Bands

ITR outputs can take many values between 1.3°C and 10°C. For ease of comparison among various company Implied Temperature Rises, we define Implied Temperature Rise bands that encompass temperature ranges with clear alignment labels, from "1.5°C aligned" to "Strongly Misaligned."

Alignment is defined by the two temperatures set by the Paris Agreement climate goals (of +1.5°C and +2°C global mean temperature increase compared with preindustrial levels).[11]

Misalignment, consequently, corresponds to any ITR 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 Regionalized Model of Investments and Development (REMIND) NGFS "Current Policies" scenario that corresponds to the first category of misalignment yields a (rounded) 3.2°C temperature at the 2100 horizon, which helps to draw the line with the second category.[12]

Exhibit 2 below describes the ITR Bands.

Exhibit 2: Overview of ITR Bands

	ITR Band	Range (°C)	Description
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 those of most companies/portfolios.
	Misaligned	> 2.0–3.2	This company/portfolio does not align with the Paris Agreement goals. Its pace of decarbonization is too slow to mitigate catastrophic climate change. The threshold is determined by the REMIND NGFS "Current policies" scenario, yielding an estimated increase of 3.24°C at the 2100 horizon (rounded 3.2°C).
ALIGN	**2°C Aligned**	> 1.5–2.0	This company/portfolio aligns with the Paris Agreement's minimum objective of a +2°C global mean temperature

[11] See Article 2 of the Paris Agreement.

[12] "NGFS Climate Scenarios Database: Technical Documentation V3.1." Intergovernmental Panel on Climate Change (IPCC), September 2022.

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			compared with preindustrial levels.[13] It is engaged in the low-carbon transition.
	1.5°C Aligned	<=1.5	This company/portfolio aligns with the Paris Agreement's maximal objective of keeping global mean temperature to +1.5°C compared with preindustrial levels. It is a transition leader, significantly contributing to mitigating catastrophic climate change.

Source: MSCI ESG Research (2024), NGFS (2022).

[13] See article 2 of the Paris Agreement.

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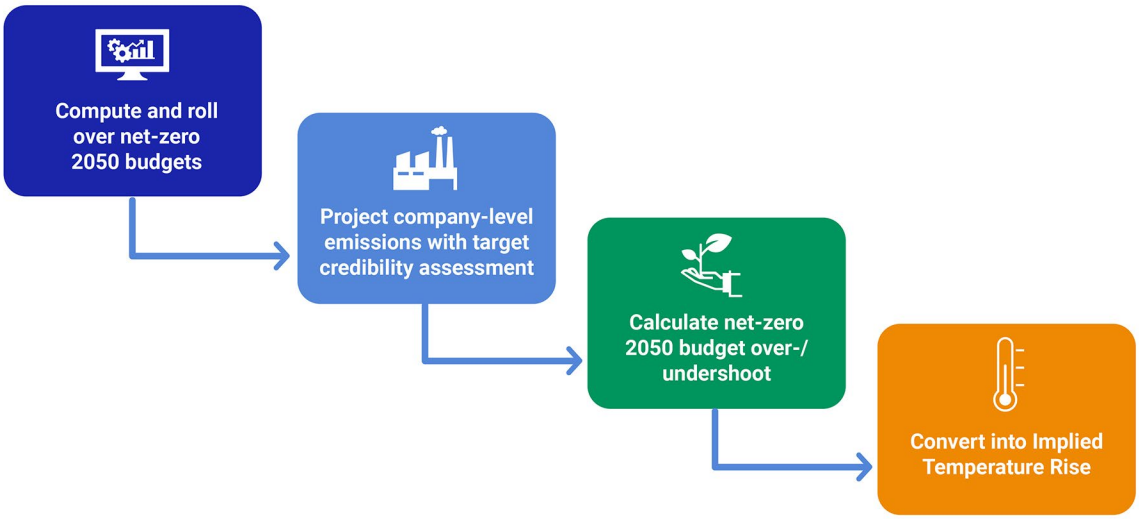
2. Methodology: Company-level

The ITR methodology is characterized by four main modelling steps, as illustrated in Exhibit 3, below. A comprehensive overview of the computation process of ITR is provided in Appendix III.

Exhibit 3: Block diagram representation of a company-level ITR model



Source: MSCI ESG Research, 2024.

2.1. Compute and roll over Net Zero 2050 budgets

Companies are allocated an initial absolute carbon budget for Scope 1, 2 and 3 emissions for the time frame 2020-2050 by first establishing sectoral decarbonization pathways, and then converting those into company-level budgets, using revenue or investment values as a proxy for fair-share budget allocation. This initial carbon budget is rolled over to the following years by subtracting realized emissions for those years and adjusting for market share.

Exhibit 4: Modelling steps of computation and rollover of Net Zero 2050 budgets

Steps		Description
1	**Initial Net Zero 2050 carbon budget**	Allocate an initial carbon budget by using sector- and region-specific Net Zero 2050 decarbonization intensity pathways and revenue / investment values as proxy for fair-share budget allocation
1.1	NGFS-based decarbonization pathways differentiated by sector and region	Establish decarbonization pathways differentiated by sector, region, loan book and assets under management (AUM) by leveraging NGFS's Net Zero 2050 scenario and sectoral carbon intensities
1.2	Company-level decarbonization intensity pathways	Derive company-level decarbonization intensity pathways by taking the company's revenue breakdown by sector and region into account, as well as company investment activities

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1.3	Company-level initial Net Zero 2050 carbon budgets	Compute company's initial Net Zero 2050 carbon budget by multiplying the decarbonization intensity pathways (tCO_2/millions USD) by company revenue and investment value (millions USD), broken down by sector and region
2	**Budget Rollover**	Update the company-level Net Zero 2050 carbon budgets year by year, considering evolving market share and recent company emissions
2.1	Market share adjustment	Adjust remaining company carbon budget based on company market share gain/loss within the relevant sector
2.2	Deduction of realized emissions	Subtract latest realized emissions from the company's remaining Net Zero 2050 budget

Why the remaining 1.5°C global carbon budget cannot be sliced into company-level budgets

The ITR methodology allocates carbon budgets to assign an implied temperature rise to companies. Such carbon budgeting is necessary because climate change is a result of the cumulative sum of absolute emissions in the atmosphere: the higher this cumulative sum, the higher the global temperature will rise. The IPCC refers to the carbon budget concept as the cumulative global emissions that would, with a certain probability, result in a certain temperature rise- for instance, 1.5°C.[14] The ITR methodology relies on 1.5°C-aligned global budget data provided in the REMIND-MagPie Net Zero 2050 scenario of the NGFS (phase 3). More details on the use and limitations of this scenario are provided in section 4.

However, directly slicing the remaining global absolute carbon budget into company-level budgets is extremely challenging, if not impossible, because the remaining global carbon budget is expressed in the amount of real-world emissions, while the Greenhouse Gas Protocol (GHGP) involves breaking down emissions attributed to a given company into several GHGP scopes, some of which double count emissions — that is, the Scope 2 and Scope 3 emissions of a given company include the emissions of other companies.[15]

Exhibit 5: Emissions scopes definitions and their double counting

Scope of emissions	Definition	Double counting
Scope 1	Emissions from owned or controlled sources	No
Scope 2	Indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed	Yes
Scope 3	All other indirect emissions that occur in a company's value chain	Yes

Source: GHGP

[14] "Special Report: Global Warming of 1.5 ºC." IPCC, 2018.

[15] Additionally, distributing the appropriate company-level budgets from the global budget would entail considering the fair share of every possible emitting entity, including private and government organizations. This is a considerable challenge.

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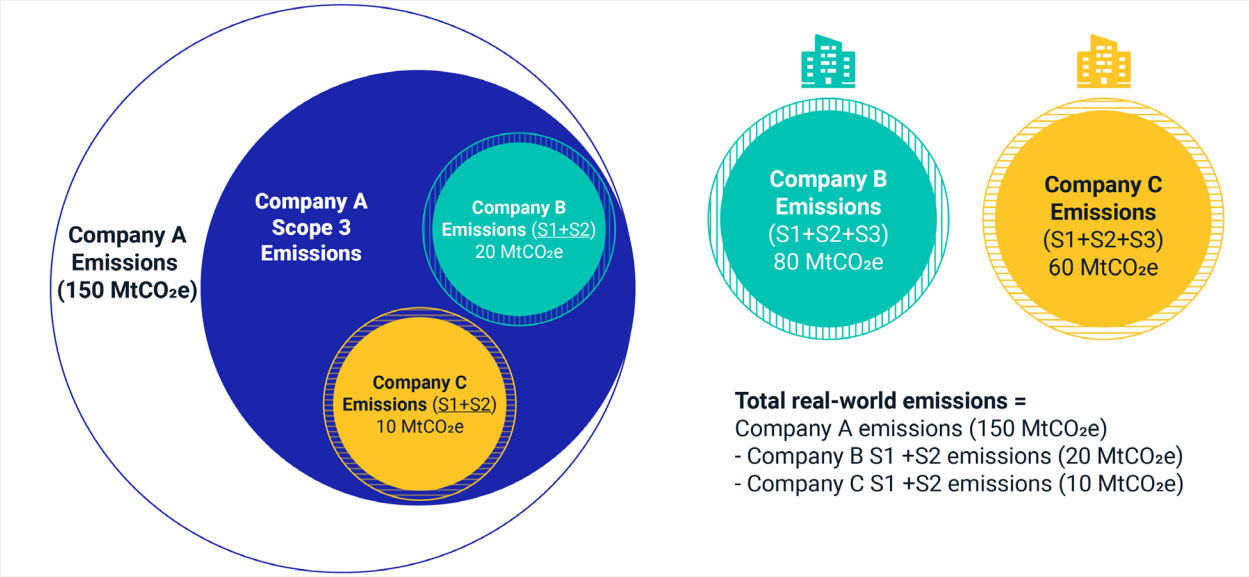
Exhibit 6 shows emissions of three companies through a GHGP lens where Scope 1 and Scope 2 emissions of company B and company C are counted twice — first, as part of their own emissions, and second as part of company A's Scope 3 emissions.

As a result of this accounting feature of double counting, the cumulative sum of companies' emissions according to the GHGP is higher than real-world aggregate emissions. Conversely, it is an impossible task to start from the global (real-world) emissions budget and slice it apart to allocate a fair share of it company by company — the global budget does not account for Scope 2 and Scope 3 emissions. For these scopes, the level of emissions always depends on the emissions of a company's specific counterparties, be they local energy grids or raw material suppliers.

Exhibit 6: Scope 3 double counting challenge (illustrative representation)



Source: MSCI ESG Research, 2024.

Compute initial Net Zero 2050 carbon budgets

We use the fair-share carbon budget approach recommended in the GFANZ portfolio alignment best practice report to allocate a Scope 1, 2 and 3 emissions budget to individual companies.[16] In the fair-share carbon budget approach, sectoral intensity decarbonization pathways are defined and aligned with a certain temperature (1.5°C in our current ITR approach) before converting them into absolute emissions reductions required across the scopes. Through such conversion, the approach preserves a direct link to the science-based concept of the carbon budget, that is, the cumulative amount of emissions until global net-zero that would result in 1.5°C of global warming, with a certain probability.[17]

The decarbonization intensity pathways are constructed by emissions sector and country for all scopes using the REMIND NGFS Net Zero 2050 scenario. Based on this scenario, if all sectors (and

[16] See Key Judgement 1 in "Measuring Portfolio Alignment." GFANZ, November 2022.

[17] "Special Report: Global Warming of 1.5 ºC." IPCC, 2018.

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thus all companies in these sectors) followed the pathways, the world would be on a 1.5°C trajectory with a probability higher than 50%.

Derive the benchmark decarbonization rates from the REMIND NGFS Net Zero 2050 scenario

There are many different sectoral pathways aligned with 1.5°C. They reflect the fair share of decarbonization efforts of different parts of the global economy.

Sectors and regions cannot realistically decarbonize at the same rate. Some sectors are harder to decarbonize. Some economies rely more on fossil fuels than others. The pathways which are chosen to benchmark companies, therefore, must reflect differences in decarbonization feasibility between sectors and regions, and between developed and emerging economies.[18]

Such differentiated, science-based pathways are retrieved from the REMIND NGFS Net Zero 2050 scenario, which is aligned with a 1.5°C temperature at the 2100 horizon. For any scope, a specific pathway can be tailored using a combination of parameters, as set out in Exhibit 7.

Exhibit 7: NGFS parameters used by the ITR pathway modelling

Parameters	Values
Scenario (single-scenario approach[19])	REMIND Net Zero 2050, Phase 3
Sector (S1, S2, S3)	Agriculture; cement; chemicals; commercial; oil & gas; steel; transportation; utilities; other industry
Region (S1, S2)	Canada, New Zealand, Australia, China, countries from the reforming economies of the former Soviet Union, European Union – 28 countries, India, Japan, Latin America and the Caribbean, Middle East, North Africa, Central Asia, non-EU 28 Europe, other Asia, Sub-Saharan Africa, United States of America

Source: NGFS (2022)

To derive the required decarbonization rates, first, emissions data in megatons of CO_2 ($MtCO_2$) and GDP in USD billions as estimated by the NGFS for the 2020-2050 ITR time frame are retrieved. This is combined to create a 2020-2050 emissions intensity pathway, as illustrated in Exhibit 8. The emissions intensity pathway is obtained from dividing the CO_2 emissions pathway by the GDP pathway ($MtCO_2e$/USD billion). It tells how much a sector in a region needs to decarbonize, adjusted for economic growth.

[18] See Key Judgement 2 in "Measuring Portfolio Alignment." GFANZ, November 2022.

[19] GFANZ recommends such a single-scenario approach as it is simpler to implement and its assumptions are easier to understand than other benchmark-selection approaches. See Key Judgement 1 in "Measuring Portfolio Alignment." GFANZ, November 2022.

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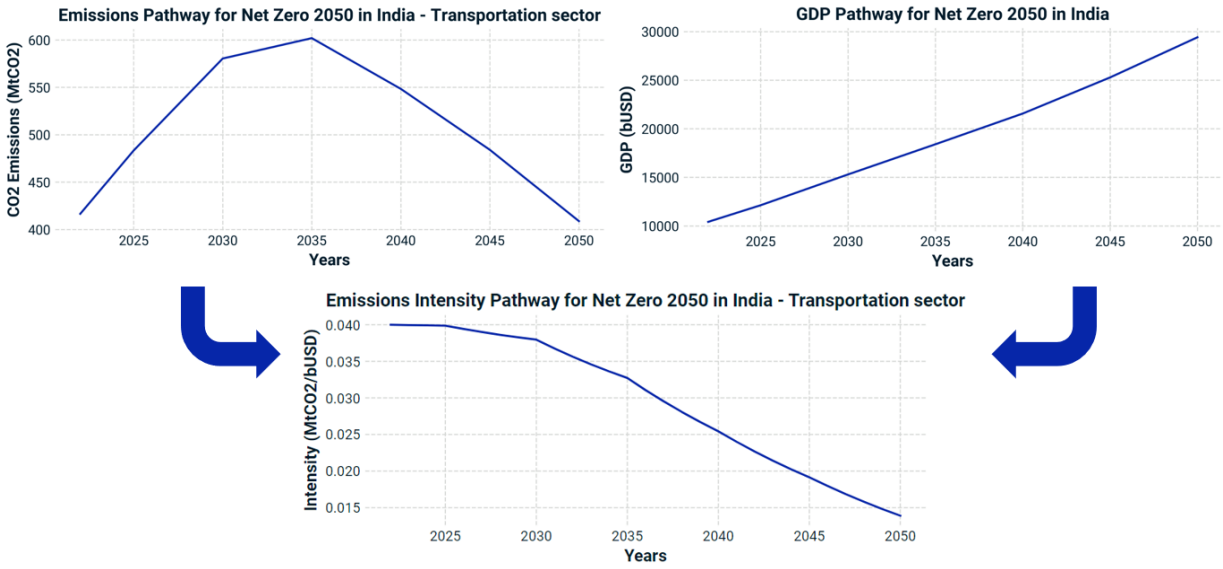
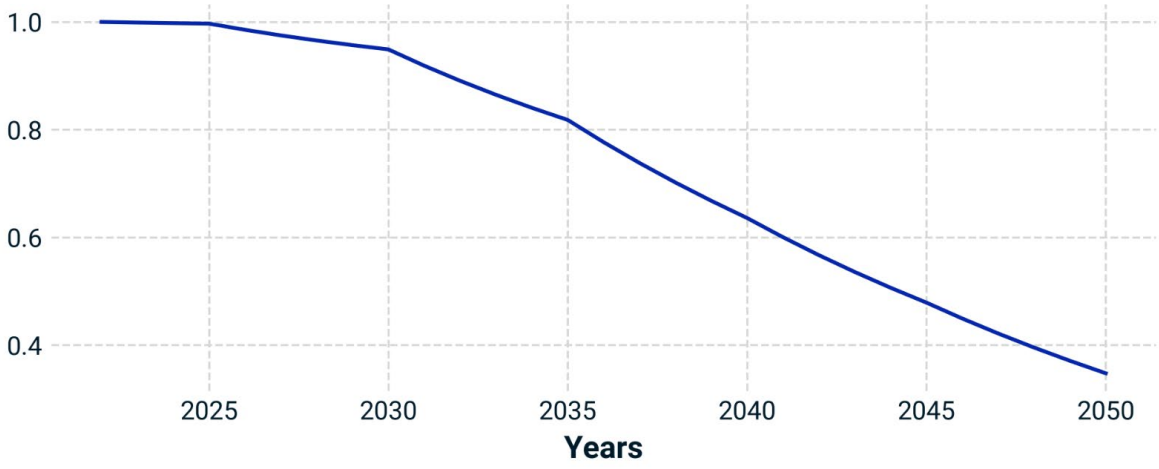
Exhibit 8: Extraction of REMIND NGFS Net Zero 2050 intensity pathway using the transportation sector in India as an example.



Source: NGFS (2022), MSCI ESG Research (2024).

The decarbonization rate is then normalized, that is, the 2020 starting point is set to 100%, and the yearly timeseries of intensities are divided by the first year to obtain the normalized rate of emissions reduction. This provides an insight into how much each sector and region needs to decarbonize relative to a 2020 baseline.

Exhibit 9: Normalized REMIND NGFS Net Zero 2050 decarbonization relative to 2020. The transportation sector in India is considered here as an example.



Source: MSCI ESG Research, 2024.

Create downscaled decarbonization rates

Downscaling NGFS data to granular sectors and countries enables further benchmark differentiation.

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Based on NGFS data, we define broad NGFS sectors (a total of 9) which are downscaled to the MSCI emissions sectors (a total of 42), as shown in Exhibit 10. In addition, sectoral pathways are differentiated by NGFS regions (a total of 12) which are downscaled to countries. In other words, the decarbonization rate of a pathway for, for example, road transport in the United States is not the same as the pathway for India.

Exhibit 10: Mapping NGFS sectors to MSCI Emissions Sectors

NGFS sectors[20]	MSCI emissions sectors (with some groupings specific to ITR[21])
Agriculture	Forestry
	Livestock
	Crop farming
	Fishing
Cement	Cement
Chemicals	Petrochemicals
	Other chemicals
Commercial	Commercial
	Distribution and transmission
	Other utility services
	Residential
Energy Supply	Coal mining
	Integrated oil & gas[22]
	Natural gas
	Oil production
	Other mining
	Petroleum refining
Other Industry	Wastewater treatment & discharge
	Solid waste disposal
	Other waste
	Water distribution
	Construction
	Other mining
	Other non-metallic minerals
	Paper, pulp & printing
	Light manufacturing
	Heavy manufacturing

[20] MSCI ESG Research defines these sectors based on relevant NGFS data. For instance, the broad utilities sector is based on the Emissions|CO2|Energy|Supply|Electricity pathway data of the REMIND Net Zero 2050 NGFS scenario.

[21] The first ITR-specific grouping consists of a single sectoral pathway for electricity generation: This includes the electricity generation sectors, such as solar, oil, gas, coal, geothermal, hydroelectric, nuclear, wind and other renewables. The rationale is that all electricity generation types should be assessed against the same benchmark. Secondly, a single sector pathway for fossil-fuel production is used. This involves grouping MSCI ESG Research's oil production, coal mining and natural gas emissions sectors. The rationale is that the production of fossil fuels should be assessed against the same benchmark independent of the fossil-fuel source.

[22] We designate this category defined under the Global Industry Classification Standard (GICS®)". GICS is the global industry classification standard jointly developed by MSCI and S&P Global Market Intelligence. MSCI ESG research considers the integrated oil & gas sub-industry reflects a distinct business model that requires its own decarbonization benchmark to differentiate peers by carbon intensity, rather than a collection of various MSCI sectors pathways depending on the companies' sectoral breakdown. When this document refers to MSCI emissions sectors, it also refers to this specific GICS® category, for ease of reading.

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	High tech manufacturing
	Food, beverage and tobacco
	Other non-ferrous metals
	Aluminum
	Lime
	Glass
Steel	Ferroalloys
	Iron and steel
Transportation	Road transport
	Rail
	Pipeline transport
	International maritime
	International aviation
Utilities	Electricity generation (solar, oil, gas, coal, geothermal, hydroelectric, nuclear, wind, other renewables).

Source: MSCI ESG Research (2024), NGFS (2022)

In addition to these sectoral pathways, we designed pathways to benchmark the decarbonization of investment activities (Scope 3 category 15) separately from the rest of Scope 3 categories. Scope 3 category 15 captures emissions which a financial institution finances through its lending and investment activities (portfolio-financed emissions). For example, a portion of the emissions of a company that receives a loan from a financial institution is captured in this scope 3 category. This design enables defining companies' fair shares of decarbonization in portfolio-financed emissions terms.

Exhibit 11: Mapping NGFS sectors to investment activities

NGFS sectors	Investment activities
Commercial	Loan book
	Assets under management (AUM)

For the downscaling, NGFS broad sectors are mapped to the MSCI emissions sectors and the emissions scopes' average intensities within each sector (Scope 1, Scope 2, Scope 3) and investment activities (Scope 3 only). Exhibit 1 outlines the mappings.

Exhibit 12: Mapping the decarbonization rates

Scope of Emissions	Details
Scope 1	For Scope 1, each NGFS broad sector's decarbonization rates is mapped to more granular MSCI emissions sectors. The NGFS regions are mapped to countries. See Exhibit 7 and Exhibit 10 for details. The rationale is that the decarbonization intensity of Scope 1 (from sources owned or controlled by the company) is strongly influenced by the company's sector and region.

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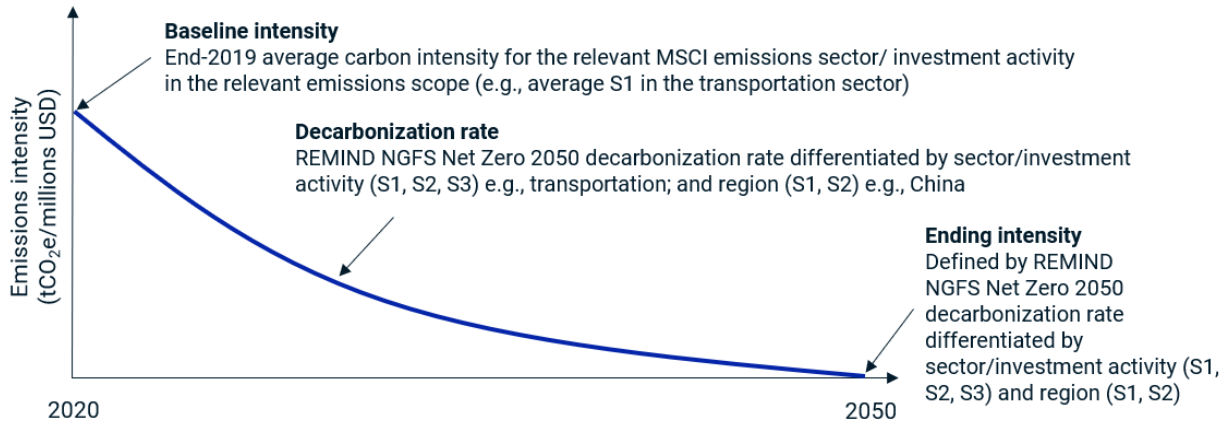
Scope 2	For Scope 2, the decarbonization rates follow the NGFS utilities sector, differentiated by region. The rationale is that the decarbonization intensity pathway linked to emissions from the energy grid should be consistent with the NGFS assumption about 1.5°C-aligned decarbonization of the grid.
Scope 3	For Scope 3, each NGFS broad sector's decarbonization rates is mapped to more granular MSCI emissions sectors / investment activities (loan book, AUM). See Exhibit 10 for details. Decarbonization rates are not differentiated by region, as Scope 3 designates emissions from value chains that are typically global for the companies assessed by ITR. Scope 3 upstream and downstream emissions involve complex multinational value chains that cannot be captured by the revenue breakdown of a company (e.g., the fact that a road transport company sells cars in the U.S. and in Europe doesn't indicate the geographical composition of its supply chains, which might be different). Note that Scope 3 emissions that are unrelated to investment (categories 1 to 14) are associated with a specific sector (e.g., the pathway corresponding to Scope 3 categories 1 to 14 in the *commercial* sector). By contrast, investment activities (Scope 3 category 15) not associated with a particular sector are benchmarked against the same pathway.

Source: MSCI ESG Research, 2024.

The normalized NGFS decarbonization rates are then combined with the baseline intensity for each MSCI emissions sector/investment activity and scope of emissions to construct sectoral decarbonization pathways that are differentiated by region (except for Scope 3). This baseline intensity is defined as the average emissions intensity of any MSCI emissions sector/investment activity based on late 2019 data, to match the January 1, 2020 start of the normalized NGFS pathway.

Exhibit 13: Illustrative decarbonization intensity pathway 2020-2050 for a given scope of emissions



Source: MSCI ESG Research, 2024.
Note: This is an illustration that is not based on actual company data.

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This brings the number of decarbonization intensities in the ITR pathway modelling to more than 1,400, as the pathways vary depending on the emissions scopes (of which there are 3), regions (of which there are 12) and emissions sectors (of which there are 42) and investment activities (of which there are 2). This granularity is a desired feature of nuanced transition benchmarking.

Calculate the pathway baseline intensities

The sector intensity, as of late 2019, is calculated based on carbon emission and revenue data of companies included in the MSCI ACWI Investable Market Index (IMI). An average baseline intensity is computed for each of the granular MSCI emissions sectors (for example, road transport) and investment activities (for example, AUM).

Exhibit 14: Formula for scopes of emissions

Scopes of emissions	Formula	Further details
Scope 1	$\frac{\sum MSCI\ ACWI\ IMI_i\ Scope\ 1\ emissions\ end-2019}{\sum MSCI\ ACWI\ IMI_i\ USD\ revenue\ end-2019}$	Exclusion of the top 1% most carbon-intensive outliers.[23] All various electricity generation sub-sectors (e.g., renewables, coal) are averaged into a utilities-wide data point[24]
Scope 2	$\frac{\sum MSCI\ ACWI\ IMI_i\ Scope\ 2\ emissions\ end-2019}{\sum MSCI\ ACWI\ IMI_i\ USD\ revenue\ end-2019}$	Exclusion of the top 1% most carbon-intensive outliers
Scope 3	Scope 3 category 1-14: $\frac{\sum MSCI\ ACWI\ IMI_i\ Scope\ 3\ emissions\ end-2019}{\sum MSCI\ ACWI\ IMI_i\ USD\ revenue\ end-2019}$ Scope 3 category 15: Loan book: $\frac{\sum MSCI\ ACWI\ IMI_i\ loan\ book\ financed\ emissions\ end-2019}{\sum\ MSCI\ ACWI\ IMI_i\ loanbook\ value\ end-2019}$ Assets under management (AUM): $\frac{\sum MSCI\ ACWI\ IMI_i\ AUM\ financed\ emissions\ end-2019}{\sum\ MSCI\ ACWI\ IMI_i\ AUM\ value\ end-2019}$	Exclusion of the top 1% most carbon-intensive outliers in MSCI emissions sectors for Scope 3 category 1-14 Historical company data for Scope 3 emissions are backdated to 2020 using MSCI ESG Research's most up-to-date Scope 3 estimation model. This is to reflect improvements in the approach to estimating Scope 3 emissions. Scope 3 category 15 investment activities' baseline intensities are not sector-specific and not based on revenue, but instead on value invested.

Source: MSCI ESG Research, 2024.

[23] Within MSCI emissions sectors, the top 1% most carbon-intensive companies are excluded in computing averages. Such outliers are often present in the sectoral groupings, skewing upwards the sectoral average intensity, misrepresenting the central tendency of the sector and making the decarbonization intensity pathway easier to meet for most sector peers.

[24] Scope 1 electricity generation sectors' pathways are averaged into a single value for utilities companies. This approach means any utility engaged in more carbon-intensive electricity generation as per the MSCI emission sectors classification (e.g., coal-fired electricity) is benchmarked against an average Scope 1 intensity including less carbon-intensive generation activities (e.g., nuclear power).

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Impute the pathway ending intensities

The ending intensities of the intensity decarbonization pathways (i.e., where they end at the 2050 horizon) are implied by the NGFS decarbonization rates, relative to the 2020 baseline.

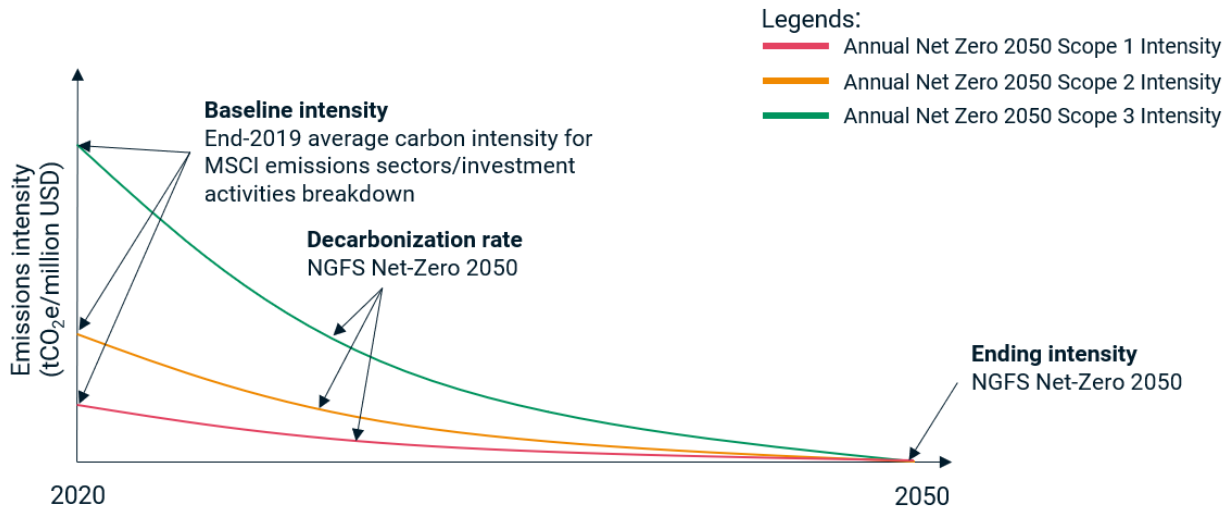
For instance, the NGFS Oil & Gas decarbonization pathways imply that the sector as a whole would be carbon negative before 2050 (i.e., capturing more emissions than it emits through carbon dioxide removal technology). Some emerging economies would still be carbon positive (i.e., emitting more carbon than at the 2050 horizon), as more developed economies help bridge the gap with a net-zero world.

Derive company-level Net Zero 2050 decarbonization intensity pathways

This is the next step towards building in company-level Net Zero 2050 carbon budgets.

For each scope of emissions (Scope 1, 2 and 3), a company is assigned decarbonization intensity pathways reflecting its exposure to various sectors/investment activities. The decarbonization intensity pathways are expressed in CO_2e/USD, which expresses the fair share of emissions a company can emit given its revenue (a proxy for size) while still being aligned with 1.5°C. This approach enables company-level carbon budgets to be built consistent with the GHGP. Thus, any given company is assigned three decarbonization intensity pathways, summarized in Exhibit 15.

Exhibit 15: Decarbonization intensity pathways for a given company (illustrative example)



Source: MSCI ESG Research, 2024.
Note: This is an illustration which is not based on an actual company data.

A company's decarbonization intensity pathway is a weighted average of the revenue share in each sector and the corresponding sector pathway (MSCI emissions sector classification) or investment activity pathway. For example:

- If a company generates 100% of its revenue from, for example, the U.S. aluminum sector, the company's decarbonization intensity pathways (Scope 1, Scope 2, Scope 3) will correspond to the U.S. aluminum pathway.

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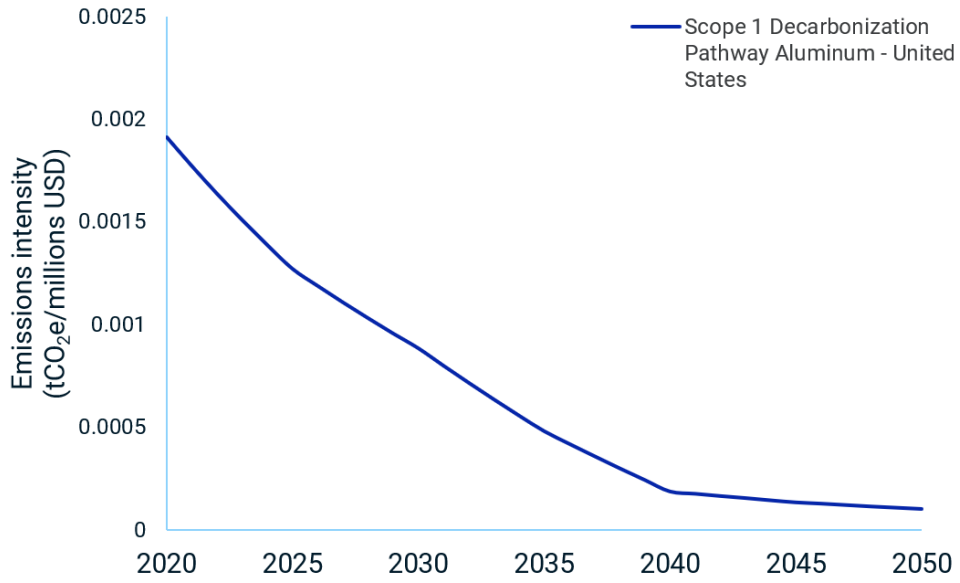
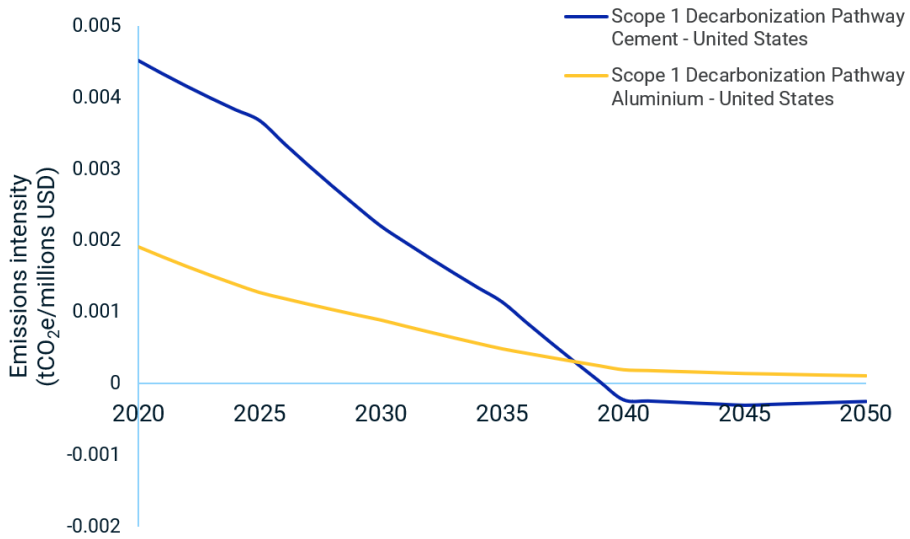
Exhibit 16: Scope 1 decarbonization intensity pathways: simple company (illustrative example)



Source: MSCI ESG Research, 2024.

- Sectoral diversification is also considered in such cases as when a company generates 40% of its revenue from aluminum in the U.S. and the remaining 60% from cement, also in the U.S. The weighted average of two sectoral decarbonization intensity pathways is used based on scopes of emissions. In other words, Scope 1 will be benchmarked against the sectoral decarbonization pathway of U.S. aluminum, that is, 40%, and the sectoral decarbonization pathway of U.S. cement, that is, 60%.

Exhibit 17: Scope 1 decarbonization intensity pathways: diversified company (illustrative)



Source: MSCI ESG Research,2024.

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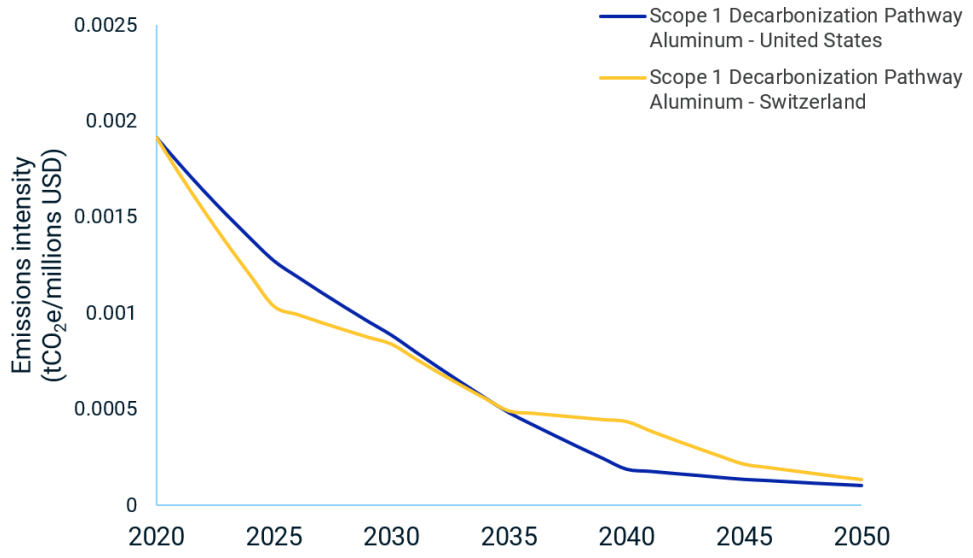
- Geographic diversification is also considered for Scope 1 and Scope 2. If, for example, a company generates 40% of its revenue from the Swiss aluminum sector and the other 60% of its revenue from the U.S. aluminum sector, the weighted average of two sectoral decarbonization intensity pathways is used based on scopes of emissions. In other words, Scope 1 will be benchmarked against the sectoral decarbonization pathway of the Swiss aluminum sector (40%), and the sectoral decarbonization pathway of the U.S. aluminum sector (60%).

Exhibit 18: Scope 1 decarbonization intensity pathways: multinational company (illustrative)



Source: MSCI ESG Research, 2024.

Sample calculation

Assume that there are three decarbonization intensity pathways assigned to a company. For ease of reading, the fictitious company in this walkthrough analysis generates 100% of its revenue from the road transport sector in India. (A more diversified/international company would be assigned various pathways based on the country and sector breakdown of the company's revenue.)

- **The Scope 1 decarbonization intensity pathway is fully regional- and sectoral-differentiated.**

  This is because this type of emissions (from owned or controlled sources by the company) is strongly influenced by the company's sector and region.

  For this company, the pathway starts from the average end-2019 intensity for the global MSCI emissions sector "road transport" and takes the NGFS decarbonization rate determined by the NGFS region (India) and NGFS broad pathway sector (transportation). It ends up close to zero, following the NGFS's implied decarbonization rate.

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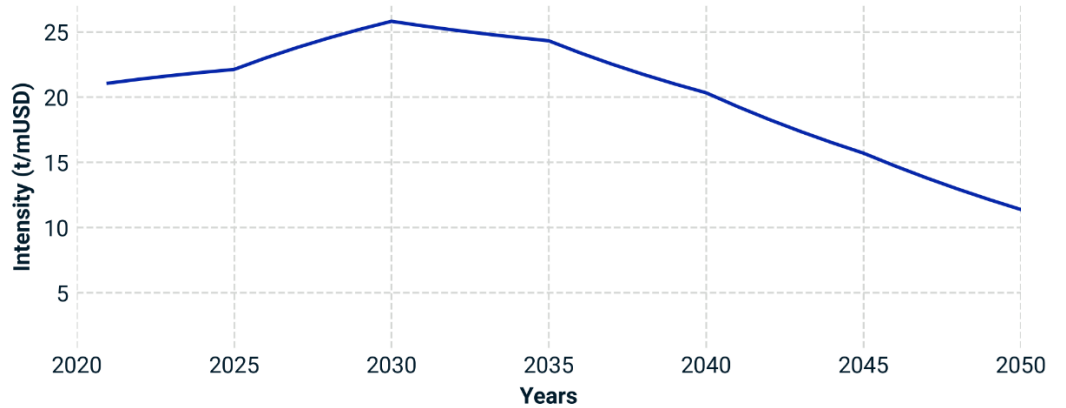
Exhibit 19: Scope 1 India road transport decarbonization intensity pathway

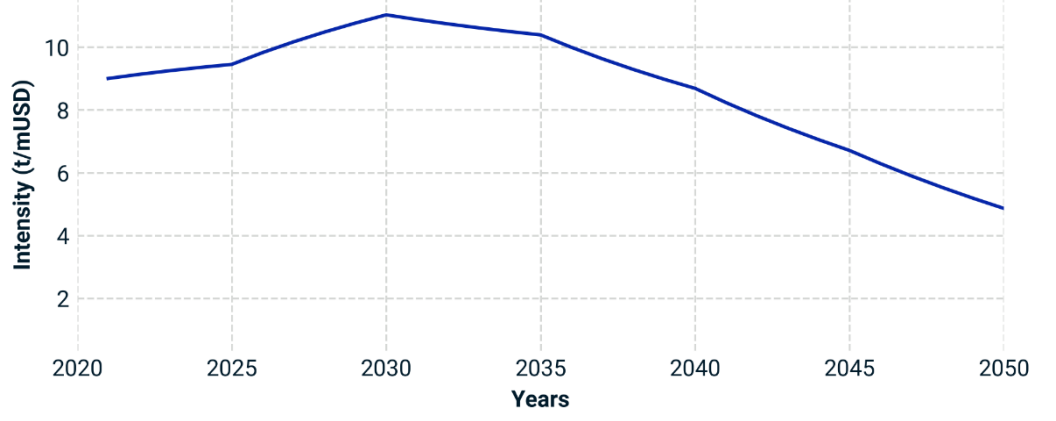


Source: MSCI ESG Research, 2024.

- **The Scope 2 decarbonization intensity pathway takes the shape of the NGFS India utilities sector, while starting from the average Scope 2 intensity specific to road transport (MSCI emissions sector).**

  Indeed, Scope 2 represents emissions from purchased electricity, steam, heating, and cooling. So, to benchmark Scope 2 decarbonization on a forward-looking basis, it must be consistent with the energy grid's decarbonization assumptions made by the REMIND NGFS Net Zero 2050 scenario. The pathway ends up close to zero, following the NGFS's implied decarbonization rate.

Exhibit 20: Scope 2 India road transport decarbonization intensity pathway



Source: MSCI ESG Research, 2024.

- **The Scope 3 decarbonization intensity pathway is specific to the sector (road transportation), but not the region (India).**

  Indeed, Scope 3 represents emissions from value chains that are global in nature for the companies assessed by the ITR methodology. These complex value chains cannot be captured by the revenue breakdown of a company (e.g., the fact that a road transport company sells cars in the U.S. and in Europe doesn't indicate the geographical composition of its supply chains). Therefore, the Scope 3 emissions of a Chinese

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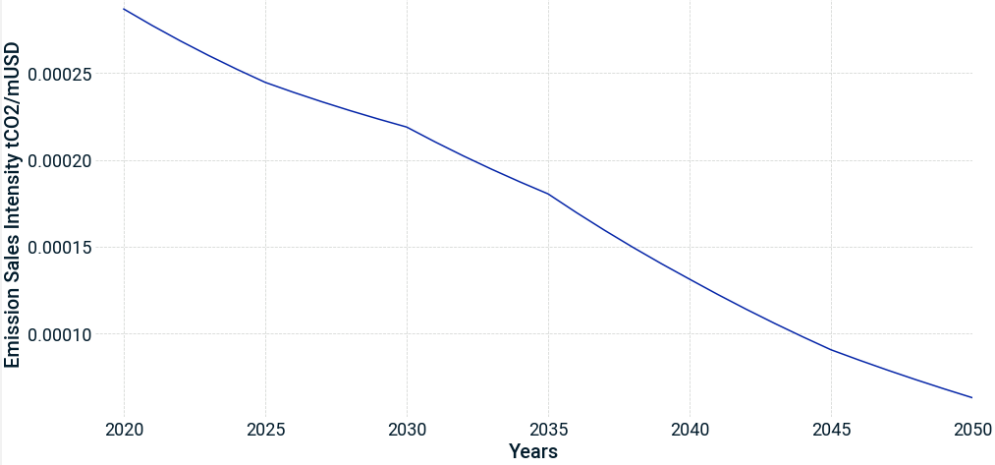
company— which may sell cars in certain countries and source materials in others – is assigned the same Scope 3 decarbonization intensity pathway as any road transport company across the world. The pathways end up close to zero, following the NGFS's implied decarbonization rate.

This company does not have loan book or AUM activities, therefore investment activities pathways are not added.

Exhibit 21: Scope 3 region-agnostic road transport decarbonization intensity pathway



Source: MSCI ESG Research, 2024.

Convert decarbonization intensity pathways into Initial Net Zero 2050 carbon budgets

Following the previous step, companies of all sizes are now assigned 1.5°C-aligned intensity pathways that reflect the ability of their regions/sectors to decarbonize.

The next step is to convert such intensity pathways to company-level absolute emissions budgets (CO_2e) for Scope 1, Scope 2, and Scope 3, which can be aggregated into an initial company-level Net Zero 2050 carbon budget (i.e., a 1.5°C-aligned carbon budget).

This conversion is necessary for appropriate alignment measurement, as climate change is a result of the cumulative sum of absolute emissions in the atmosphere. Where benchmarking company alignment is solely based on emissions intensity, company absolute emissions may be left unchecked: alignment might be achieved in a misleading way by growing the denominator (e.g., company A decreased its emissions intensity in CO_2e/USD or CO_2/kWh while increasing its absolute emissions by growing revenue or power production).[25]

Calculating an Initial Net Zero 2050 carbon budget is a simple conversion of the three scopes of emissions intensities pathways into absolute emissions based on the company's revenue, for all pathways except those on investment activities. For each year of the 2020-2050 ITR time frame, the

[25] See Key Judgement 3 in "Measuring Portfolio Alignment." Glasgow Financial Alliance for Net Zero (GFANZ), November 2022; and "Understand the methods for science-based climate action." Science-Based Targets Initiative (SBTi), February 25th 2021.

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decarbonization intensity pathway's annual data point (expressed in tCO_2e/USD million) is multiplied by the company's end-2019 revenue (expressed in USD million).

$$Initial\ Net\ Zero\ 2050\ Scope\ X\ Budget\ per\ Year_{Year\ Y} = Annual\ Net\ Zero\ 2050\ Scope\ X\ Intensity_{Year\ Y} * company\ revenue\ data_{2019}$$

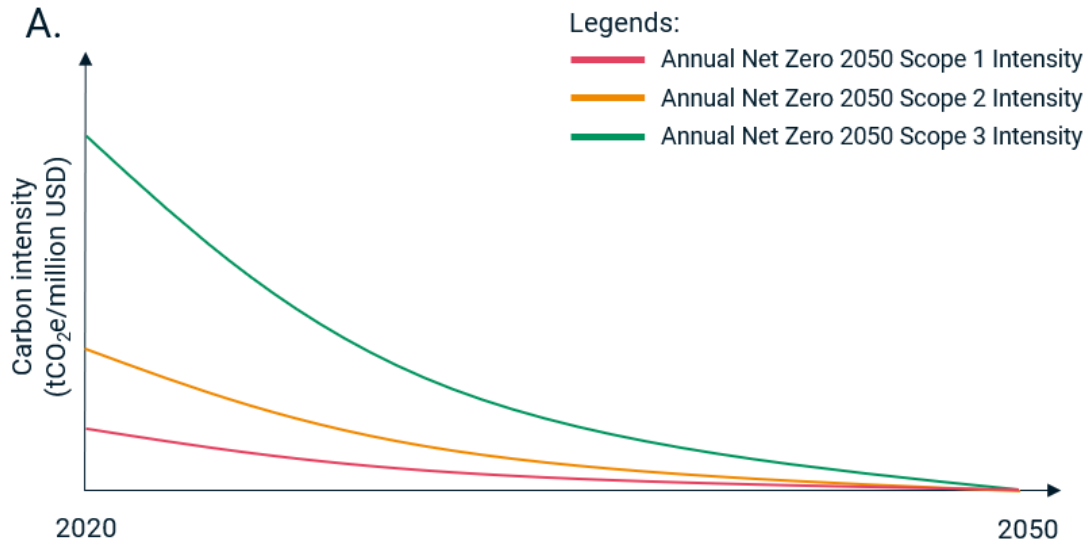
For investment activities (Scope 3 category 15), the decarbonization intensity pathway's annual data point (expressed in tCO_2e/USD million) is multiplied by the company's end-2019 loan book or AUM value (expressed in USD million).

$$Initial\ Net\ Zero\ 2050\ Loan\ Book\ Budget\ per\ Year_{Year\ Y} = Annual\ Net\ Zero\ 2050\ Loan\ book\ Intensity_{Year\ Y} * company\ loan\ book\ data_{2019}$$

$$Initial\ Net\ Zero\ 2050\ AUM\ Budget\ per\ Year_{Year\ Y} = Annual\ Net\ Zero\ 2050\ AUM\ Intensity_{Year\ Y} * company\ AUM\ data_{2019}$$

This computation logic is applied for all years of the ITR time frame 2020-2050, and summed up for all the annual Scope 1, Scope 2, and Scope 3 budgets into initial Net Zero Budgets.[26] These budgets are available at all scope levels, or aggregated at the company level.

Exhibit 22: How to compute the Initial Net Zero 2050 carbon budget (illustrative chart)



[26] Consider, for example, a hypothetical company that generates 1 USD billion revenue from India in the road transport sector. To determine the annual Scope 1 carbon budget for a given year, examine the required 1.5°C-aligned decarbonization intensity path for Scope 1 India road transport. The intensity for year 2023 is 6.1 tCO2e/USD million sales. So, to get the annual carbon budget for this year, the 2023 emissions intensity is multiplied by the company's end-2019 revenue of 1 USD billion to derive the company's Scope 1 annual budget in 2023 (6,100 tCO2e).

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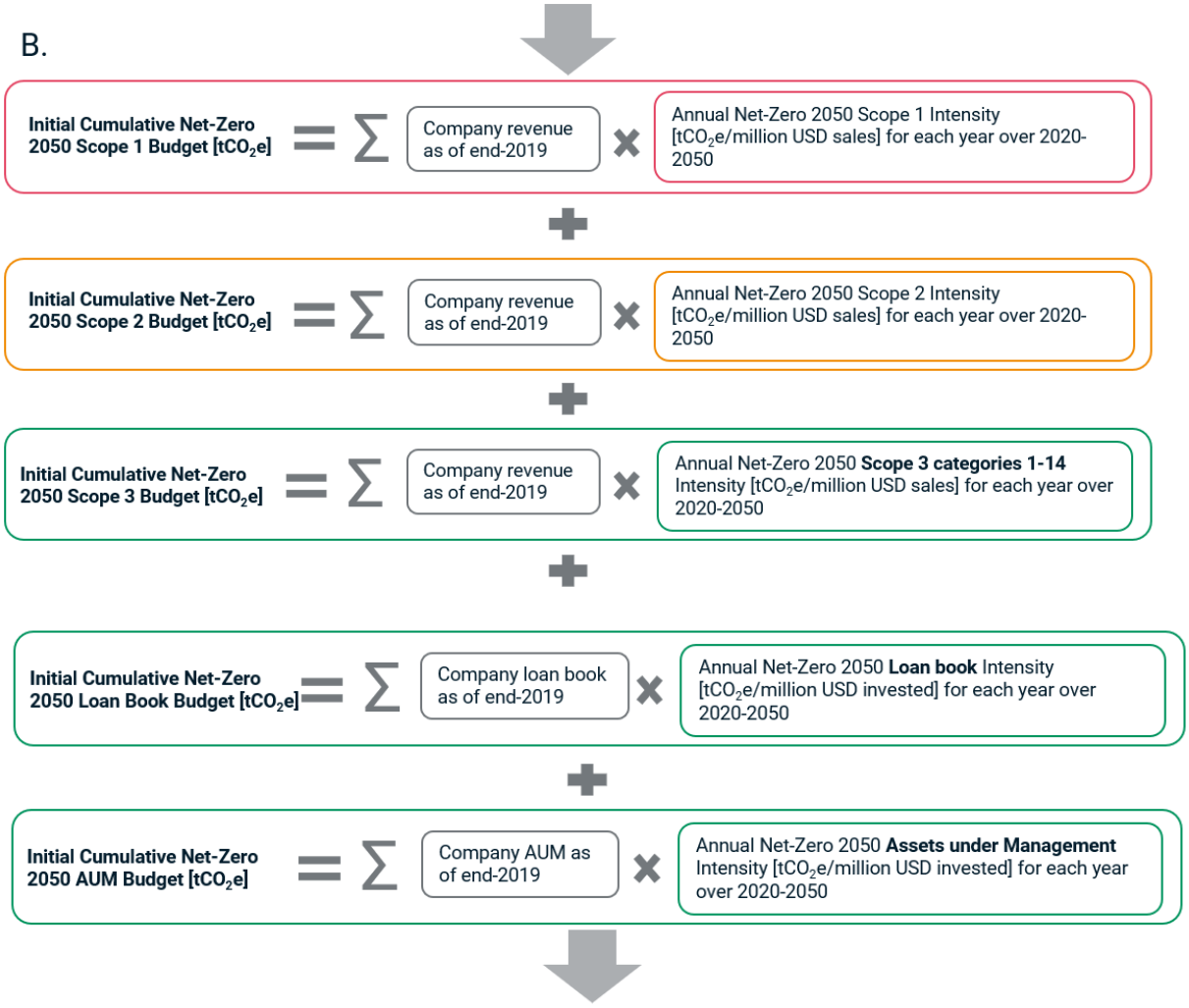
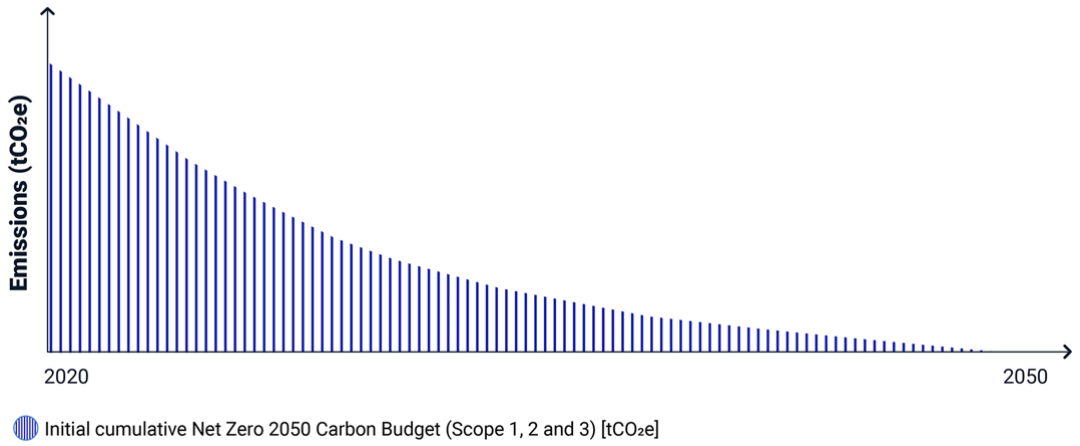
B.



C.



Source: MSCI ESG Research, 2024.
Note: These are illustrations, not based on actual company data.

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The aggregate of these calculations leads to a company-level initial Net Zero 2050 carbon budget allocated for the horizon 2020-2050. This represents the fair share of emissions allocated to a company to keep global warming under 1.5°C.

The budget is proportional to company size, as proxied by revenue and volume of investment activities; that is, a larger company by these measures will have a higher 1.5°C-aligned budget than its smaller peers. It also reflects the average sectoral baseline intensity that is used, and the NGFS-differentiated benchmark decarbonization rates. Within a group of companies sharing similar regional/sectoral characteristics, the more carbon-intensive ones would need to decarbonize at a steeper absolute emissions rate than the less carbon-intensive ones to meet their 1.5°C-aligned budget. This is aligned with the GFANZ best practice report. By contrast, benchmarking peer companies against a single absolute emissions reduction rate (e.g., 4% decrease per year) penalizes companies that have already decarbonized significantly relative to their peers.[27]

One can think of this absolute carbon budget shape as the one given to an average company for this sectoral/regional composition, based on the REMIND NGFS Net Zero 2050 scenario. This means that the latest emissions of the specific company may start from below or above the annual carbon budget time series, (as can be seen on ITR visualization charts, for example Exhibit 1 above, where the start of the projected emissions pathway [black line] is below the carbon budget [shaded area]). What matters ultimately is a company's ability to meet this total cumulative carbon budget of the average company.

Roll over Net Zero 2050 budgets

The series of calculations above yields an initial Net Zero 2050 carbon budget (Scope 1, 2 and 3) covering the entire period 2020-2050, allocated for any company as of January 1, 2020. To remain 1.5°C-aligned, the company's projected emissions must stay within what remains of that initial budget at any point in time.

Budget rollover defines what remains of the initial budget since the 2020 baseline year. Year after year, the Net Zero 2050 carbon budget is rolled over through two steps, market-share adjustment and subtracting realized emissions, both summarized in Exhibit 23.

Exhibit 23: Budget rollover steps

Steps	Description	Rationale
Adjusting for market share	The remaining company's budget at the beginning of a given year (e.g., 2021) is first derived using the market share gain/loss realized during the latest year for which we have data (e.g., 2020). If a company gained market share, their carbon budget would increase, all else being equal. If a company lost market share, their carbon budget would decrease, all else being equal.	The sums of budgets distributed across companies of a given sector remain stable. Growth in market share is not penalized by a static budget. Extrinsic monetary factors linked to economic intensity pathways hold little influence. Any company close to the average sectoral revenue growth has little or no change in carbon budget.

[27] See Key Judgement 1 in "Measuring Portfolio Alignment." GFANZ, November 2022.

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Subtracting realized emissions	This step takes place after the market-share adjustment and results in the rolled over budget as of the next year (e.g., the 2020 company emissions are deducted from the 2020 market-share adjusted budget to result in the final 2021 company budget). This step decreases the market-adjusted budget by the latest annual realized company emissions (i.e., past emissions that the company emitted).	A company's alignment is judged not only by its forward-looking trajectory but also by its past emissions. Company carbon budgets are "spent" by realized emissions just like the remaining global carbon budget.

Adjust carbon budget based on market share

This is the first step of the budget rollover feature. The company's remaining cumulative Net Zero 2050 budget is adjusted by market share change when sufficient revenue data for both the company and its sector are available. A company growing its market share should be allocated a larger carbon budget, otherwise the ITR methodology would penalize company growth by keeping the carbon budget static while the company's operations have expanded.

A market share adjuster is used to derive the evolving market share of the company. This compares company change in revenue to that of the MSCI emissions sector classification, providing a proxy for evolving market share[28]:

$$Market\ share\ adjuster_{2020} = \frac{Company\ revenue\ growth_{2020}}{Sector\ revenue\ growth_{2020}}$$

The effect of the relative gain or loss in market share on the company's carbon budget can then be assessed. Take, for instance, an energy company whose revenue growth was 3% in 2020 compared to 3.33% for the sector as a whole in 2020. The company carbon budget would shrink by 10% using the market-share adjuster:

$$Market\ share\ adjuster_{2020} = \frac{3\%}{3.33\%} = 0.90$$

The market-share adjusted budget for 2020 is thus calculated as:

$$\begin{aligned} &Market\ share\ adjusted\ company\ carbon\ budget_{2020} \\ &\quad = Company\ carbon\ budget_{2020} * Market\ share\ adjuster_{2020} \\ &\quad = Company\ carbon\ budget_{2020} * 0.90 \end{aligned}$$

Exhibit 24 shows the downward adjustment for a company that has lost market share. This results in a market-adjusted carbon budget, highlighted in pale green.

[28] Note that this approach based on market share change spares us the thorny question of establishing current market share across a full universe of companies.

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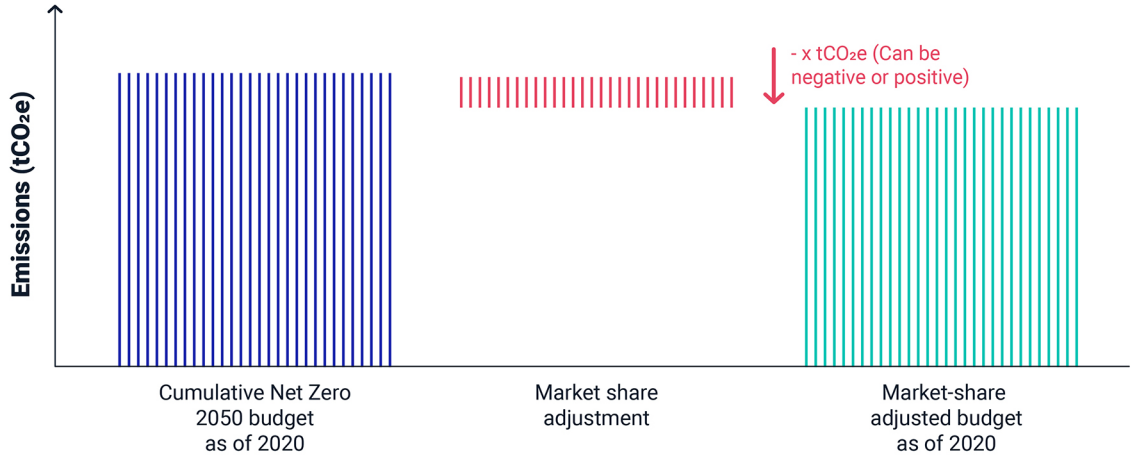
Exhibit 24: Market-share adjustment (illustrative example)



Source: MSCI ESG Research, 2024.
Note: This is an illustration, which is not based on an actual company data.

Subtract realized company emissions

To complete budget rollover, the ITR methodology further decreases the market-adjusted carbon budget by the latest annual realized company emissions. Scope 1 and Scope 2 realized emissions data may be reported by the company (otherwise, we use estimations)[29]; Scope 3 emissions are always estimated for consistency across peer companies.[30]

For instance, to calculate the remaining company budget as of 2021, the 2020 realized emissions are subtracted from the market-share adjusted 2020 budget.

$$Carbon\ budget_{2021} = Market\ share\ adjusted\ company\ carbon\ budget_{2020} - Realized\ company\ emissions_{2020}$$

Exhibit 25 shows the final step of subtracting realized emissions to calculate the company's carbon budget as of January 1, 2021.

[29] Under MSCI ESG Research's Scope 1+2 carbon emissions estimation approach, estimates of carbon intensity are produced at the company level and at the industry-segment level. MSCI ESG Research uses one out of the following three models (listed in order of preference) to estimate any company's carbon emissions. MSCI ESG Research uses the production model to specifically estimate direct emissions due to power generation for electric utilities, i.e., Scope 1 emissions of utilities. This model uses power generation fuel-mix data to estimate Scope 1 emissions. For companies that have reported Scope 1 or Scope 2 carbon emissions data in the past but not for all years, MSCI ESG Research applies the company-specific intensity model, which is based on data previously reported by the company. If the company does not report and has never reported, MSCI ESG Research uses the industry segment-specific intensity model, which is based on the estimated carbon intensities of 1,000+ industry segments.

[30] Bokern, D. "Reported Emission Footprints: The Challenge is Real." MSCI Research Blog, March 9, 2022.

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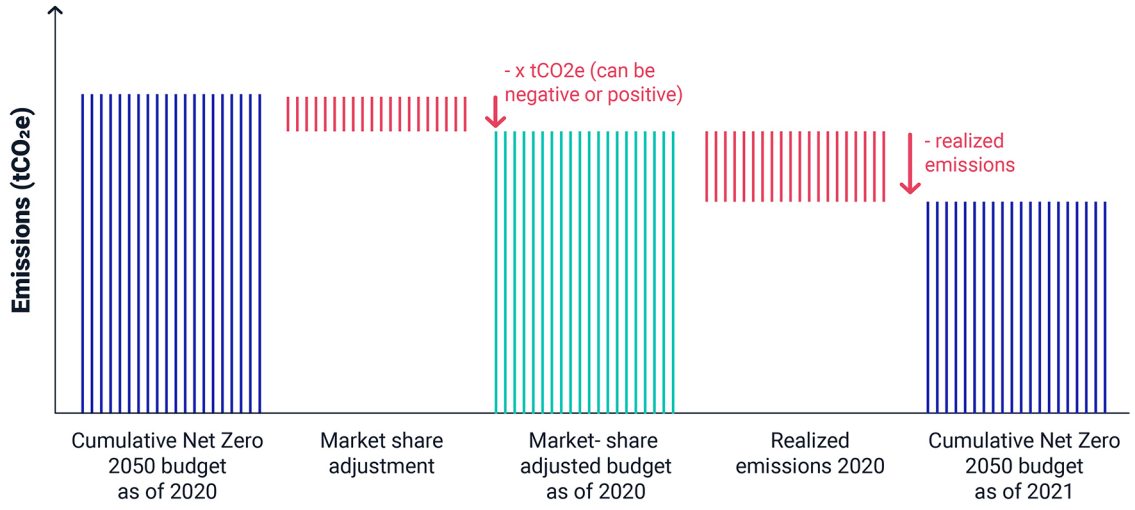
Exhibit 25: Subtraction of realized emissions (illustrative example)



Source: MSCI ESG Research, 2024.
Note: This is an illustration, which is not based on an actual company data.

Consequently, in the ITR methodology all historical emissions count towards depleting the initial company budget from 2020 onwards. This way, ITR accomodates the scientific fact that global warming is the result of cumulative emissions, including historical emissions.

Allocate budgets to new companies

For certain new companies, the required data to assign an ITR over the 2020-2050 period (e.g., emissions, revenue) might not be available, due, for instance, to an initial public offering or a merger of a company taking place in 2021.

For these companies, the initial budget allocation is not based on end-2019 revenue data (the base year for other companies), but on the first company data point available, for example, 2021. The level of budget allocated is determined by the relevant decarbonization intensity pathway data point.

The decarbonization intensity pathways are adjusted for the growth of the sector to avoid assigning a budget based on misaligned revenue data. See the formula below.

$$Pathway\ carbon\ intensity_{year\ x} = \frac{Pathway\ carbon\ intensity_{year\ x-1}}{Revenue_{year\ x}/Revenue_{year\ x-1}}$$

This way, if a sector's revenue has grown significantly in recent times, the inflation effect to keep a robust assessment of decarbonization intensity alignment is corrected.

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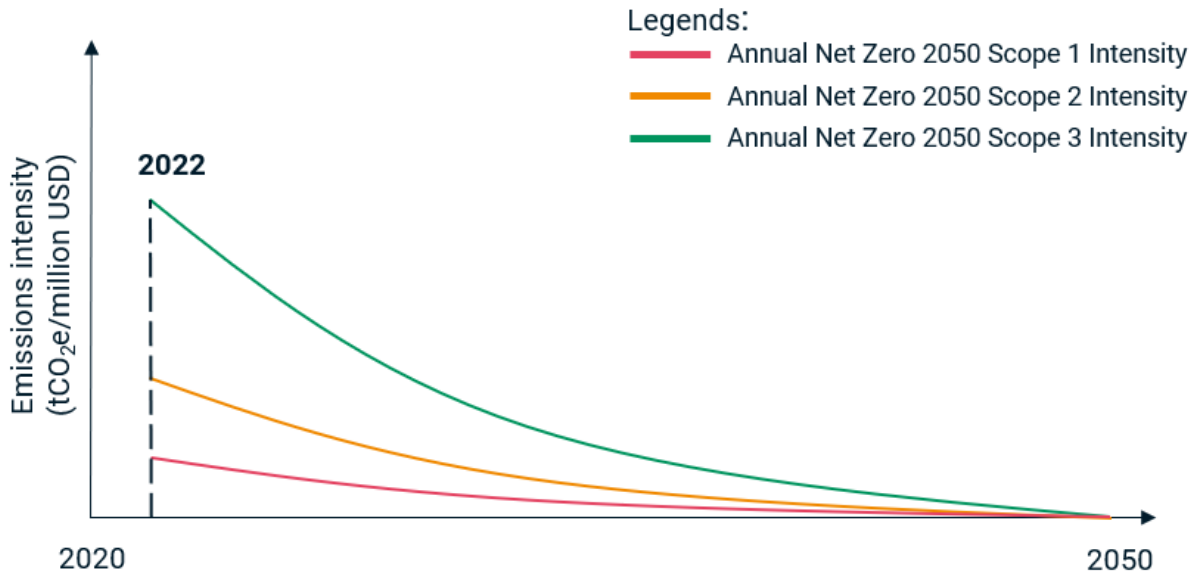
Exhibit 26: Budget allocation for a new company (illustrative example)



Source: MSCI ESG Research, 2024.
Note: This is an illustration which is not based on an actual company data.

2.2. Project company emissions with target credibility assessment

Once a company-level (rolled over) cumulative Net Zero 2050 budget is up-to-date, we project company emissions to 2050, considering climate targets and how credible these are. This is necessary to determine whether the company may overshoot or undershoot its remaining carbon budget.

A company's future emissions are projected from the latest available company emissions data (e.g., 2021)[31] until 2050 (the conclusion of the ITR time frame). For instance, for a company whose latest available emissions data are for 2020, the first year of projected emissions will be in 2021. All Scope 1 and Scope 2 emissions data that is used in the ITR methodology is reported data from the company. In cases where there is no available reported data, the ITR methodology uses estimated data for both Scope 1 and Scope 2 emissions, as produced by MSCI ESG Research's estimation model.[32] For all Scope 3 emissions (category 1-15, including optional category 15 emissions), estimated data is used, which is also produced by MSCI ESG Research's estimation model, thus

[31] This is referred to as Year reference of current ITR.

[32] Under MSCI ESG Research's Scope 1+2 carbon emissions estimation approach, estimates of carbon intensity are produced at the company level and at the industry-segment level. MSCI ESG Research uses one out of the following three models (listed in order of preference) to estimate any company's carbon emissions. MSCI ESG Research uses the production model to specifically estimate direct emissions due to power generation for electric utilities, i.e., Scope 1 emissions of utilities. This model uses power generation fuel-mix data to estimate Scope 1 emissions. For companies that have reported Scope 1 or Scope 2 carbon emissions data in the past but not for all years, MSCI ESG Research applies the company-specific intensity model, which is based on data previously reported by the company. If the company does not report and has never reported, MSCI ESG Research uses the industry segment-specific intensity model, which is based on the estimated carbon intensities of 1,000+ industry segments.

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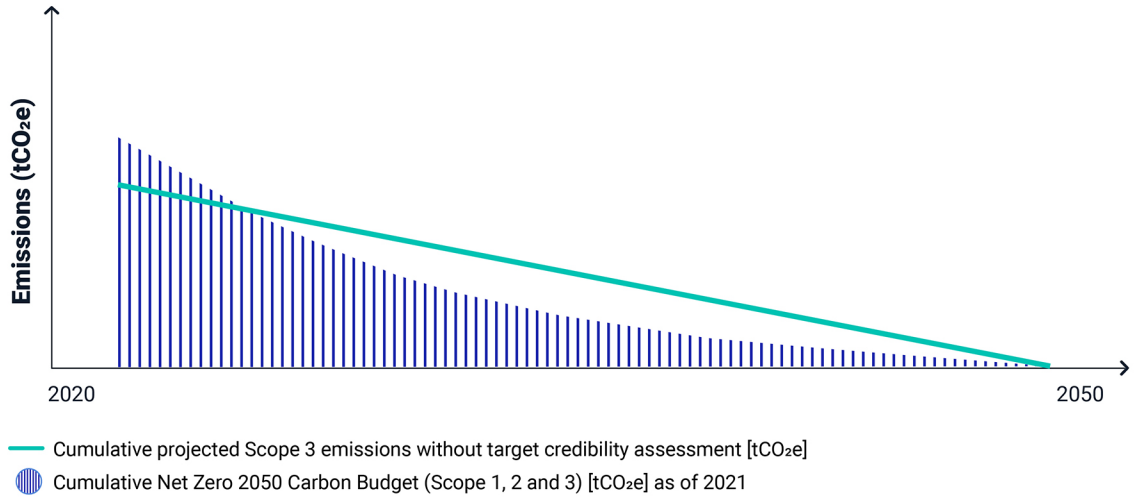
enhancing comparability in the ITR outputs, where reported data across companies is often inconsistent.[33]

Through our emissions projection model, all Scope 1, Scope 2 and Scope 3 emissions of the company are projected until 2050 based on climate targets stated by the company itself. The time series of these projections can then be aggregated into a company's cumulative projected carbon emissions value (e.g., a cumulative value of 1500 $MtCO_2e$ for all company emissions between 2024 and 2050)

Exhibit 27: Projected company emissions, taking targets at face value (illustrative example)



Source: MSCI ESG Research, 2024.

Note: This is an illustration, which is not based on an actual company data.

Note in Exhibit 27 the starting point of projected emissions, which corresponds to the first year of the remaining cumulative Net Zero 2050 budget.

Two main steps are involved in projecting emissions:

- taking the stated trajectory of the company; and
- adjusting it based on credibility indicators.

Compute projected emissions by taking climate targets at face value

The first modelling steps estimate the cumulative projected emissions with targets at face value (Scope 1, 2 and 3).

For every scope of emissions (Scope 1, Scope 2, Scope 3):

- **If a company has disclosed targets, climate targets with a sufficient level of detail to be assessed are aggregated into a single trajectory of projected absolute emissions within the relevant scope of emissions (e.g., Scope 3).** This is done through MSCI ESG Research's emissions projection model, which normalizes and aggregates all types of targets (e.g., physical intensity targets, economic intensity targets, net-zero targets). If there are no

[33] Bokern, D. "Footprints: The Challenge is Real." MSCI Research Blog, March 9, 2022.

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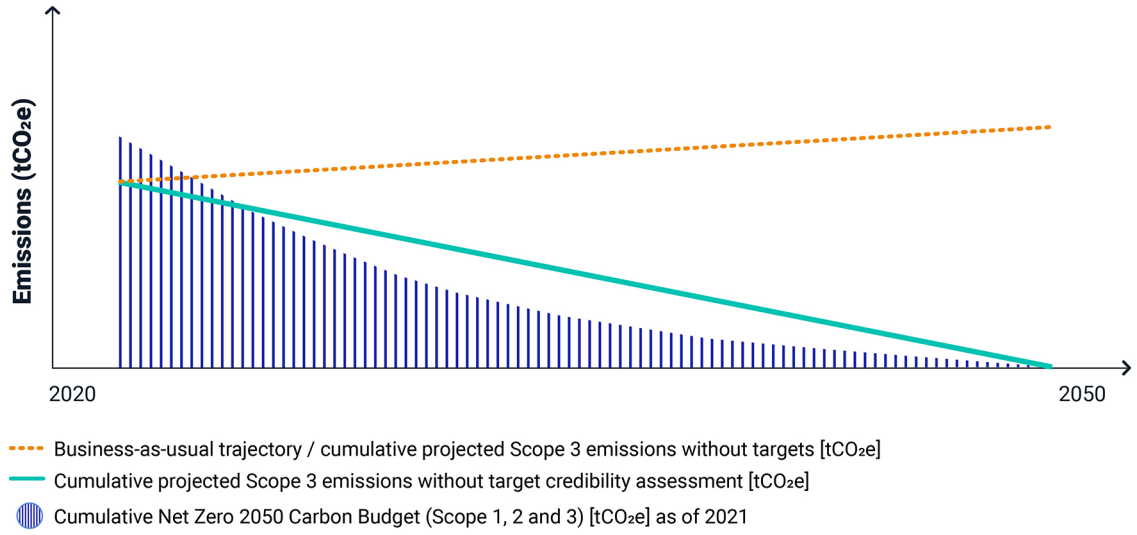
climate targets beyond a certain target year (e.g., 2035), emissions are kept constant beyond that time horizon (e.g., between 2035 and 2050). Note that the emissions projection model is currently agnostic to the use of carbon offsets to achieve targets. However, MSCI ESG Research provides data on whether a company intends to make use of offsets in achieving its climate targets.

- **If a company does not have climate targets at all, or only targets that do not provide a sufficient level of detail to be assessed, it is assumed that company emissions will grow by 1% every year to reflect business-as-usual.**[34] This trajectory entails company misalignment with its cumulative Net Zero 2050 carbon budget and, in turn, company-level ITR.

Exhibit 28 shows both projected emissions when targets are taken at face value, and the baseline for a given company.

Exhibit 28: Business-as-usual emissions trajectory (illustrative example)



Source: MSCI ESG Research, 2024.

Note: This is an illustration, which is not based on an actual company data.

Adjust projected emissions based on target credibility weights

The second step amends projected emissions based on a target credibility assessment, for those companies which have disclosed climate targets. This assessment is meant to penalize stated decarbonization trajectories that lack credibility, for example, a company setting a distant Scope 3 net-zero target in 2050 with no interim targets in place. Such target credibility assessments increases projected emissions where credibility is considered to be lacking.

[34] Based on global average growth rate of emissions over 2009-2019 from the UNEP Gap Report (United Nations Environment Programme (2020). This is adjusted for GDP based on data from the World Bank.

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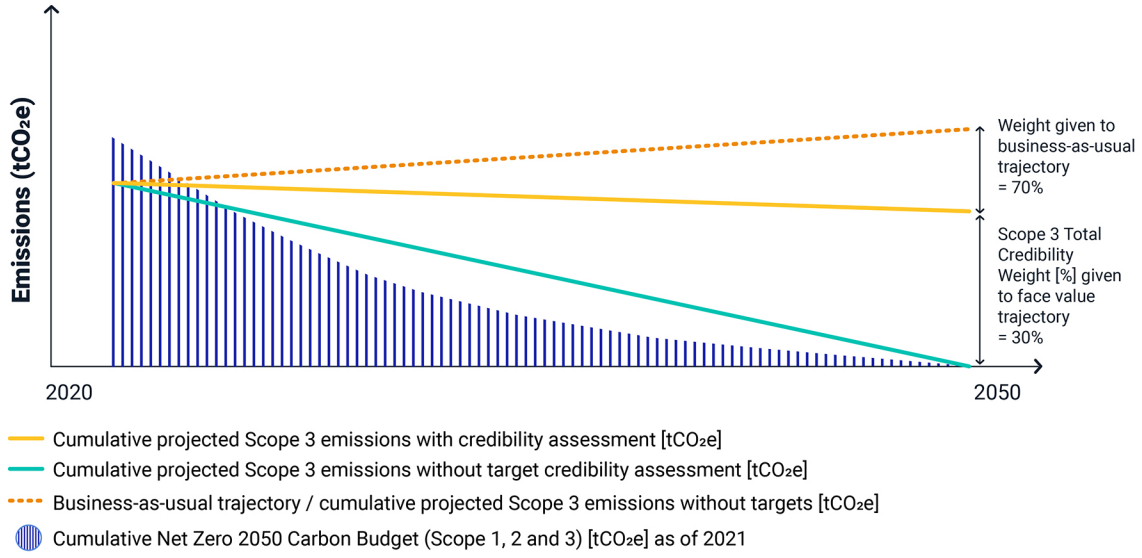
In line with GFANZ's best practice recommendation,[35] the target credibility assessment applies the following formula for each company's GHGP scope's projected emissions, where *w* is the total company credibility weight. This total credibility weight is calculated based on a mix of forward-looking and backward-looking indicators that are outlined further below.

$$\begin{aligned} &Projected\ company\ emissions \\ &\quad = w * Projected\ emissions\ based\ on\ company\ targets + (1 - w) \\ &\quad * Projected\ emissions\ according\ to\ the\ baseline \end{aligned}$$

Using the total credibility weight, those projected emissions taking targets at face value are weighted against the baseline/business-as-usual assumption of 1% annual growth in emissions.[36] In the example shown in Exhibit 29, the target credibility of the Scope 3 trajectory is a low 30%.

Exhibit 29: Target credibility adjustment for a given Scope (e.g., Scope 3)



Source: MSCI ESG Research, 2024.

Note: This is an illustration, which is not based on an actual company data.

[35] "Practitioners should derive the weighting between backward- and forward-looking indicators from a credibility assessment of the company's reduction target, where a higher weighting is attributed to more credible targets." From: "Measuring Portfolio Alignment." GFANZ, November 2022.

[36] MSCI ESG Research has chosen a 1% annual growth rate as its business-as-usual baseline to enhance transparency and penalize companies with low credibility/no targets. GFANZ recommends a waterfall approach (refer to Appendix 1 for more details) to assign a future emissions trajectory to companies without targets. Of the methods GFANZ recommends, MSCI ESG Research does not follow the first method (production forecasts) as production plans are not available for a medium-term or long-term horizon. MSCI ESG Research does not follow the second method (historical emissions) as past emissions are not good predictors of future emissions, as the NGFS reflects well in its REMIND Current Policies scenario: climate policies already enacted will make a significant part of company emissions fall. MSCI ESG Research does not follow the third method (constant emissions intensity), as this is not penalizing those companies which are not transitioning. MSCI ESG Research does not follow the fourth method (benchmark emissions growth rate) for the same reason.

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A total credibility weight of 100% is equivalent to taking company climate targets at face value. This means the company was assessed as likely to meet its stated targets. A total credibility weight of 0% is equivalent to the business-as-usual emissions trajectory, that is, no targets in place.

The Total Credibility Weight for each scope of emissions is composed by the following credibility indicators:

- At least one short-term target (i.e., by 2030[37]) for the relevant scope (e.g., reduce Scope 1 absolute emissions by 30% by 2028);
- At least one externally validated target;
- A track record of achieving past targets; and
- A current trajectory to meet (at least some of) its future targets.

The specific weights are determined as follows for all sectors except the energy sector defined by the Global Industry Classification Standard (GICS®).[38] This GICS sector aligns well with the Science-Based Targets initiative (SBTi) definition of companies that cannot currently submit targets for external validation by SBTi approval.[39]

Exhibit 30: Credibility weighting system for all GICS sectors except energy

Question	Indicator	Application	Contribution to Total Credibility Weight (%)
Does the company have any short-term targets?	Target credibility weight for short-term targets (%)	Scope-specific	40% for having at least one target set between 2020 and 2030 horizons 20% for having only target(s) beyond 2030 horizon
Does the company have third-party verified targets?	Third-party verification credibility weight (%) (SBTi validation)	Company-wide	Yes = 20% No = 0%
Does the company have a good track	Target track record credibility weight (%)	Company-wide	% of past targets achieved * 20%

[37] MSCI ESG Research chooses 2030 as the horizon defining "short-term" in line with the IPCC setting 2030 as a milestone for halving global emissions and ensuring limiting global warming to 1.5°C is feasible. See "The evidence is clear: the time for action is now. We can halve emissions by 2030". IPCC, April 4 2022.

[38] GICS is the global industry classification standard jointly developed by MSCI and S&P Global Market Intelligence.

[39] These are companies with any level of direct involvement in exploration, extraction, mining and/or production of oil, natural gas, coal or other fossil fuels, irrespective of percentage revenue generated by these activities, i.e., including, but not limited to, integrated oil and gas companies, integrated gas companies, exploration and production pure players, refining and marketing pure players, oil products distributors, gas distributors and retailers, and traditional oil and gas service companies. See https://sciencebasedtargets.org/sectors/oil-and-gas#what-is-the-sb-tis-policy-on-fossil-fuel-companies

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record of achieving targets in the past?[40]			
Is the company progressing towards achieving targets?	Current trajectory credibility weight (%)	Company-wide	On track for at least some targets = 20% Not on track to meet any targets = 0%

Source: MSCI ESG Research, 2024.

For energy companies, the weight attributed to external verification (i.e., approval by the SBTi) is redistributed to "track record" and "on track" weights. This is to ensure energy companies can potentially reach a 100% credibility score in the absence of a currently existing SBTi-approval process for such companies. Otherwise, credibility scores for the oil and gas sector would be systematically lower than in other sectors for lack of an existing verification process, instead of a lack of credibility performance against that process (see footnote 37 above for more details).

Exhibit 31: Credibility weighting system for the GICS energy sector

Question	Indicator	Application	Contribution to Total Credibility Weight (%)
Does the company have any short-term targets?	Target credibility weight for short-term targets (%)	Scope-specific	40% for having at least one target set between 2020 and 2030 horizons 20% for having only target(s) beyond 2030 horizon
Does the company have a good track record of achieving targets in the past?	Target track record credibility weight (%)	Company-wide	% past targets achieved * 30%
Is the company progressing towards achieving targets?	Current trajectory credibility weight (%)	Company-wide	On track for at least some targets = 30% Not on track to meet any targets = 0%

Source: MSCI ESG Research, 2024.

Applying the target credibility assessment results in the company credibility-adjusted projected emissions that are used as an input for ITR. This can be seen in Exhibit 32 below.

[40] Note that companies without a track record of past targets will not obtain 100% total credibility weights. Such companies cannot add credibility linked to demonstrating past successful decarbonization planning.

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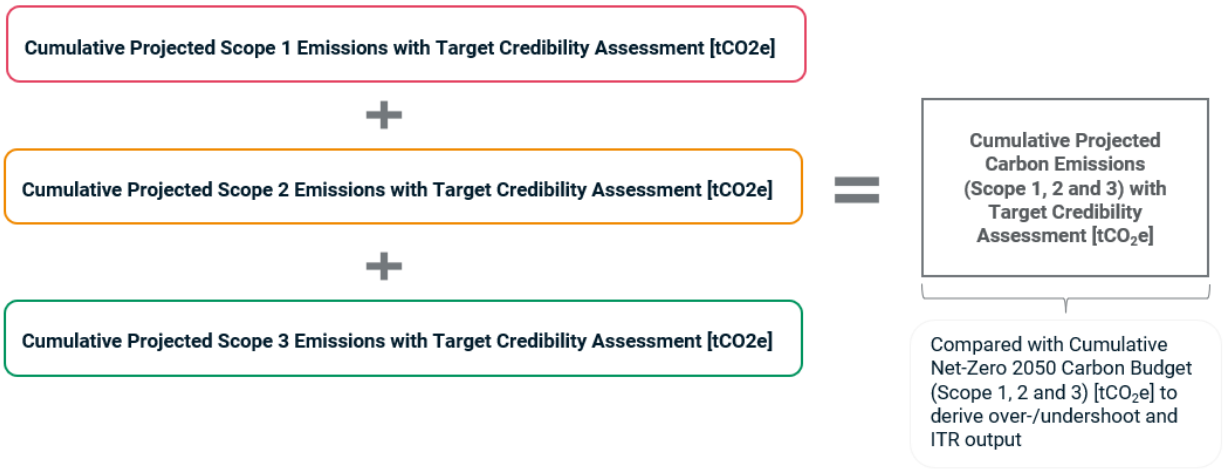
Exhibit 32: Aggregation of projected emissions across all scopes of emissions



Source: MSCI ESG Research, 2024.

Note that projected company emissions based on targets taken at face value — cumulative projected carbon emissions (Scope 1, 2 and 3) with targets at face value — are available for users. It is also possible to access projected emissions assuming no climate target for a given company (i.e., cumulative projected carbon emissions [Scope 1, 2 and 3] without targets [tCO_2e]). In this case, the business-as-usual trajectory is assumed to be 1% annual growth in annual emissions. Time series for those two types of projected emissions are equally available.

The outputs computed by the ITR methodology remain based on the target credibility assessment.

2.3. Calculate Net Zero 2050 budget over- or undershoot

Both the company's remaining carbon budget and company projected emissions are now calculated. The next question is: by how much do (credible) company projected emissions over- or undershoot the company cumulative Net Zero 2050 budget?

Overshooting means that a company's total projected emissions exceed the budget. Undershooting means that company's total projected emissions fall under the budget. Both overshoots and undershoots can take place over 2020-2050 — but what matters here is the net cumulative outcome.

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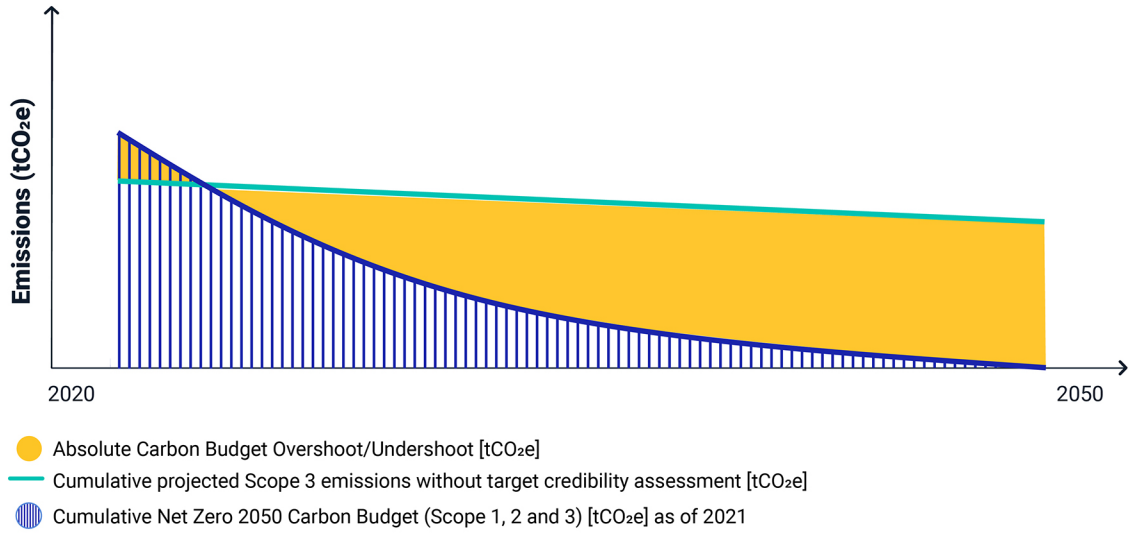
Exhibit 33: Cumulative assessment of over- or undershoot (illustrative example)



Source: MSCI ESG Research, 2024.

Note: This is an illustration, which is not based on an actual company data.

To calculate a company's carbon budget over- or undershoot, we subtract the cumulative projected carbon emissions (the area under the green line) from the company's cumulative Net Zero 2050 carbon budget (the area under the blue line).

An absolute carbon budget overshoot can also be derived at the scopes of emissions level:

$$Absolute\ Carbon\ Budget\ Overshoot_{Scope\ X} = Cumulative\ Projected\ Carbon\ Emissions\ with\ Target\ Credibility\ Assessment_{Scope\ X} - Cumulative\ \text{Net Zero 2050}\ Budget_{ScopeX}$$

What matters for the company-level ITR is the aggregated budget over- or undershoot, that is, the sum of projected emissions across all scopes minus the sum of cumulative Net Zero 2050 budgets across all scopes:

$$Absolute\ Carbon\ Budget\ Overshoot = Cumulative\ Projected\ Carbon\ Emissions\ (Scope\ 1,2\ and\ 3) with\ Target\ Credibility\ Assessment - Cumulative\ Net\ Zero\ 2050\ Carbon\ Budget\ (Scope\ 1,2\ and\ 3)$$

Exhibit 34 provides an illustrative example of a company showing company-level overshoot.

Exhibit 34: Compute the absolute carbon budget over- or undershoot (illustrative example)

Factor	Value
Cumulative projected carbon emissions (Scope 1, 2 and 3) with target credibility assessment (tCO_2e)	63,577 tCO_2e

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Cumulative Net Zero 2050 carbon budget (Scope 1, 2 and 3) (tCO_2e)	24,266 tCO_2e
Absolute carbon budget overshoot (tCO_2e)	39,311 tCO_2e (63,577–24,266)

Source: MSCI ESG Research, 2024.

Note: This is an illustration, which is not based on an actual company data.

Moving towards the ultimate ITR question — what if the world exceeded its budget by an equivalent amount as this company — requires converting the absolute carbon budget overshoot to a relative overshoot per company (%).

Specifically, the calculation is performed to understand the proportion of over- or undershoot each company has used relative to its overall carbon budget. Again, this can be done per each scope of emissions, and aggregated at a company level by adding the overshoots and the budgets. The formulas are indicated below.

$$Relative\ Carbon\ Budget\ Overshoot_{Scope\ X} = \frac{Absolute\ Carbon\ Budget\ Overshoot_{Scope\_X}}{Cumulative\ \text{Net Zero 2050 Budget}_{ScopeX}}$$

$$Relative\ Carbon\ Budget\ Overshoot = \frac{Absolute\ Carbon\ Budget\ Overshoot}{Cumulative\ Net\ Zero\ 2050\ Carbon\ Budget\ (Scope\ 1,2\ and\ 3)}$$

Exhibit 35 summarizes the relative over- or undershoot computation for the fictional company.

Exhibit 35: Compute the absolute carbon budget over- or undershoot (illustrative example)

Factor	Value
Absolute carbon budget overshoot (tCO_2e)	39,311 tCO_2e
Cumulative Net Zero 2050 carbon budget (Scope 1, 2 and 3) (tCO_2e)	24,266 tCO_2e
Relative carbon budget overshoot (%)	162% = 39,311/24,266

Source: MSCI ESG Research, 2024.

Note: This is an illustration, which is not based on an actual company data.

2.4. Convert into Implied Temperature Rise

As illustrated in the first Exhibit in this methodology document (Exhibit 1), converting a company's over- or undershoot to an ITR answers the question: "If the world economy were to operate like this company, what would be the projected rise in global temperature?"

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Two main steps are involved in this extrapolation:

- Extrapolating the company's relative overshoot to the relevant remaining global carbon budget; and
- Expressing the global budget overshoot as an implied temperature rise.

Extrapolate the company over- or undershoot to the relevant remaining global carbon budget

A company's ITR is always tied to a reference year (e.g., 2021). To yield a temperature rise, the company's over- or undershoot in 2021 is extrapolated to a global budget as of 2021. For instance, a company with a reference year of 2021 will get an ITR based on the remaining global budget as of Jan. 1, 2021 (1,117.6 $GtCO_2e$).

How is the remaining global budget computed for various years?

Under the REMIND NGFS Net Zero 2050 model, the sum of absolute emissions in $GtCO_2e$ to keep global warming to 1.5°C as of January 1, 2020 was 1,171.6 $GtCO_2e$. The CO_2e unit means that the global budget estimate covers all greenhouse gases, consistent with the ITR model's assessment of the full range of GHG emissions at company level. This carbon budget is much higher than the CO_2-only carbon budget.

To derive what remains of this carbon budget in 2021 and 2022, we deduct annual global emissions estimates published in the United Nations Environment Programme's Emissions Gap (UN GAP) reports. UN GAP emissions estimates are annual science-based assessments consistent with the IPCC's findings.[41]

Exhibit 36: Remaining global carbon budgets

	As of (Jan 1) 2020	As of (Jan 1) 2021	As of (Jan 1) 2022
Remaining Global Budgets ($GtCO_2e$)	1,171.6	1,117.6	1,061.5
Computation	Estimated global CO_2e budget as of Jan 1, 2020 based on the REMIND NGFS Net Zero 2050 scenario	Subtract 2020 global emissions: 54 $GtCO_2e$ (UN GAP report 2022)	Subtract 2021 global emissions: 56.1 $GtCO_2e$ (derived from the UN GAP report 2022[42])

Source : NGFS (2022), UN GAP Report (2022), MSCI ESG Research, 2024.

Express Temperature Rise with the transient climate response to cumulative CO_2 emissions (TCRE) factor

The over-undershoot (%) is expressed in terms of a global temperature rise by applying a TCRE factor to the remaining global carbon budget.

[41] "Emissions Gap Report", UNEP, 2022.

[42] The UN GAP report 2022 provides only the 2021 global emissions estimates excluding land use, land-use change and forestry (LULUCF), a GHG inventory sector that covers emissions and removals of GHGs resulting from direct human-induced land use, land use change and forestry activities. We approximate the figure including LULUCF based on the relative proportion of 2020 emissions including and excluding LULUCF.

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The TCRE factor, referred by the IPCC, provides a near-linear relationship that links each additional unit of emissions produced beyond the available remaining 1.5°C carbon budget to degrees of additional global warming, specifically, 0.00045°C warming per $GtCO_2$.[43]

In other words, for each Gt of CO_2 emissions exceeding the global Net Zero 2050 carbon budget, an additional ~0.00045°C of warming is expected over the scenario baseline of 1.55°C.

This relationship is used in the ITR methodology to convert a company's or portfolio's allocated carbon budget over- or undershoot into a value in degrees Celsius of additional warming.[44]

$$Additional\ Warming = Relative\ company\ overshoot * Global\ 1.55°C\ Budget * TCRE\ factor$$

To then calculate the Implied Temperature Rise, the additional warming is added to the base temperature of 1.55°C of the REMIND NGFS Net Zero 2050 scenario (the base temperature that defined the decarbonization pathways used in this methodology).

$$Implied\ Temperature\ Rise = 1.55°C + Relative\ company\ overshoot * Global\ 1.55°C\ Budget * TCRE\ factor$$

To illustrate, consider a hypothetical company that overshoots its allocated carbon budget as of 2021 (1,117.6 $GtCO_2e$) by 162% and assume the whole economy overshoots at the same rate. This entails a 1.55°C global budget overshoot of 1817.8 $GtCO_2e$ (1,117.6 * 1.62), which converts into 0.8°C additional warming through the TCRE factor (1810.5 * 0.00045). As a result, the ITR for this hypothetical company is 2.4°C (1.55 + 0.8, rounded[45]). See calculations summarized in Exhibit 37.

Exhibit 37: ITR conversion calculation (illustrative example)

Factor	Value
Relative carbon budget overshoot (company-level)	162%
Remaining Global Net Zero 2050 carbon budget ($GtCO_2e$)	1,117.6 $GtCO_2e$
TCRE factor	0.00045°C/$GtCO_2e$
Implied Temperature Rise	**2.4°C** (1.55°C + 1,117.6 x 162% x 0.00045)

Source: MSCI ESG Research, 2024.

Note: This is an illustration, which is not based on an actual company data.

[43] "Climate Change 2021: The Physical Science Basis", IPCC, 9 August 2021.

[44] Based on the relationship presented in "Measuring Portfolio Alignment," Appendix O. GFANZ, November 2022.

[45] Company-level ITRs are mathematically rounded to one decimal. Fund-level ITRs are rounded up one decimal, which is considered a conservative approach.

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3. Methodology: Portfolio-level

Consider a portfolio composed of various companies, to each of which an ITR can be attributed.

To derive a portfolio-level ITR , we use a so-called "aggregated budget approach", recommended as best practice aggregation by GFANZ.[46] This approach enables us to aggregate all companies' financed carbon budgets, and derive a portfolio-level Net Zero 2050 budget. Similar to a company-level ITR computation, an Implied Temperature Rise can be computed looking at the over- or undershoots of companies in the portfolio, using a TCRE factor. This makes for a consistent aggregation approach.

Similar to the company approach, the question asked by the ITR methodology then becomes: what would be the estimated global warming if the global carbon budget was over- or undershot to the same extent as this portfolio?

Providing a portfolio-level ITR helps assess the portfolio's contribution to global warming. For instance, some investors may want to know the cumulative impact of their financing across sectors or only at a specific sector level.

More detailed steps are set out below.

3.1. Define portfolio ownership

This approach aggregates all companies' projected emissions and carbon budgets using an attribution factor based on the Partnership for Carbon Accounting Financials (PCAF) framework. According to the framework, if a portfolio finances e.g. 5% of a company's enterprise value including cash (EVIC), it "owns" (i.e., finances) 5% of this company's projected emissions and 5% of this company's carbon budget — and therefore, 5% of this company's over- or undershoot.[47]

The portfolio ownership for the emissions and carbon budget of each constituent is defined using the following calculation:

For listed companies:

$$Ownership_{security} = \frac{Outstanding\ Amount_{security}}{EVIC_{company}}$$

For unlisted companies:

$$Ownership_{security} = \frac{Outstanding\ Amount_{security}}{Total\ Equity + Debt_{company}}$$

The outstanding amount can be defined as the current value of investment of the loan (it can also be defined in a portfolio weight manner: $weight_{Security}$ * *current total portfolio value*).

To ensure consistency and comparability, investors who use ITR should either use the calendar or financial year-end outstanding amount, and communicate which approach has been used.

[46] "For benchmark divergence and ITR metrics, practitioners should use an aggregated budget approach in order to maximize the scientific robustness of their disclosures" ("Measuring Portfolio Alignment." GFANZ, November 2022).

[47] Since an absolute over- or undershoot is equal to company projected emissions – company carbon budget.

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3.2. Calculate Financed Budget and Overshoot

Once the ownership factors have been defined, the amount of company Net Zero 2050 budgets and projected emissions that are financed by the portfolio are quantified. See Exhibit 38.

Exhibit 38: Determine portfolio ownership factors (illustrative example)

	Ownership	Company Cumulative Net Zero 2050 Budget (S1, S2, S3) ($MtCO_2e$)	Company Carbon Budget Overshoot ($MtCO_2e$)	Financed Budget ($MtCO_2e$)	Financed Carbon Budget Overshoot ($MtCO_2e$)	ITR Reference Year
Company A	0.05	100	200	5 (0.05 x 100)	10 (0.05 x 200)	2022
Company B	0.04	150	100	6 (0.04 x 150)	4 (0.04 x 100)	2021

Source: MSCI ESG Research, 2024.

Note: This is an illustration, which is not based on an actual company data.

3.3. Calculate Portfolio Budget and Overshoot

Using the financed budget and financed overshoot, the portfolio budget and overshoot are calculated:

$$Portfolio\ Financed\ Overshoot = \sum Financed\ Overshoot_i$$

$$Portfolio\ Financed\ Budget = \sum Financed\ Budget_i$$

3.4. Convert into Implied Temperature Rise

In the portfolio aggregation formula, the contribution of each portfolio constituent *i* is calculated based on the reference year of the constituent's budget. The portfolio ITR is calculated with this formula:

$$Portfolio\ Implied\ Temperature\ Rise = Base\ Temperature + \frac{\sum\left(TCRE * Global\ Budget_{reference\ year,i} * Financed\ Overshoot_i\right)_i}{\sum Financed\ Budgets_i}$$

Note that the formula accommodates multiple reference years at a company level. This is important, as not all companies will have the same reference year. For instance, a given company could disclose its 2020 realized emissions a few months earlier than its peers. That company's year

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reference of current Implied Temperature Rise would then be updated to 2021, while the peers' reference year would remain 2020, until their realized emissions for 2020 are disclosed.

Exhibit 39 shows the application of the aggregation formula to an illustrative portfolio of three companies.

Exhibit 39: Calculate a portfolio-level ITR (illustrative example)

Step 1: Calculate Ownership

Step 2: Financed Budgets

Step 3: Financed Overshoot

Step 4: Financed Overshoot **x** TCRE **x** Global Budget

Position	Outstanding amount [USD]	Company value (EVIC) [USD]	Ownership *Outstanding amount / Company Value*	Cumulative 1.5°C Carbon Budget (Scope 1, 2 and 3) [tCO2e]	Absolute Carbon Budget Overshoot [tCO2e]	Current Year Reference of ITR	TCRE	Remaining Global Budget [GtCO2e]	Financed Budget *Ownership * Company Budget*	Financed Overshoot *Ownership * Company Overshoot*	Financed Overshoot x TCRE x Global Budget
Position 1	200	500	40%	75	-50	2021	0.00045	1,122	30	-20	-10.1
Position 2	180	600	30%	190	300	2021	0.00045	1,122	57	90	45.4
Position 3	270	900	30%	400	200	2020	0.00045	1,176	120	60	31.8

Step 5: Calculate Portfolio Budget and Portfolio Overshoot **x** TCRE **x** Budget

Step 6: Calculate Portfolio ITR

Portfolio Budget ∑Financed Budgets_i	Portfolio Overshoot x TCRE x Budget= ∑(Financed Overshoot x TCRE x Global Budget)i	Portfolio ITR 1.55* + Portfolio Overshoot x TCRE x Budget/Portfolio Budget
207	67.1	**1.9°C**

* 1.55°C is the baseline temperature of the Net-Zero 2050 NGFS Scenario. Any overshoots/undershoots of the benchmark are relative to this 1.55°C baseline.

Source: MSCI ESG Research, 2024.

Note: This is an illustration, which is not based on actual company data. Outstanding amount corresponds to the actual outstanding amount in listed equity or corporate bonds. It should be defined in line with the denominator. Therefore, the value of outstanding listed equity is defined based on its market value (i.e., market price times number of shares), and the value of outstanding corporate bonds is defined based on the book value of the debt that the borrower owes to the lender. To ensure consistency and comparability, Investors who use ITR should either use the calendar or financial year-end outstanding amount, and communicate which approach has been used.

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4. Assumptions and limitations

4.1 Use of REMIND NGFS Net Zero 2050 scenario

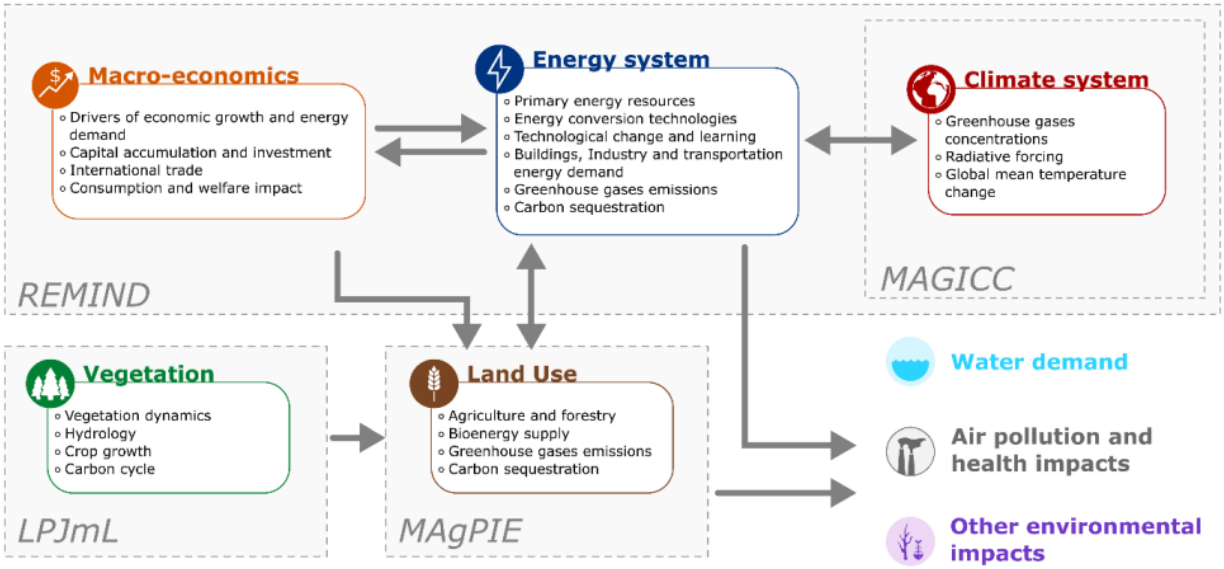
Climate scenarios are predicated on certain assumptions and probabilities.

ITR relies on the REMIND-Model of Agricultural Production and its Impact on the Environment (MAgPIE) NGFS Net Zero 2050 scenario, which projects a temperature rise at the 2100 horizon of 1.55°C.

REMIND-MAgPIE is an integrated assessment model (IAM) that produce scenario outputs based on certain policy and socioeconomic pathways, summarized in Exhibit 40. To do so, it simulates interactions between a range of variables including energy production, the global economy, and greenhouse gases. One key advantage of IAMs is to provide a broad-based view of the complex reality affecting climate change, accounting for interdependencies and feedback loops between different physical and socioeconomic variables. Emissions computed in the REMIND-MAgPIE model are passed to the Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC) model for calculation of global mean temperature change.[48]

Resulting scenarios are designed to ensure comparability of climate estimates with those of the IPCC, through the same probabilistic setup as the one used by the IPCC's "Special Report: Global Warming of 1.5°C."[49]

Exhibit 40: Overview of the REMIND-MAgPIE framework



Source: NGFS (2022).

The REMIND NGFS Net Zero 2050 scenario includes the following key assumptions:

[48] Meinshausen, M., Raper, S. C. B., & Wigley, T. M. L.. 2011. "Emulating coupled atmosphere-ocean and carbon cycle models with a simpler model, MAGICC6 – Part 1: Model description and calibration." *Atmospheric Chemistry and Physics*, 11(4), 1417–1456.

[49] "Special Report: Global Warming of 1.5 ºC." IPCC, 2018.

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- The scenario results in a 1.55°C global mean surface warming at the 2100 horizon compared to preindustrial times. It is composed of decarbonization pathways differentiated by sectors and regions. The scenario also includes differentiated GDP projections until 2100 — these estimates are obviously subject to a high level of uncertainty.
- The scenario foresees global CO_2 emissions to be at or close to net-zero in 2050, with global emissions falling by around 45% between 2020 and 2030, in line with the IPCC's findings.[50] Countries with a clear commitment to a specific net-zero policy target defined before the end of 2021 are assumed to meet this target. Given that not all net-zero targets are for 2050, various regions have positive emissions in 2050. Some sectors have negative emissions at this horizon (e.g., oil and gas), compensating for other sectors that have positive emissions (e.g., transportation).
- This is a "low overshoot" 1.5°C scenario, that is, median temperature increase compared to preindustrial levels is required to return to below 1.5°C in 2100, after a limited temporary overshoot. It is designed to be compatible with the 6th Assessment Report of the IPCC (AR6) scenario category C1, which "limit[s] warming to 1.5°C (>50%)[51] with no or limited overshoot".[52] These characteristics are in line with the GFANZ recommendation on scenario selection for designing portfolio alignment metrics.[53]
- This is an "orderly" scenario, that is, it assumes immediate and smooth policy reaction, as well as rapid technology change. That makes it different from the REMIND NGFS Divergent Net Zero scenario, where the transition does not happen smoothly across sectors.
- Carbon dioxide removal (CDR) measures have a significant, profound impact on mitigation trajectories. The assumption here is that higher CDR availability enables a more gradual phase-out of the use of fossil fuel across various sectors and end-uses.
- As noted by the NGFS, climate scenarios are neither predictions nor forecasts. They help to gauge various impacts associated with a certain course of action, for example, "If these decarbonization pathways were followed, what would be the likely global temperature rise?" For instance, assume that the entire steel sector follows the REMIND NGFS Net Zero 2050 pathway, while other sectors overshoot theirs; the global warming would then likely be higher than the 1.55°C end temperature of the scenario.

Note on scenario selection

Why is the NGFS scenario used?

NGFS scenario outputs are produced with high-quality IAMs. They are open source, which adds transparency to sophistication in the ITR assessment. They provide decarbonization pathways differentiated by sector and region, supporting a nuanced ITR benchmarking in line with GFANZ recommendations. Lastly, they cover all greenhouse gases, which can potentially support further refinement of the ITR methodology.

[50] "The evidence is clear: the time for action is now. We can halve emissions by 2030." IPCC, April 4, 2022.

[51] This designates a probability higher than 50%.

[52] "NGFS Climate Scenarios Database: Technical Documentation V3.1." NGFS, September 2022.

[53] See Key Judgement 2 in "Measuring Portfolio Alignment." GFANZ, November 2022.

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Why use the REMIND Net Zero 2050 scenario, specifically?

The REMIND scenarios are highly regarded as science-based transition scenarios. The Net Zero 2050 version is used in the ITR model to align with the GFANZ report recommendation to select a 1.5°C-aligned, low- or no-overshoot scenario.

4.2 Choice of sector granularity

The choice of sector granularity to produce ITRs can have an impact on companies' alignment. For example, for the electricity generation sector, a single sectoral pathway (differentiated by region) is used to assess the alignment of electricity generation firms. This approach means any utility engaged in more carbon-intensive electricity generation (e.g., gas power) is benchmarked against a baseline intensity including less carbon-intensive generation activities (e.g., hydro power). This model choice makes 1.5ºC alignment easier for less carbon-intensive utilities (lowering final ITR outputs), and harder for more carbon-intensive ones (increasing ITR outputs). If the sectoral pathways were defined by generation type (e.g., separate pathways for hydro and gas), both the more carbon-intensive utilities and less carbon-intensities ones might have similar alignments and ITRs, because they would be assessed relative to their electricity generation type and not according to a common benchmark.

The ITR budget model uses MSCI ESG Research's emissions sector classification. The sectors are listed in Exhibit 10 in Section 2.1. For the following MSCI emission sectors, the sectoral decarbonization pathways are merged into broader sector groups:

- **Electricity generation**: A single sectoral pathway for electricity generation is used. This includes emission sectors such as solar, oil, gas, coal, geothermal, hydroelectric, nuclear, wind and other renewables. The rationale is that all electricity generation types should be assessed against the same benchmark.
- **Fossil-fuel production**: A single sector pathway for integrated oil and gas companies is used, reflecting the average emissions intensity of the GICS sub-industry. This is because we consider this sub-industry to constitute a distinct business model, whose pathway should benchmark accurately the most and less carbon intensive companies.

4.3 Flooring and capping

ITR outputs are floored at 1.3°C and capped at 10°C for both companies and portfolios.

- **The minimum ITR is set at 1.3°C**. This represents 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 near 1.2°C in 2022 and is further increasing 0.2°C per decade due to past and current emissions.[54] It was considered plausible to set the lower boundary at 1.3°C in the absence of robust, globally scalable carbon-removal technologies.

- **The maximum ITR is set for a company at 10°C**. This corresponds to an alarming consumption of one's fair share of the global carbon budget. The highest temperature cited by the IPCC and other leading climate scientists in a worst-case climate scenario range between 5°C and 6°C.

[54] "Climate change widespread, rapid, and intensifying.", IPCC, 9 August 2021.

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This 6°C temperature represents the average global warming of the planet if no efforts are made to curb global emissions.[55] However, it is conceivable that a single company's own contribution to global warming is aligned to a scenario of higher than 6°C. While the real world is made up of diverse companies with low and high carbon contributions, it is not likely to face a mean temperature rise of 6°C. But if the world economy behaved like a single strongly misaligned company, the estimated global warming would be much higher.

The absolute carbon budget overshoot at scopes and aggregate levels reflects this 10°C capping. It has an upper bound limit, calculated with the following formula:

$$Absolute\ Carbon\ Overshoot_{Max} = \frac{(10°C - 1.55°C)}{TCRE\ factor * Global\ Budget * Cumulative\ Net\ Zero\ Budget_{ScopeX}}$$

The capped absolute overshoot is the minimum of the absolute carbon budget overshoot and the absolute carbon budget overshoot$_{Max}$:

$$Absolute\ Carbon\ Budget\ Overshoot_{Capped} = Min(Absolute\ Carbon\ Budget\ Overshoot, Absolute\ Carbon\ Budget\ Overshoot_{Max})$$

Relative carbon overshoot values reflect any capped absolute carbon budget overshoot, at scopes and company levels. For example, if a company's absolute carbon budget overshoot is capped at 520 MtCO2e following the 10°C capping calculation above, and the company's cumulative Net Zero 2050 budget is 100 MtCO2e, the value for relative carbon budget overshoot will be 520% (520/100).

4.4 Uncertainties around ITR modelling

As with any forward-looking methodology, ITR is a simplified representation of a potential future that remains radically uncertain. It is underpinned by a set of assumptions, some of which are derived from the REMIND NGFS Net Zero 2050, as mentioned in section 6.1.

Normative vs predictive

The temperature expression of ITR does not equate to a forecast of future global warming. It is a translation of alignment with pathways that are normative — and not predictive — by design. ITR provides an intuitive sense of the degree of alignment or misalignment with a given NGFS forward-looking 1.5°C-aligned pathway, which may not be followed in the real world, but which is consistent with a scenario where global warming is limited to 1.5°C. So, the best way to look at pathway alignment is a normative one. Is the company (or portfolio) doing its fair share of global decarbonization based on an alignment model?

It is a deliberate modelling choice that the ITR outputs express single global warming value estimates instead of temperature ranges as well as probabilities. ITR is designed to provide a measurement of how various companies and portfolios align to scenario pathways, not to estimate empirical facts. This is why ITR carbon budgets integrate corporate carbon accounting that double-count real world emissions (Scope 2 and Scope 3).

[55] "Climate Change 2014 Synthesis Report Summary for Policymakers." IPCC, 2014.

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Given that the 1.55°C end-temperature increase benchmark from the NGFS scenario might give an impression of false precision, the 1.55°C benchmark should be treated as a helpful 1.5°C rough estimate to assess companies' alignment within a certain sectoral or regional composition. Similarly, the ITR computation through a TCRE factor is not as sophisticated as a fully-fledged climate model that would include a range of non-linearities (e.g., feedback loops past a certain degree of warming). The essential use case of ITR is to measure the relative alignment of companies intuitively and transparently vis-à-vis a certain pathway, and not to aim for the most comprehensive temperature modelling, which is subject to high levels of uncertainty.

The target credibility assessment is a normative feature too. It can increase projected emissions for companies that lack credibility using a weighting based on certain indicators that are defined according to best judgement (e.g., track record in achieving past targets). These indicators and weighting are not precisely predictive. As the economy is transitioning for the first time to net-zero, it is extremely challenging to build a model using accurate predictors for a company's complete low carbon transition: there are no sufficient historical data.

Time horizon conclusion

The forward-looking ITR assessment starts in 2020 and concludes in 2050. It is benchmarked against a 1.55°C long-term temperature increase at the 2100 horizon, which is a common scientific horizon point for estimating global warming (e.g., in IPCC reports). So, there is a discrepancy between the time horizon conclusion for ITR assessment and that of global warming estimation.

This discrepancy is warranted. Due to geophysical processes, there is a time lag between CO_2e emissions, CO_2e concentrations in the atmosphere, and the resulting global-mean temperature. Temperature is stabilized decades after decarbonization action, as some of the climate feedback processes slowly unfold (e.g., melting of ice sheets, ocean heat uptake). Since the NGFS Net Zero 2050 assumes that the world reaches net-zero in 2050, estimating the resulting (stabilized) global warming at the 2100 horizon is an approach aligned with this scenario. Lengthening the ITR time frame to a time horizon conclusion beyond 2050 also increase modelling uncertainties and weaken the time reference for climate action.

No time horizon conclusion is ideal. One can indeed imagine a world that remains carbon positive in any future year (e.g., 20650). This would in turn postpone the magnitude and time reference of the stabilized global warming temperature.

Decarbonization intensity pathways for Scope 1, Scope 2 and Scope 3 emissions

The NGFS scenario expresses CO_2 emissions in real-world terms, that is, not categorized as per GHGP framework (i.e., Scope 1, Scope 2, Scope 3 emissions), which are an unavoidable accounting system for any company's emissions.

This means that when three different intensity decarbonization pathways for a company (Scope 1, Scope 2, Scope 3) are defined, it is assumed that they all need to follow the decarbonization rates of NGFS-based real-world emissions reductions — none of which are double-counted.

Note that this is a conservative approach. When a company implements a transition plan to decrease its Scope 3 emissions, it may decrease the emissions of other companies (e.g., suppliers).

All company-projected GHG emissions are harmonized to a CO_2-equivalent unit, which are benchmarked against the same decarbonization pathways. There are no specific benchmarks set

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for methane, whose short-lived nature makes any reductions more impactful on the end temperature scenario. The ITR pathway modelling therefore implicitly treats methane as a long-lived gas, warming ITR outputs, all else being equal.

Scope 3 double counting

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 GHGP suggests that Scope 3 emissions be excluded from such institutional investment climate practices.[56]

First, we acknowledge that precisely removing double counting from a Scope 3 data set is impossible today given the setup of the GHGP. The most challenging issue is that the level of double counting may be very different from one company to the other.

Second, double counting is not a material challenge for the ITR methodology because, in this methodology, the question is not "What is the absolute amount of real-world emissions financed in the portfolio?" The question is rather, "Is this company/portfolio decreasing its Scope 3 emissions at the right pace?"

The ITR methodology computes the relative over- or undershoot of each company and portfolio by summing up the over- or undershoots and budgets of a company or portfolio in all three scopes. Whether or not companies A and B in the portfolio have overlapping Scope 3 emissions is not relevant to the portfolio-level ITR. What matters is whether or not, cumulatively, these financed companies bring their Scope 3 emissions in line with a Net Zero 2050 pathway.

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

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5. Coverage, data and methodology updates

5.1. Coverage

The ITR coverage universe is determined by issuers' inclusion in the MSCI ESG Climate Change Metrics coverage universe. As of January 2024, this universe includes constituents of the MSCI ACWI Investable Markets Index (IMI) and constituents of selected other equity indexes[57] and fixed income issuers.[58]

5.2. Data quality assurance processes

Data quality assurance processes are conducted on all data prior to publication.

5.3. Methodology update processes

The ESG Methodology Committee ("EMC") presides over the development, review and approval of all MSCI ESG Research methodologies. Methodology update proposals are subject to market consultation prior to approval for implementation by the EMC.

5.4. Data update frequency

The ITR is typically recalculated on a biweekly basis to reflect the most recent company data i.e., from the point company data are updated in MSCI databases, relevant changes would be reflected in the ITR within two weeks. Prior to publication, additional QA may be conducted, making the ITR update last up to 30 days.

Company data relevant to ITR computations include newly issued or updated corporate targets, new emissions figures, estimates, or sales/business segment information. Regular data update cycles:

- Scope 1 and 2 reported emissions data and climate target announcements are collected when available (companies do not follow the same reporting schedule and format). Data updates of emissions and targets in MSCI databases can take up to 90 days[59], followed by the inclusion into the ITR update that may take up to 30 days. It may take up to 120 days in total to reflect updated Scope 1 and 2 reported emission data and climate data in the ITR outputs.
- Revenue and segment revenue data updates in MSCI databases can take up to 90 days, followed by the inclusion into the ITR update that may take up to 30 days. It may take up to 120 days in total to reflect updated revenue and segment data in the ITR outputs.
- Scope 3 emission data used in the ITR methodology are currently produced by our estimation model. They are recalculated on a biweekly basis and included into the ITR in the same cycle of up to 30 days.

[57] MSCI China A International, MSCI Pakistan IMI, MSCI Argentina Standard, MSCI Domestic Kuwait, MSCI EFM AFRICA, MSCI Australia IMI+, MSCI New Zealand IMI+, MSCI Europe IMI+, MSCI UK IMI+.

[58] Corporate constituents of the Bloomberg Global Aggregate Index that meet our minimum disclosure threshold.

[59] Timelines may shorten for data updates associated with data correction (up to 3-5 days), client queries (up to 3-5 days) and issuer (company) escalations (up to 30 days).

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The budget rollover feature that updates the reference year of an ITR (see end of section 2.1) requires all the latest emissions data (Scope 1, Scope 2 and Scope 3), the latest global budget value as well as latest revenue data to be as of the same year (e.g., 2022, for a rollover to a 2023 ITR).To roll over the ITR und calculate the ITR for the newest reference year, all the above mentioned datapoints need to be available.[60]

[60] For example: new emission data for a certain company might be available already, but the latest global budget values not. In this situation, the budget roll over is not possible yet and the current year ITR will not yet reflect new emission data.

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Appendix I –Alignment with GFANZ best practice report

Exhibit 41: Alignment with the GFANZ report on portfolio alignment measurement

Key design judgement	GFANZ recommendation	MSCI ITR alignment
1. What type of benchmark should be built?	Fair-share budget approach allowed Use of physical intensity benchmarks for homogeneous sectors where feasible; otherwise, convergence benchmark	**Aligned** (fair-share carbon budget approach) **Almost fully aligned** (convergence economic intensity benchmarks CO_2e/USD)
2. How should benchmark scenarios be selected?	Select 1.5°C scenario Have sectoral/geographical granularity	**Aligned** (use of 1.5°C low overshoot scenario) **Aligned** (pathways reflecting differentiated abilities in sectoral/regional decarbonization)
3. Should absolute emissions, production or emission intensity units be used?	Fair-share budget approach allowed Various units allowed for oil and gas sector, e.g., absolute	**Aligned** (fair share budget approach) **Aligned** (absolute emissions unit)
4. What scope of emissions should be included?	Assess Scope 3 alignment at least for most material sectors	**Aligned** (Scope 3 decarbonization pathways cover all sectors)
5. How should emissions baselines be quantified?	Include all company GHGs in assessment Prioritize reported over estimated emissions at least for Scope 1 and Scope 2	**Aligned** (cover all GHGs – CO_2 equivalent) **Aligned** (for Scope 1 and Scope 2, reported company data is prioritized)
6 (a). How should alignment be measured?	Build a target credibility-weighted assessment using a combination for forward-looking and backward-looking data For companies without targets, apply (a) a waterfall approach of four methods and (b) a lower bound score	**Aligned** (target credibility assessment applying the GFANZ weighting formula) **Not aligned (**a) 1% growth in annual emissions not listed in methods; (b) lower bound applied)
6 (b). How should alignment be measured?	Assess alignment on a cumulative basis Assess alignment on short, medium and long term	**Aligned** (assessment on cumulative basis from 2020 to 2050) **Aligned** (short-term, medium-term and long-term assessments available)
7 (a). How should alignment be expressed as a metric?	Use scenario interpolation where internally consistent scenarios are available, otherwise use TCRE on long-term alignment (second-best option)	**Almost fully aligned** (use of TCRE factor on long-term alignment, for simplicity and transparency)
7 (b). How should alignment be expressed as a metric?	Aggregated-budget approach	**Aligned** (aggregated-budget approach)

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The table above represents our assessment of the ITR modelling characteristics compared with the 2022 GFANZ report on portfolio alignment.

Reasons for diverging from certain GFANZ recommendations are outlined below:

- **Use of physical intensity benchmark for homogeneous sectors where feasible (judgement 1)**
  This approach can form a basis for the fair-share carbon budget approach instead of economic intensity benchmarks, for a handful of homogeneous sectors (e.g., use of CO_2/kWh to size company budgets in the utilities sector). The benefit of such an approach is to avoid extrinsic monetary effects linked to the use of economic intensity benchmarks (e.g., inflation). However, it is challenging to obtain precise production data across a large universe of companies. Note that the current ITR pathway modelling mitigates such extrinsic monetary effects through correcting decarbonization intensity for inflation, and budget-rollover market share adjustment.

- **Baseline trajectories suggested for companies without targets (judgement 6 [a])**

  GFANZ suggests a waterfall approach towards a list of default future emissions trajectories.

  1) *Production forecasts*. Such forecasts are not available over a long-term horizon. Consequently, they cannot be used in the ITR methodology or any alignment metric with a long-term dimension.
  2) *Historical emissions trends*. Due to climate policies already implemented in several jurisdictions (e.g., on greening energy grids), the future is unlikely to look like the past — especially when projecting to a 2050 horizon. This is recognized, for instance, by the REMIND NGFS Current Policies scenario, which foresees a decrease in global emissions from around 2030, simply because of policies already implemented.
  3) *Neutral emissions intensity*. This approach has the merit of simplicity. We prefer a default 1% growth in company annual emissions, which is also simple, but in addition penalizes misalignment with a decarbonization pathway over a long time frame.
  4) *Benchmark emissions growth rate* (i.e., rates provided at sector and/or region level by business-as-usual climate scenarios). This approach has merits but involves specific curves of decarbonization that add modelling complexity. Again, we prefer a simple default 1% growth in company annual emissions to make the ITR model more transparent and interpretable.

     GFANZ also recommends applying a lower-bound alignment score to a company without decarbonization targets, which is 1.3°C in our ITR approach. This is not a punitive lower bound score (e.g., 3°C), which may penalize certain climate solutions providers without decarbonization targets, for example some wind turbine manufacturers.

- **Use of scenario interpolation to derive temperature expressions (judgement 7 [a])**

  This approach consists of computing several cumulative carbon budgets corresponding to various temperature benchmarks (e.g., 1.5°C, 2ºC, 3°C) for every company. An ITR can then be interpolated based on the relative distance between the company's cumulative emissions and the various company cumulative carbon budgets. While this approach has merits in terms of multiple scenarios' consistency, we prefer the use of a TCRE factor applied to the

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alignment/misalignment with a single company budget. This temperature calculation is a simpler approach, which makes the output modelling more transparent to stakeholders.

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Appendix II - Modelled history

Any company-level ITR refers to a certain date — the year reference of current Implied Temperature Rise. As the company cumulative net-zero budget (Scope 1, Scope 2, Scope 3) is rolled over, a company-level ITR moves to the next year's reference.

To calculate the company ITRs of years prior to the reference year of current implied temperature rise, the following building blocks are required:

- Carbon budget as of a specific model year.
- Projected emissions (projected emissions with credibility assessment, baseline emissions, projected emissions with targets at face value) as of a specific model year.
- Global budget as of a specific model year.

The allocated carbon budget as of a specific model year is available from 2020 onwards as part of the budget rollover feature (please see section 2.1 for more details).

To project emissions as of a specific year, a clear definition of which information can be considered is required. Exhibit 42 outlines the data used to create a modelled history.

For example, to project emissions as of 2021 (i.e., January 1, 2021), the ITR methodology uses emissions data up to 2020 (December 31, 2020). On the target side, all targets are included in the emissions projection.

Targets typically have multiple dates associated with them — an announcement date, a baseline year data and a target date. For example, in 2022 (announcement date) company A commits to reduce its scope 1 emissions by 30% by 2030 (target end date) compared to 2010 (target baseline date).

The aim of the ITR is to perform a forward-looking assessment including all company targets to assess the alignment with the 1.5°C scenario. Therefore, excluding the most recent company targets from past company ITRs would not align with the overall aim of the ITR metric. So, any ITR output in the ITR modelled history will integrate the latest company targets, even when the target announcement date (e.g., 2022) has occurred after the reference year in the modelled history (e.g., 2020).

Exhibit 42: Data used to create back-stated projected emissions

Year reference of implied temperature rise	Scope 1 & 2 emissions data	Scope 3 emission data[61]	Target data
2020	2019	Simulated value for 2019	All targets available up to today
2021	2019-2020	Simulated values for 2019-2020	All targets available up to today

[61] For Scope 3 emissions we use the MSCI Scope 3 estimated emissions. Currently no history is available for the Scope 3 estimates. We therefore create a simplified Scope 3 history by multiplying the most recent Scope 3 sales intensity with the sales number of the corresponding year. For example, Scope 3_{2019} = Scope 3 current intensity * $Sales_{2019}$.

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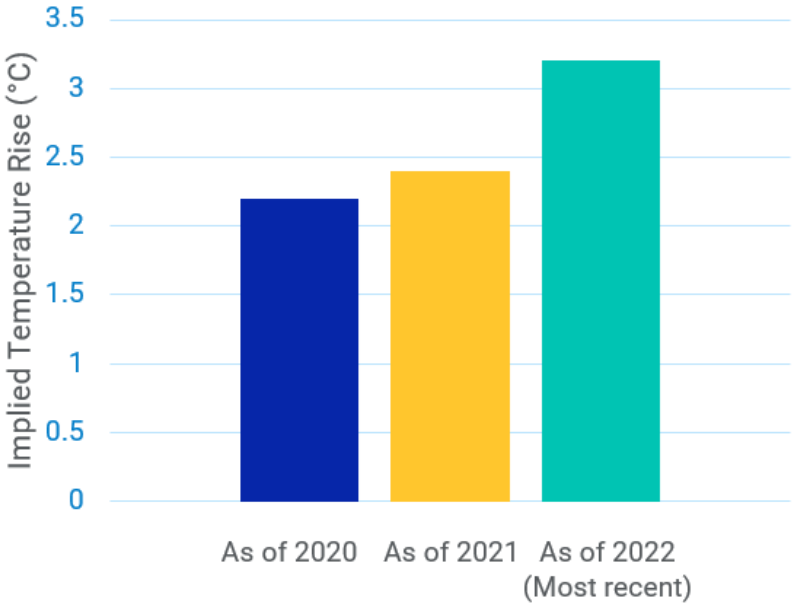
Finally, the global budget that is required to translate the company-level carbon budget overshoot into a degree of warming is available from 2020 onwards. Please see Section 2.4 for more details.

Thanks to these building blocks, a company-level ITR can be back dated. It uses company budget, company projected emissions and global budget for the specific year (year x):

$$Implied\ Temperature\ Rise_{year\ x} = 1.55°C + \frac{Absolute\ Carbon\ Budget\ Overshoot_{year\ x}}{Carbon\ Budget_{year\ x}} * Global\ 1.55°C\ Budget_{year\ x} * TCRE\ factor$$

In Exhibit 43, the reference year of the company's ITR (in green) is 2022.

Exhibit 43: Modelled history for a company or a portfolio (illustrative example)



Source: MSCI ESG Research, 2024.

Note: This is an illustration, which is not based on an actual company data.

To calculate a back dated portfolio-level ITR, the modelled history computes the core components of constituents' ITR as of the selected reference year (year x) — company carbon budget data, absolute company over- or undershoot and reference global budget. The portfolio aggregation formula then applies by considering year x:

$$Portfolio\ ITR_{year\ x} = Base\ Temperature + \frac{\sum\left(TCRE * Global\ Budget_{year\ x,\ i} * Financed\ Overshoot_{year\ x,\ i}\right)_i}{\sum Financed\ Budget_{most\ recent,\ i}}$$

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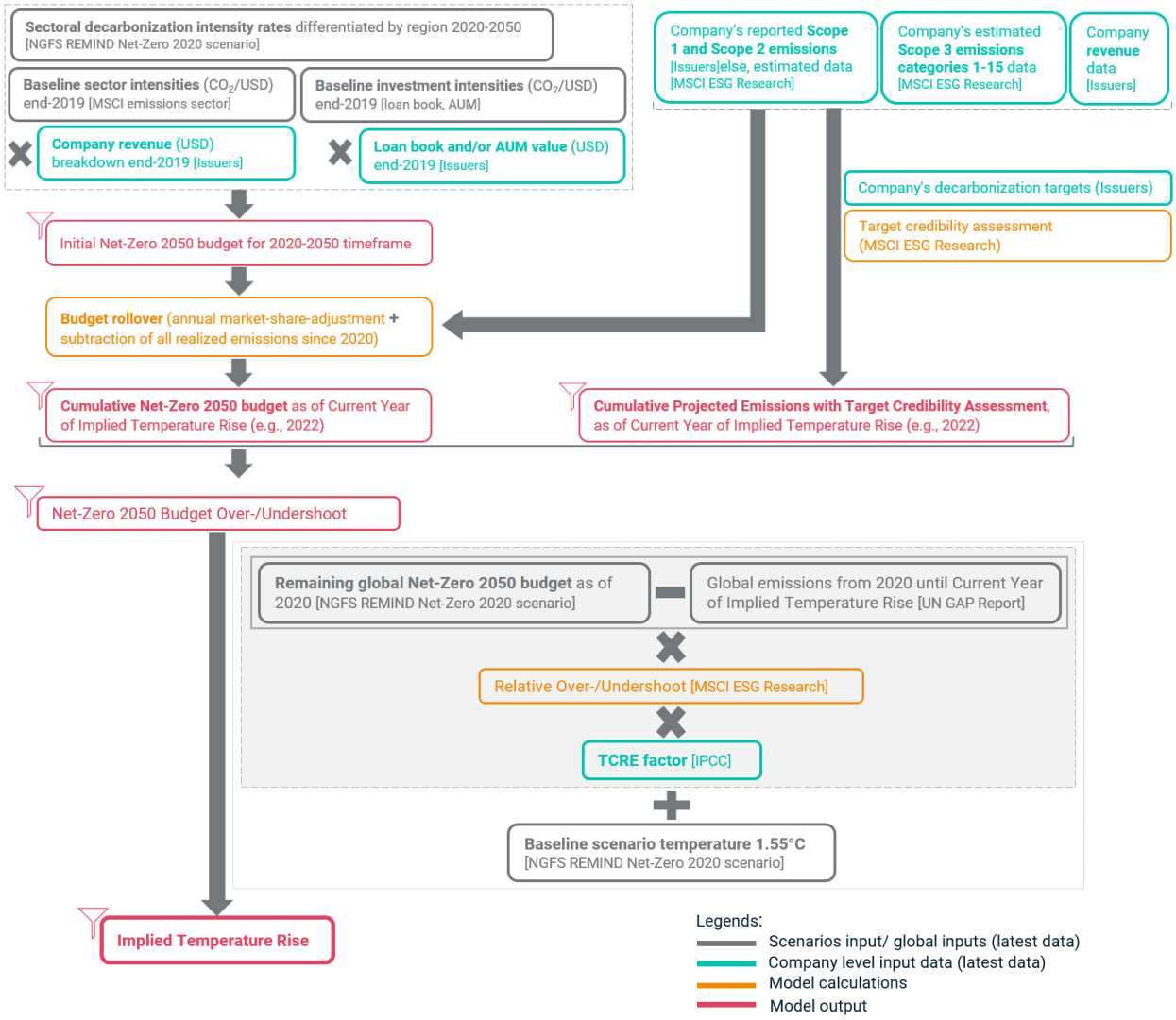
Appendix III – Overview of company-level Implied Temperature Rise computation

Exhibit44: High-level summary of ITR computation



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Glossary

Name	Definition
Absolute carbon budget overshoot (tCO_2e)	A company's projected greenhouse gas emission over- or undershoot when comparing a company's projected Scope 1, 2 and 3 emissions to its remaining emission budget available to limit global warming to 1.55°C. This is the difference in tCO_2e between the cumulative projected carbon emissions with target credibility assessment and the cumulative Net Zero 2050 carbon budget. A negative number corresponds to a budget undershoot and a positive number to a budget overshoot. The overshoot is capped at emissions scope level so that the resulting Implied Temperature Rise does not exceed 10°C.
Annual Net Zero 2050 Scope 1 intensity (tCO_2e/USD million sales)	The annual Net Zero 2050 Scope 1 intensity in tCO_2e per USD million sales is the Scope 1 intensity pathway required for a 1.55°C alignment over the time frame 2020-2050. The annual Net Zero 2050 Scope 1 intensity is region- and sector (MSCI ESG emission sector)-specific.
Annual Net Zero 2050 Scope 2 intensity (tCO_2e/USD million sales)	The annual Net Zero 2050 Scope 2 intensity in tCO_2e per USD million sales is the Scope 2 intensity pathway required for a 1.55°C alignment over the time frame 2020-2050. The annual Net Zero 2050 Scope 2 intensity follows the utilities pathways differentiated by region.
Annual Net Zero 2050 Scope 3 intensity (tCO_2e/USD million sales)	The annual Net Zero 2050 Scope 3 intensity in tCO_2e per USD million sales is the Scope 3 intensity pathway required for a 1.55°C alignment over the time frame 2020-2050. The annual Net Zero 2050 Scope 3 intensity is sector (MSCI ESG emission sector)-specific.
Cumulative projected carbon emissions (Scope 1, 2 and 3) with targets at face value (tCO_2e)	A company's total projected greenhouse gas emissions from the year reference of current Implied Temperature Rise until the year 2050, taking any climate target at face value. A company's emissions are projected by taking into account the latest Scope 1, 2 and 3 emissions data (Scope 1 and 2: reported, if available or estimated; Scope 3: estimated) and, when available, the company's pledged climate targets. This value may be different from that of cumulative projected emissions with target credibility assessment, which determines Implied Temperature Rise outputs.
Cumulative projected carbon emissions (Scope 1, 2 and 3) with target credibility assessment (tCO_2e)	A company's projected total greenhouse gas emissions from the year reference of current Implied Temperature Rise until the year 2050. These emissions are projected by taking the latest Scope 1, 2 and 3 emissions data (Scope 1 and 2: reported, if available or estimated; Scope 3: estimated) and, when available, the company's pledged climate targets into account as well as target credibility weights.

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Emissions intensity	Emissions rate normalized by revenue.
Implied Temperature Rise (ITR)	The Implied Temperature Rise methodology computes a forward-looking temperature alignment for companies and portfolios. It extrapolates a company's or portfolio's over- or undershoot to a global carbon budget over- or undershoot. This way, it expresses the individual contributions of companies and portfolios to global warming.
Initial Net Zero 2050 carbon budget	The Initial Net Zero 2050 carbon budget (tCO_2e) is the initial sum of total greenhouse gas emissions (Scope 1, 2 and 3) available for the company to emit to keep global warming to 1.55°C (this temperature value is per NGFS data). This is based on an initial budget allocation for the period 2020-2050, derived from NGFS REMIND Net Zero 2050 pathways. The initial Net Zero 2050 Scope 1 budget is differentiated by sector and region, the initial Net Zero 2050 Scope 2 budget follows the relevant NGFS utilities pathway by country breakdown, and the initial Net Zero 2050 Scope 3 budget is differentiated by sector.
Intergovernmental Panel on Climate Change	Created in 1988, the Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change. It determines the state of knowledge on climate change, identifying where there is agreement in the scientific community, and where further research is needed. The IPCC does not conduct its own research. IPCC reports are neutral, policy-relevant but not policy-prescriptive.
Global Industry Classification Standard (GICS®)	GICS is the global industry classification standard jointly developed by MSCI and S&P Global Market Intelligence. GICS is a four-tiered, hierarchical industry classification system. The four tiers are: sectors, industry groups, industries and sub-industries. Revenue is a key factor in determining a firm's principal business activity
Glasgow Financial Alliance for Net Zero (GFANZ)	The Glasgow Financial Alliance for Net Zero (GFANZ) is a global coalition of more than 550 financial institutions committed to accelerating the decarbonization of the economy. Members commit to align their lending and investing with 1.5°C from preindustrial levels. The GFANZ workstream on portfolio alignment published, in November 2022, a landmark report on portfolio alignment measurement best practice, which the ITR methodology strives to align with.
Greenhouse Gas Protocol (GHGP)	GHGP is the body that set comprehensive global standardized frameworks to measure and manage greenhouse gas emissions from private- and public-sector operations, value chains and mitigation actions.

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MSCI ACWI Investable Market Index (IMI)	The MSCI ACWI Market Index (IMI) captures large-, mid-, and small-cap stocks across 23 developed markets (DM) and 27 emerging markets (EM) countries, covering approximately 99% of the global equity investment opportunity set.
Network for Greening the Financial System (NGFS)	The Central Banks and Supervisors Network for Greening the Financial System (NGFS) is a group of central banks and supervisors willing, on a voluntary basis, to exchange experiences, share best practices, contribute to the development of environment and climate-risk management in the financial sector, and to mobilize mainstream finance to support the transition toward a sustainable economy. It commissions work on climate finance, including open-source climate scenarios. The ITR pathway modelling uses the REMIND-MAgPIE Net Zero 2050 scenario to benchmark companies and portfolios.
Partnership for Carbon Accounting Financials (PCAF)	The Partnership for Carbon Accounting Financials (PCAF) is a global partnership led by the financial industry to enable financial institutions to develop and implement a harmonized approach to assess and disclose GHG emissions associated with their loans and investments.
Relative carbon budget overshoot (%)	A company's relative carbon budget over- or undershoot for Scope 1, 2 and 3 emissions when comparing a company's projected Scope 1, 2 and 3 emissions to its remaining emission budget available to limit global warming to 1.55°C. This is the relative difference between the cumulative projected carbon emissions with target credibility assessment and the cumulative Net Zero 2050 carbon budget. A negative number corresponds to a budget undershoot and a positive number to a budget overshoot. The relative overshoot is capped so that the resulting Implied Temperature Rise - Scope 1 does not exceed 10°C.
Science-Based Targets initiative (SBTi)	The Science-Based Targets initiative (SBTi) is a partnership between CDP, the United Nations Global Compact, World Resources Institute and the World Wide Fund for Nature. The partnership defines standards and promotes best practices in emissions reductions and net-zero targets in line with climate science, providing companies with an independent assessment and validation of targets.
Scope 1 emissions	Scope 1 emissions are those from sources owned or controlled by the company, typically direct combustion of fuel, as in a furnace or vehicle.
Scope 2 emissions	Scope 2 emissions are those caused by the generation of electricity purchased by the company.

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Scope 3 emissions	Scope 3 emissions include an array of indirect emissions resulting from activities such as business travel, distribution of products by third parties, and downstream use of a company's products (i.e., by customers). Most reports of Scope 3 emissions include only some portion of these.
Transient Response to Cumulative CO_2 Emissions (TCRE) factor	The transient climate response to cumulative CO_2 emissions (TCRE) is a factor that directly relates the primary cause of climate change (cumulative CO_2 emissions) to global mean temperature change. The metric was developed as researchers noticed that the cumulative CO_2 emissions versus temperature change curve was nearly linear for almost all Earth system model output. The IPCC mentions, in its 2018 AR6 Report (Summary for Policymakers), "Each 1,000 $GtCO_2$ of cumulative CO_2 emissions is assessed to likely cause a 0.27°C to 0.63°C increase in global surface temperature with a best estimate of 0.45°C"
Remaining global Net Zero 2050 carbon budget ($GtCO_2e$)	The global Net Zero 2050 carbon budget represents the remaining total greenhouse gases available globally to limit global warming to 1.55°C, as of the year reference of current Implied Temperature Rise. It is used to extrapolate an Implied Temperature Rise, as of the year reference of current Implied Temperature Rise.
Year reference of current Implied Temperature Rise	Year corresponding to the company's current Implied Temperature Rise, i.e., the year after which the emissions budget rollover has been implemented (market-share adjustment, deduction of realized emissions) and from which company projected emissions and the remaining budget are computed (e.g., the Implied Temperature Rise of a company as of Jan 1, 2021).

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