

Corporate emissions targets failing to keep pace with 1.5°C trajectory

8 DECEMBER 2021

AUTHORS

Andrew Grant

VP – Climate Solutions
Moody's ESG Solutions

Natalie Ambrosio Preudhomme

Director – Outreach & Research
Moody's ESG Solutions

Hasan Cerhozi

Head of Methodology Development -
Impact & Sustainable Finance
Moody's ESG Solutions

8 DECEMBER 2021

ABOUT

Moody's is committed to helping market participants advance strategic resilience, responsible capitalism, and the greening of the economy. Our offerings span across credit, ESG, sustainable finance, and climate risk solutions and help our customers identify risks and opportunities and provide meaningful performance measurements and insights.

MEDIA CONTACT

Michael Simon
AVP, Communications
+1 (212) 553-0213
michael.simon@moodys.com

GENERAL CONTACT

Email us at MESG@moodys.com

Climate Solutions – Global

Corporate emissions targets failing to keep pace with 1.5°C trajectory

Summary

In this report, we examine our recently-launched [Temperature Alignment Data](#) to understand whether the ambition of corporate emissions targets matches what is required to reach net zero by 2050, thus keeping global temperature rise to 1.5°C.

Companies' target-setting relating to emissions is increasingly popular, but remains a minority practice. 42% of the 4,400 assessed companies have set emissions targets of some sort, but only 17% reference “net zero”.

Targets are difficult to quantify, compare and assess within a consistent framework. 11% of companies in our universe, representing 19% of global market capitalization, have set targets that we can quantify and which extend as far as 2030. Reasons for the gap include a lack of disclosure of current emissions and idiosyncratic intensity targets. Assumptions can be made to increase coverage, but at the expense of certainty.

The average implied temperature rise across the universe of companies we scored is 2.9°C. Many companies have not set targets and are assumed to be aligned with a “current policies” future of 3.1°C.

Even among those companies that have set targets, the average implied temperature increase is 2.1°C, highlighting the need for companies to keep ratcheting up ambition to meet international climate goals. Just 3% of companies are aligned with net zero by 2050.

Company propensity to set targets varies by size and emissions intensity, among other factors. If we weight by market capitalisation, the average assessment is 2.6°C compared to 2.9° unweighted. This demonstrates that larger companies are more likely to set emissions targets. Similarly, if we weight by emissions (scope 1 and 2), the average assessment is 2.7°C, indicating that the greater pressure on high-emitting companies is translating into greater levels of target setting in these segments.

Sector results vary widely, but every individual sector has an aggregate implied temperature increase of more than 2°C. The electric and gas utilities sector has one of the best average alignment levels, at 2.1°C. The oil and gas sector is the worst performer, with an average increase of 3.0°C – just 6% of universe companies in the sector have set targets including scope 3, which accounts for the vast majority of the industry's lifecycle emissions.

North America's performance is dependent on ambition from larger companies. The temperature rise of companies in the region is a poor 3.0°C on a simple average, but 2.5°C when weighting by market capitalisation. Europe leads in both number and ambition of targets.

Portfolio alignment techniques become increasingly popular

With the growing number of net zero commitments by governments, companies and financial institutions comes a growing need for transparency and clarity on what these commitments mean in practice and what interim steps will be taken to achieve net zero. This is particularly important for investors and lenders who need greater clarity on companies' net zero plans to inform efforts to implement net zero in their own portfolios. The increasing use of [Task Force on Climate-related Financial Disclosures \(TCFD\)](#) recommendations has furthered the growing demand for forward-looking metrics on how companies are contributing to the transition to a low-carbon economy. In particular, following the Paris Agreement of 2015 and [2018's IPCC Special Report on Global Warming of 1.5°C](#), aligning with a pathway to net zero emissions in 2050 has emerged as a key objective given the IPCC's finding that we must reach this milestone if we hope to limit warming to 1.5°C. In fact, during COP26, The United Nations Glasgow Financial Alliance for Net Zero (GFANZ), a group of investors, banks and insurers overseeing [\\$130 trillion in assets](#), [pledged that their investments would hit net zero emissions targets by 2050](#). This underscores the growing demand for datasets that assess portfolios' associated emissions and contributions to net zero.

One forward-looking metric that has sharply risen in prominence in recent years is "portfolio temperature alignment," or the practice of associating a security or portfolio with a particular climate pathway or global warming outcome. For the many producers and users of financial products, portfolio alignment offers a relatively simple way to boil a complex set of variables down to a single metric that intuitively describes the degree of warming that a given product would be consistent with, and hence a way to indicate its climate credentials. At the same time, methodologies that give a single implied temperature rise (ITR) number have come under scrutiny for, amongst other things, being "black boxes" that gloss over the many uncertainties inherent in such an exercise. For example, there is no single set pathway to a particular climate outcome, and any single emissions pathway will have a probabilistic range of different potential associated temperature outcomes rather than one certain level of warming.

These differences of opinion in part reflect the several trade-offs and judgement calls that must be made in the development of portfolio alignment methodologies, depending on the desired focus of the approach. These have been well detailed, for example, by the [Portfolio Alignment Team](#), occasioned to support the TCFD's efforts in this space. While different approaches have different strengths and limitations, there is an opportunity to leverage temperature alignment datasets to provide meaningful insights into investment portfolios' contribution to the journey to net zero. Understanding the details of a specific approach will enable the most meaningful use of that dataset to inform risk management and portfolio decision-making.

Leveraging a temperature alignment dataset to identify the ambition of corporate emissions targets

We leverage our recently-launched [Temperature Alignment Data](#) to assess the forward-looking trajectory of companies' emissions based on their greenhouse gas (GHG) emissions reduction targets (see Appendix for methodology overview). This assessment covers roughly 4,400 large, publicly listed companies, representing around 67% of global market capitalisation.^{1,2} The findings include information on the prevalence of target-setting in our universe, as well as the temperature alignment of existing targets, providing insight into how corporate commitments may translate into associated global temperature pathways and the gap between the current trajectory and what's needed to reach net zero by 2050.

Based on market feedback, the development of our dataset has been guided by several key principles. Firstly, the dataset focuses on the relatively near term, examining targeted emissions in the period from 2022 to 2030. This approach places priority on more immediate action rather than incentivising claims about the far future that aren't backed up by a clear plan. Where possible, we try to avoid making assumptions about company behaviour in the long term based on today's knowledge, recognising that each may be very different in 10-plus years than it is today. Secondly, the dataset leverages well-known benchmarks published by the [International Energy Agency](#) (IEA). While in theory there is flexibility on the pathway to net zero, particularly at more granular levels, in practice there are a small number of available scenarios that give the requisite sector detail to be compared on a like-for-like basis with company targets. We use three benchmarks with a simple approach to interpolation and rules for where companies fall outside these levels.

¹ Further research will cover an expanded universe of 7,500 companies, which will be available in 2022.

² Certain sectors, such as REITs and banking, are currently excluded due to poor disclosure or understanding of what constitutes scope 3 emissions.

This paper shares key findings from this analysis at a global level, as well as sector and regional trends. This enables consideration of the different drivers of temperature alignment. Together with company specific results, these findings can help identifying high-priority targets for engagement, benchmarking or aligning portfolios or funds, and aiding the setting of emissions targets for financial market participants.

Moody's on Climate

The shift to a net zero global economy is well underway and accelerating. As critical carbon-intensive sectors undergo rapid transformation, there are significant and diverging impacts on transition preparedness, with implications for default risk and industrial competitiveness. The ability of these sectors to navigate risks and unlock opportunities over the next 10 to 15 years in this fundamental realignment of the global economy will determine whether a 1.5°C world is in reach by 2050.

As such there is significant and growing demand in the financial system for accurate assessment of climate risk and opportunity. Through this line of research – along with the other data and analytics we are developing across Moody's – we hope to provide the tools and insights needed to support sustainable and resilient investments that enable sectors and companies to thrive in a zero-carbon future.

For more, visit our [Moody's on Climate](#) hub and read [Ready or not? Sector Performance in a Zero-Carbon World](#), our new report that analyses the exposure of carbon-intensive sectors to climate risk and their readiness for the transition at hand.

Our global dataset indicates a need for increased ambition to align with net zero by 2050

Target setting is increasing in popularity, but remains a minority practice

We observe that 42% of assessed companies have set emissions targets in some form, but only 17% refer to net zero and these may only be referring to certain portions of company emissions.

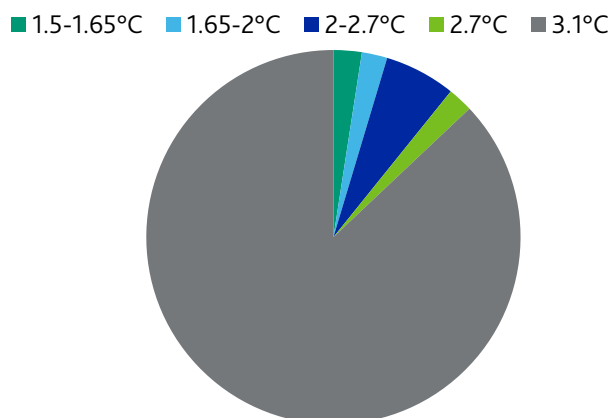
However, converting these targets into temperature assessments under our framework requires that they be quantifiable in terms of the levels of GHG reduction involved, and extend a reasonable distance into the future. We find that 11% of the companies in our universe have set targets which can be quantified and which run to 2030 or beyond, representing 26% of total universe emissions (scope 1 and 2) and 28% of universe market capitalization.³

Globally, just 3% of companies in our universe are aligned with 1.5°C warming, or a future of net zero by 2050, with a further 2% above this level but still “well below 2°C”.⁴

³ I.e., the target has an end date of 2030 or later, which allows us to look at targeted emissions over the period 2022-2030 and have an equivalent time period to assess companies on a like-for-like basis. We note that our dataset also includes a temperature assessment for each company target based on the entire period covered by the target, regardless of when it ends – so targets which cover the period to 2025 or 2035 would be assessed based on emissions relative to benchmark over the periods from 2022 to those end dates respectively.

⁴ Here assumed to be 1.65°C, the temperature outcome associated with the International Energy Agency's Sustainable Development Scenario (with a 50% probability of limiting temperature rises to this level).

Figure 1 Distribution of company alignment with key climate pathways



Note: throughout this report, temperature alignment numbers exclude companies that have targets with insufficient data to quantify or that do not extend to 2030 (32% of universe).

Sources: Company reports, International Energy Agency, Moody's ESG Solutions

Among those companies that have set targets, the mean temperature alignment is 2.1°C.

Companies that haven't set a target are given a default temperature alignment of 3.1°C, being assumed to be broadly representative of a 'current policies' world where there is no further action on climate.⁵ As only a minority of companies have set targets, and a fewer still have set quantifiable targets, the average implied temperature outcome is heavily weighted towards the business-as-usual behaviour of those companies that haven't set targets. This means that on a simple average basis, the mean temperature outcome across the universe is 2.9°C. We expect that this average temperature outcome may increase further as we increase coverage, extending into increasingly smaller companies that are perhaps less likely to set decarbonisation targets, unless offset by a ramp up of commitments across the company universe.

Additional pledges made at COP26, if implemented in full and on time, have been estimated to lead to a 1.8°C at 2100 outcome by the [International Energy Agency](#) and [Climate Action Tracker](#). This highlights the continuing ratcheting of ambition required by the corporate world to catch up with government net zero targets and associated policies which may be implemented to reach a well-below 2°C outcome, let alone the ultimate 1.5°C goal.

A sharp change of direction is required

Our analysis shows that the corporate world will need to change practice on emissions significantly to hit its own targets, reflecting the sharp change in trajectory required by the broader global economy to hit climate commitments. We quantify the required change of direction by projecting forward emissions based on historical time series for each individual target-setting company on two bases. First, we use the trajectory in emissions since 2015, the year of the Paris Agreement; and, second, we use the trajectory since the base year of each company's target.⁶

⁵ 3.1°C is based on the work of Climate Action Tracker (CAT) at the time of methodology development. See <https://climateactiontracker.org/global/temperatures/>. We note that CAT has updated their analysis post-COP26, and we will review this default temperature outcome in future iterations. In the interim, we highlight that a) indicated temperature outcomes on the CAT website are stated in terms of a 66% probability of maintaining temperatures below this level, rather than the 50% probability used in the benchmarks here; and b) that this is based on the median of the potential range of outcomes and that companies that haven't set targets might arguably be more likely to fall on the wrong side of average, meaning that the use of a median temperature outcome for these companies is relatively conservative. We further note that this 3.1°C implied temperature rise differs to the 2.7°C default used in an earlier version of the methodology included in the *Ready or Not* report referenced above. The 2.7°C was based on the STEPS scenario, which includes full implementation of the Paris Agreement Nationally Determined Contribution (NDCs); we therefore ultimately considered this being incorporated as the worst possible temperature outcome to underestimate the risk of potentially higher warming outcomes and revised the default assumption as above.

⁶ If a company sets a target to reduce emissions by 20% by 2030 from its 2016 level, 2016 would be the base year for this purpose. However, we note that this is a relatively short time series and hence subject to a degree of volatility when used for this purpose. In particular, for companies where historical trajectory includes 2020, this will likely be impacted by the effects of the COVID-19 pandemic (perhaps particularly in absolute emissions terms compared to intensity terms), and hence historical trajectories may be artificially low in the short term and rise sharply as updated data begins to reflect recovering activity. Conversely, companies where the last reported data used is from 2019 may see their trajectory dip and then rise.

The extrapolations of historical data can then be contextualised in a number of ways. For example, they can be treated with a temperature assessment in the same way as a forward-looking target, therefore yielding a temperature alignment if the trend was continued, that can be compared against the alignment of the planned target to put the impact of the potential change in company direction in degrees Celsius. Alternatively, the extrapolation might also be compared to emissions reduction trajectories in CO₂ terms to indicate the percentage cut required to meet the company's stated target, or indeed to meet the company's sector benchmark for net zero alignment.

We find that the average company that has set a target will need to cut aggregate 2022-2030 emissions by 20% to meet its own commitments, or by 35% to put itself on a net zero path by 2050. This finding is broadly consistent with the conclusion of the [IPCC that limiting warming to 1.5°C requires anthropogenic emissions to fall by about 45% by 2030 \(from 2010 levels\)](#).

Sectors exhibit significantly difference performance

Target-setting activity levels vary significantly, with gas and electric utilities leading the way

Reflecting its importance in the shift to a decarbonised global economy, the gas and electric utilities sector contains the highest level of target setting, with 84% of companies setting targets and 62% with targets that are quantifiable and comparable to the sector benchmark under our framework. Airlines and shipping companies also exhibit high levels of target-setting, but from a small sample size for shipping, and with a large proportion of airline sector targets being unable to be quantified in terms of emissions reductions (Table 1).⁷

Table 1 Target setting by sector

APPROACH	SECTOR	NUMBER OF COMPANIES	% OF COMPANIES WITH TARGETS	% OF COMPANIES WITH QUANTIFIED TARGETS TO 2030	% OF COMPANIES WITH AN UNQUANTIFIABLE TARGET
SDA	Airlines	32	81%	13%	69%
	Aluminium	10	60%	30%	30%
	Automobiles	55	49%	25%	24%
	Cement	27	63%	41%	22%
	Electric and gas	94	84%	62%	22%
	Oil and gas	179	47%	16%	31%
	Shipping	6	83%	67%	17%
	Steel	24	67%	38%	29%
ARA	Others	3,973	40%	9%	32%
SDA + ARA	All	4,400	42%	11%	32%

Note: SDA = Sector Decarbonisation Approach, ARA = Absolute Reduction Approach.

Sources: Company reports, Moody's ESG Solutions

This is not reflected in the oil & gas sector, perhaps influenced by its comparatively limited range of substitution options, where just 11 companies (6% of total) have set explicit targets that include scope 3, which accounts for an estimated 85-90% of lifecycle GHG emissions related to oil and gas use. Again we note that our universe so far covers larger companies, and that we expect these average figures to fall as we extend the universe into smaller companies that are less likely to have set targets (unless offset by a commensurate increase in target-setting activity from the present day).

Companies in other sectors assessed using the Absolute Reduction Approach (ARA) show a lower level of target setting than the Sector Decarbonisation Approach (SDA) sectors. This likely reflects investors having prioritised portions of the economy with higher emissions and potentially greater exposure to transition risk in their analysis, in turn incentivising such companies to set targets.

⁷ This is frequently because companies state that they follow the International Air Transport Association (IATA) targets, which are not specific on absolute reduction and only refer to "net" CO₂ i.e. including the effect of offsets, which are not quantified and thus hard to compare to a sector benchmark stated in emissions reduction terms. IATA has recently approved a resolution for the airlines industry to achieve net-zero carbon emissions by 2050, with the roadmap in terms of the planned technologies rather than emissions reductions. See <https://www.iata.org/en/pressroom/2021-releases/2021-10-04-03/>.

The SDA is applied to eight key sectors, with benchmark metrics and attributes varying for each depending on which scopes of emissions are most material in lifecycle terms and which activity measures are most relevant (Table 2).

Table 2 Focus sectors using Sector Decarbonisation Approach

SECTOR	ASSESSMENT METRIC	SCOPES	NOTES
Airlines	gCO ₂ /RTK	1	RTK = revenue tonne-kilometre
Aluminium	tCO ₂ e/t Al	1+2	Includes primary and secondary production, includes PFC emissions
Automobiles	gCO ₂ /km	3	New sales of passenger cars only
Cement	Net tCO ₂ /t	1	Net CO ₂ excludes on-site power gen. Per tonne cementitious materials
Electric and gas utilities	gCO ₂ /kWh	1	
Oil and gas	tCO ₂ e/TJ	1+2+3	Based on energy sector intensity, includes methane emissions
Shipping	gCO ₂ /tkm	1	tkm = tonne-kilometer
Steel	tCO ₂ /t steel	1+2	Includes primary and secondary production
Other sectors (ARA)	tCO₂	1+2+3	Absolute reductions rather than intensity basis

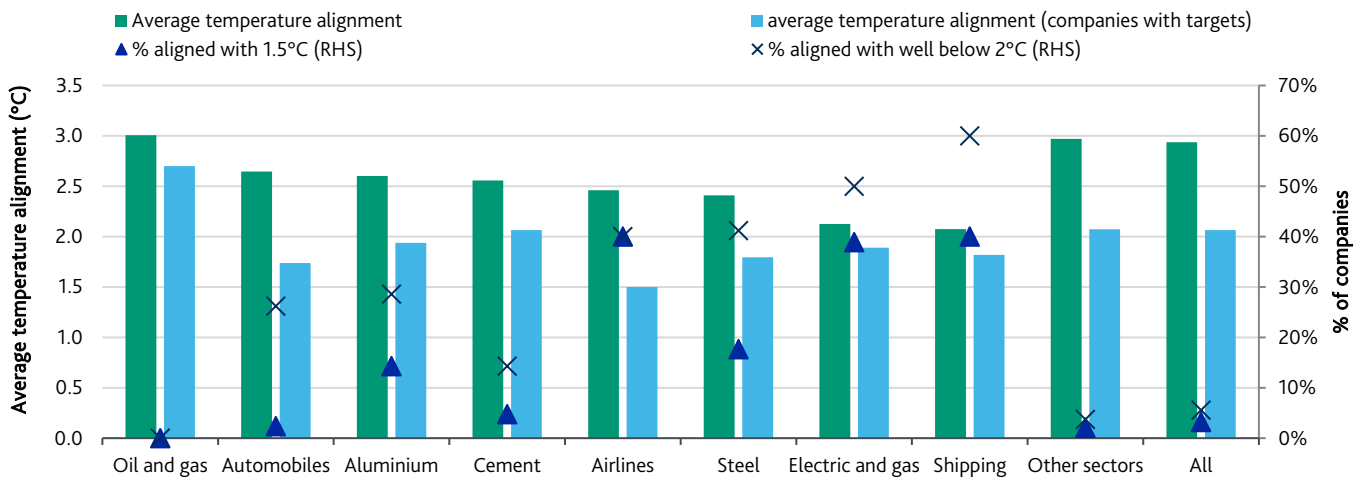
Sources: Company reports, Moody's ESG Solutions

Implied temperature alignment reflects both extent of target setting and ambition of targets

This level of target setting then feeds through to implied temperature rise projections, where the oil and gas sector comes in as the worst performer with an average alignment of 3.0°C (Figure 2).

Conversely, the electric and gas utilities and shipping sectors lead the pack with an average temperature rise of 2.1°C overall, still well above the 1.5° target. If we focus solely on those companies that have set targets, we find that these two sectors (1.9°C and 1.8°C respectively) fall behind airlines (1.5°C) and automobiles (1.7°C) in having the most ambitious target setters. That said, we note that the airlines sector has a small sample size, and may yet be influenced by a mismatch in timing between the publication of the source material used to calculate the benchmarks and the reporting calendar for companies, meaning that the impacts of COVID-19 are not reflected to equal degree in both.

Figure 2 Average temperature alignment, % alignment by sector



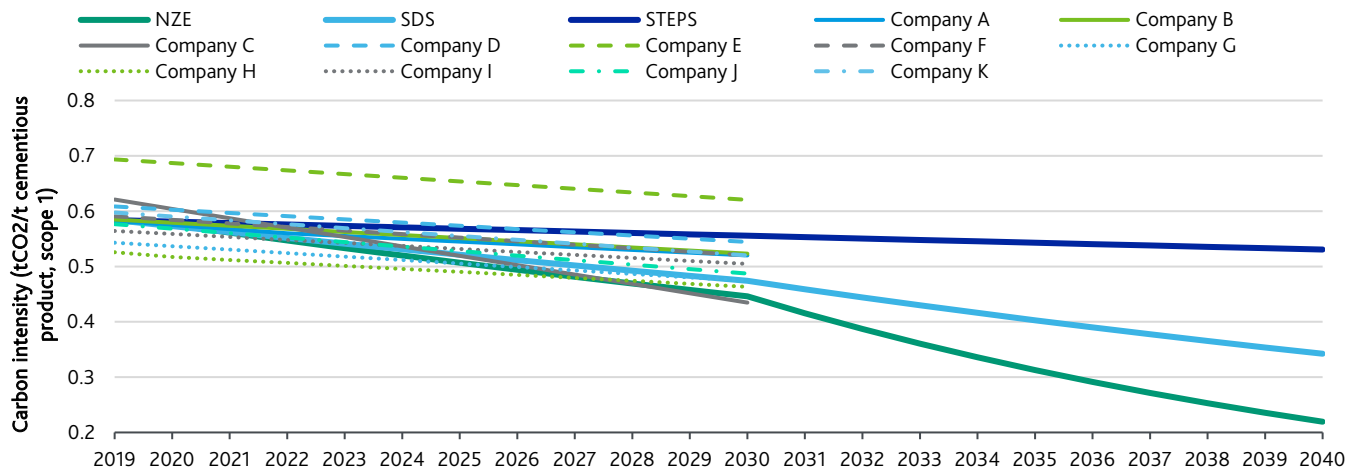
Sources: Company reports, International Energy Agency, Moody's ESG Solutions

Time series highlight leaders and laggards within sectors

Some sectors are composed of companies with a wide range of starting positions for emissions intensity, as well as levels and ambition of target setting. In addition to looking at sector averages, it is instructive to look at the performance of individual names, particularly for certain use cases such as identifying laggards as a focus for engagement activities.

As an example, the chart below shows 11 companies assessed in the cement sector that have set quantified targets.

Figure 3 Cement sector emissions intensity targets and benchmarks



Note: company targets and benchmarks are stated in units of tonnes of “net” CO₂ per tonne of cementitious product. Net emissions are direct (scope 1) emissions from cement production. This includes the emissions from burning fossil fuels to heat kilns, from the calcination process and from on-site use of the company’s vehicles. It however excludes CO₂ emissions from on-site power generation, emissions from alternative fuels and raw materials, and emissions from off-site use of the company’s vehicles. “Cementitious product” consists of all clinker produced by the reporting company for the purposes of making cement or direct clinker sale, plus gypsum, limestone, cement kiln dust, all clinker substitutes consumed for blending, and all cement substitutes. “Cementitious product” excludes clinker purchased from another company and used to make cement.

Sources: Company reports, International Energy Agency, Moody’s ESG Solutions

The companies vary in implied temperature rise from 1.5°C to 2.7°C as a function of their starting carbon intensity and rate of change embedded in their targets. As the chart shows, cement industry practice to date stays short of setting targets that extend beyond 2030. Some companies have set net zero or carbon neutrality targets that extend beyond this, for example [Holcim Group](#). However, without quantified emissions reductions these are not reflected. The benchmarks illustrate the continued and accelerating progress that will be required by the industry to align with international climate goals.

Weighting techniques can give different aggregated assessments for the same universe, depending on focus

The results discussed in this paper largely give the underlying constituent companies equal weight. However, when thinking about results in terms that summarise the positioning of multiple companies in aggregate terms – for example, in the case of portfolio-level statistics – differing weights in each security will need to be considered. By way of illustration, different size equity stake holdings will mean that individual securities contribute differently to portfolio overall emissions and temperature assessment, and require differing levels of portfolio reallocation in order to meet desired outcomes.

Aggregation techniques

In the same way that there are multiple options and trade-offs at every stage of the temperature alignment methodology development process, there are several different ways of aggregating individual company or security alignment views up to the portfolio or other summary (e.g. sector, asset class) level.

For example, if security emissions are projected in absolute terms and in the long (multi-decadal) term, under the “aggregated-budget” approach they can be summed at the portfolio level and compared to an absolute portfolio-level emissions benchmark. The total CO₂ overshoot from the benchmark can then be quantified and multiplied by a factor representing the sensitivity of the climate to a tonne of CO₂ to give an overall portfolio temperature assessment. On the downside, this requires making assumptions about what companies might look like in many years hence, an exercise that may involve a high degree of uncertainty.

Given our methodology focuses on the relatively-near term, and uses both absolute emissions and sector-specific emissions intensity metrics, we calculate portfolio metrics as a weighted average – the “portfolio-weight approach.” This can be weighted either based on investment size (larger % of portfolio capital results in a higher weighting) or “owned” emissions (larger % of portfolio owned emissions results in a higher weighting). The latter is considered by the Portfolio Alignment Team to be more scientifically robust; for example, weighting based on investment size may mean that small stakes in big emitters are undercounted. However, full weighting based on emissions including scope 3, as recommended, remains a challenge due to poor disclosure. We therefore suggest portfolio weighting on the basis of scope 1 and 2 owned emissions, where our coverage is 100% (reported or estimated), or invested capital depending on objective.

Company propensity to set targets varies by size and emissions intensity, among other factors. As mentioned above, the overall universe temperature assessment on a simple average basis is 2.9°C. If we weight by market capitalisation – that is, treat the universe as a portfolio with an equal percentage stake in each company – the average assessment is 2.6°C, illustrating that larger companies are more likely to set emissions targets. If we weight by emissions (scope 1 and 2), the average assessment is 2.7°C, indicating that the greater pressure on high-emitting companies is translating into greater levels of target setting in these segments. Accordingly, different portfolio styles may find themselves at an initial advantage or disadvantage depending on the types of companies included in their mandates.

This further highlights an important dynamic in the portfolio context – changes in overall temperature assessment can be made via either position resizing or even divestment, or by the underlying companies themselves becoming greener, or most likely a combination. Comparing portfolio holdings and company scores over time will allow investors to disaggregate these two effects and quantify them separately, helping them understand the extent to which their portfolio companies are shifting and seeking to make changes in the real economy.

Europe based companies lead the way in terms of target setting

As might be expected, regional levels of temperature alignment are largely driven by the extent of target setting of companies located in those regions. Europe has the greatest proportion of companies with targets, and the lowest average temperature rise of just under 2.8°C. We note that there isn't a wide dispersion of alignment levels, with just a quarter of a degree range between first and last place (North America). Target setting in Europe is significantly more common than in North America, with roughly 25% more companies having set targets and 11% more having set quantifiable targets (Table 3).

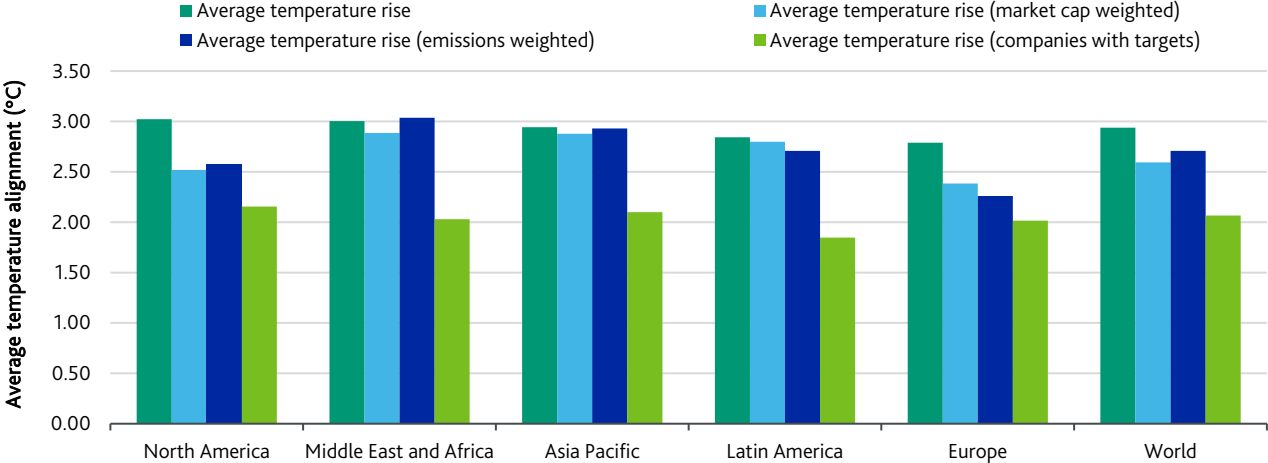
Table 3 Target setting by geographic region

	NUMBER OF COMPANIES	% OF COMPANIES WITH TARGETS	% OF COMPANIES WITH QUANTIFIED TARGETS TO 2030
North America	1727	32%	6%
Middle East and Africa	77	35%	6%
Asia Pacific	1255	43%	11%
Latin America	115	50%	13%
Europe	1126	57%	17%
World	4400	42%	11%

Source: Company reports, Moody's ESG Solutions

However, where companies do set targets, a similar trend is seen in the level of ambition. Target-setting companies based in Europe (averaging 2.0°C) again feature well; target-setters in Latin America (1.8°C) and Middle East and Africa (2.0°C) also have relatively low average temperature alignment figures, but we note very small sample sizes in these regions (Figure 4).

Figure 4 Average temperature alignment by geographic region



Sources: Company reports, International Energy Agency, Moody's ESG Solutions

Again however, weighting the averages exposes difference in practice by different companies and presents some surprising results. Strong performance by larger companies in North America means that weighting by market capitalisation lowers the implied temperature rise to 2.5°C, second only to Europe on this basis.

The urgent need for progress calls for increased transparency and ambition

These findings demonstrate the progress that has been made in preparing for the transition to a low-carbon economy, while underscoring that progress to date is not enough to match international climate commitments. While a growing number of companies have set emissions reduction targets, companies with quantifiable targets remain the minority. Further, for those that have announced targets, there is still much to be done in terms of setting an emissions reductions strategy and executing on delivery.

Incremental progress on both disclosing upon and achieving emissions reductions is essential and industry organizations such as GFANZ have an opportunity to serve as market-leading examples. A steady increase in both transparency and accountability will help ensure the the growing excitement around net zero commitments translates into tangible change.

Appendix: Moody's ESG Solutions Temperature Alignment Methodology

The Temperature Alignment Data, a net zero solution, is part of our wider transition risk offering. It leverages Moody's ESG Solutions' database of reported and estimated corporate GHG emissions and applies announced company emissions targets to produce a forward-looking trajectory of emissions implied by those targets. We then compare cumulative targeted emissions for each company to benchmark climate scenarios produced by the International Energy Agency (IEA) over the period 2022-2030 to measure alignment with different emissions trajectories. Company alignment with these scenarios can be distilled in a single assessment, expressed in degrees Celsius, that indicates positioning relative to these benchmarks. This is referred to as an implied temperature rise (ITR) or temperature alignment. Since a company's emissions pathway is projected as implied by its publicly stated targets, the alignment refers to the ambition of these targets rather than incorporating a company's likelihood of achieving them.

An assessment of 1.5°C indicates alignment with a net zero in 2050 pathway; linear interpolation is used where targets fall above the net zero pathway and below another benchmark trajectory. Scopes of emissions are included based on materiality, including scope 3 where relevant.

For benchmark pathways we use three scenarios published by the IEA:

- » **Net Zero Emissions by 2050 (NZE2050)** – based on a pathway to net zero CO₂ emissions globally by 2050 and consistent with limiting global warming to 1.5°C.
- » **Sustainable Development Scenario (SDS)** – consistent with a 50% likelihood of limiting warming to 1.65°C, and implying net zero around 2070 based on a continuation of trend.
- » **Stated Policies Scenario (STEPS)** – a “business as usual” scenario modelled using currently announced policies, consistent with mean warming of 2.7°C.

The assessment incorporates two main approaches, based on a company's sector:

- » **Sector Decarbonisation Approach (SDA)** – used to assess those companies in relatively homogenous, carbon-intensive sectors for which technological and emission projections are available. Intensity-based, using sector-specific units of activity.
- » **Absolute Reduction Approach (ARA)** – used for more heterogeneous sectors, based on the absolute reductions of GHG emissions implied by company targets compared to an economy-wide benchmark. Here scope 3 is always considered material.

Companies that have not set a decarbonisation target are allocated a default implied temperature rise of 3.1°C, based on the current policies outcome projected by Climate Action Tracker (CAT) at the time of our methodology development.⁸ Where companies have set a target, but it exceeds the STEPS benchmark described above, companies are allocated a maximum 2.7°C outcome so as not to extrapolate beyond the benchmarked range. “Pure-plays” focusing exclusively in certain sectors essential to the achievement of climate targets, such as electric vehicles or renewable power generation, are allocated a default outcome of 1.5°C without the need to set separate emissions targets (that is not to say that these companies should not be encouraged to lower their emissions).

Temperature assessments are not provided for “net zero” or “carbon neutral” targets unless companies specify the actual emissions reductions planned. This approach deprioritises the setting of vague, long-distance targets without a realistic roadmap to achievement, which are less useful for investors trying to understand future emissions.

⁸ The median modelled outcome of 2.9°C by CAT is based on a 66% probability; as the benchmarks here are based on 50% probability we use the higher 3.1°C.

© 2021 Moody's Corporation, Moody's Investors Service, Inc., Moody's Analytics, Inc. and/or their licensors and affiliates (collectively, "MOODY'S"). All rights reserved.

CREDIT RATINGS ISSUED BY MOODY'S CREDIT RATINGS AFFILIATES ARE THEIR CURRENT OPINIONS OF THE RELATIVE FUTURE CREDIT RISK OF ENTITIES, CREDIT COMMITMENTS, OR DEBT OR DEBT-LIKE SECURITIES, AND MATERIALS, PRODUCTS, SERVICES AND INFORMATION PUBLISHED BY MOODY'S (COLLECTIVELY, "PUBLICATIONS") MAY INCLUDE SUCH CURRENT OPINIONS. MOODY'S DEFINES CREDIT RISK AS THE RISK THAT AN ENTITY MAY NOT MEET ITS CONTRACTUAL FINANCIAL OBLIGATIONS AS THEY COME DUE AND ANY ESTIMATED FINANCIAL LOSS IN THE EVENT OF DEFAULT OR IMPAIRMENT. SEE APPLICABLE MOODY'S RATING SYMBOLS AND DEFINITIONS PUBLICATION FOR INFORMATION ON THE TYPES OF CONTRACTUAL FINANCIAL OBLIGATIONS ADDRESSED BY MOODY'S CREDIT RATINGS. CREDIT RATINGS DO NOT ADDRESS ANY OTHER RISK, INCLUDING BUT NOT LIMITED TO: LIQUIDITY RISK, MARKET VALUE RISK, OR PRICE VOLATILITY. CREDIT RATINGS, NON-CREDIT ASSESSMENTS ("ASSESSMENTS"), AND OTHER OPINIONS INCLUDED IN MOODY'S PUBLICATIONS ARE NOT STATEMENTS OF CURRENT OR HISTORICAL FACT. MOODY'S PUBLICATIONS MAY ALSO INCLUDE QUANTITATIVE MODEL-BASED ESTIMATES OF CREDIT RISK AND RELATED OPINIONS OR COMMENTARY PUBLISHED BY MOODY'S ANALYTICS, INC. AND/OR ITS AFFILIATES. MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS AND PUBLICATIONS DO NOT CONSTITUTE OR PROVIDE INVESTMENT OR FINANCIAL ADVICE, AND MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS AND PUBLICATIONS ARE NOT AND DO NOT PROVIDE RECOMMENDATIONS TO PURCHASE, SELL, OR HOLD PARTICULAR SECURITIES. MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS AND PUBLICATIONS DO NOT COMMENT ON THE SUITABILITY OF AN INVESTMENT FOR ANY PARTICULAR INVESTOR. MOODY'S ISSUES ITS CREDIT RATINGS, ASSESSMENTS AND OTHER OPINIONS AND PUBLISHES ITS PUBLICATIONS WITH THE EXPECTATION AND UNDERSTANDING THAT EACH INVESTOR WILL, WITH DUE CARE, MAKE ITS OWN STUDY AND EVALUATION OF EACH SECURITY THAT IS UNDER CONSIDERATION FOR PURCHASE, HOLDING, OR SALE.

MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS, AND PUBLICATIONS ARE NOT INTENDED FOR USE BY RETAIL INVESTORS AND IT WOULD BE RECKLESS AND INAPPROPRIATE FOR RETAIL INVESTORS TO USE MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS OR PUBLICATIONS WHEN MAKING AN INVESTMENT DECISION. IF IN DOUBT YOU SHOULD CONTACT YOUR FINANCIAL OR OTHER PROFESSIONAL ADVISER.

ALL INFORMATION CONTAINED HEREIN IS PROTECTED BY LAW, INCLUDING BUT NOT LIMITED TO, COPYRIGHT LAW, AND NONE OF SUCH INFORMATION MAY BE COPIED OR OTHERWISE REPRODUCED, REPACKAGED, FURTHER TRANSMITTED, TRANSFERRED, DISSEMINATED, REDISTRIBUTED OR RESOLD, OR STORED FOR SUBSEQUENT USE FOR ANY SUCH PURPOSE, IN WHOLE OR IN PART, IN ANY FORM OR MANNER OR BY ANY MEANS WHATSOEVER, BY ANY PERSON WITHOUT MOODY'S PRIOR WRITTEN CONSENT.

MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS AND PUBLICATIONS ARE NOT INTENDED FOR USE BY ANY PERSON AS A BENCHMARK AS THAT TERM IS DEFINED FOR REGULATORY PURPOSES AND MUST NOT BE USED IN ANY WAY THAT COULD RESULT IN THEM BEING CONSIDERED A BENCHMARK.

All information contained herein is obtained by MOODY'S from sources believed by it to be accurate and reliable. Because of the possibility of human or mechanical error as well as other factors, however, all information contained herein is provided "AS IS" without warranty of any kind. MOODY'S adopts all necessary measures so that the information it uses in assigning a credit rating is of sufficient quality and from sources MOODY'S considers to be reliable including, when appropriate, independent third-party sources. However, MOODY'S is not an auditor and cannot in every instance independently verify or validate information received in the rating process or in preparing its Publications.

To the extent permitted by law, MOODY'S and its directors, officers, employees, agents, representatives, licensors and suppliers disclaim liability to any person or entity for any indirect, special, consequential, or incidental losses or damages whatsoever arising from or in connection with the information contained herein or the use of or inability to use any such information, even if MOODY'S or any of its directors, officers, employees, agents, representatives, licensors or suppliers is advised in advance of the possibility of such losses or damages, including but not limited to: (a) any loss of present or prospective profits or (b) any loss or damage arising where the relevant financial instrument is not the subject of a particular credit rating assigned by MOODY'S.

To the extent permitted by law, MOODY'S and its directors, officers, employees, agents, representatives, licensors and suppliers disclaim liability for any direct or compensatory losses or damages caused to any person or entity, including but not limited to by any negligence (but excluding fraud, willful misconduct or any other type of liability that, for the avoidance of doubt, by law cannot be excluded) on the part of, or any contingency within or beyond the control of, MOODY'S or any of its directors, officers, employees, agents, representatives, licensors or suppliers, arising from or in connection with the information contained herein or the use of or inability to use any such information.

NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE ACCURACY, TIMELINESS, COMPLETENESS, MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OF ANY CREDIT RATING, ASSESSMENT, OTHER OPINION OR INFORMATION IS GIVEN OR MADE BY MOODY'S IN ANY FORM OR MANNER WHATSOEVER.

Moody's Investors Service, Inc., a wholly-owned credit rating agency subsidiary of Moody's Corporation ("MCO"), hereby discloses that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by Moody's Investors Service, Inc. have, prior to assignment of any credit rating, agreed to pay to Moody's Investors Service, Inc. for credit ratings opinions and services rendered by it fees ranging from \$1,000 to approximately \$5,000,000. MCO and Moody's Investors Service also maintain policies and procedures to address the independence of Moody's Investors Service credit ratings and credit rating processes. Information regarding certain affiliations that may exist between directors of MCO and rated entities, and between entities who hold credit ratings from Moody's Investors Service and have also publicly reported to the SEC an ownership interest in MCO of more than 5%, is posted annually at www.moody.com under the heading "Investor Relations — Corporate Governance — Director and Shareholder Affiliation Policy."

Additional terms for Australia only: Any publication into Australia of this document is pursuant to the Australian Financial Services License of MOODY'S affiliate, Moody's Investors Service Pty Limited ABN 61 003 399 657 AFSL 336969 and/or Moody's Analytics Australia Pty Ltd ABN 94 105 136 972 AFSL 383569 (as applicable). This document is intended to be provided only to "wholesale clients" within the meaning of section 761G of the Corporations Act 2001. By continuing to access this document from within Australia, you represent to MOODY'S that you are, or are accessing the document as a representative of, a "wholesale client" and that neither you nor the entity you represent will directly or indirectly disseminate this document or its contents to "retail clients" within the meaning of section 761G of the Corporations Act 2001. MOODY'S credit rating is an opinion as to the creditworthiness of a debt obligation of the issuer, not on the equity securities of the issuer or any form of security that is available to retail investors.

Additional terms for Japan only: Moody's Japan K.K. ("MJJK") is a wholly-owned credit rating agency subsidiary of Moody's Group Japan G.K., which is wholly-owned by Moody's Overseas Holdings Inc., a wholly-owned subsidiary of MCO. Moody's SF Japan K.K. ("MSFJ") is a wholly-owned credit rating agency subsidiary of MJJK. MSFJ is not a Nationally Recognized Statistical Rating Organization ("NRSRO"). Therefore, credit ratings assigned by MSFJ are Non-NRSRO Credit Ratings. Non-NRSRO Credit Ratings are assigned by an entity that is not a NRSRO and, consequently, the rated obligation will not qualify for certain types of treatment under U.S. laws. MJJK and MSFJ are credit rating agencies registered with the Japan Financial Services Agency and their registration numbers are FSA Commissioner (Ratings) No. 2 and 3 respectively.

MJJK or MSFJ (as applicable) hereby disclose that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by MJJK or MSFJ (as applicable) have, prior to assignment of any credit rating, agreed to pay to MJJK or MSFJ (as applicable) for credit ratings opinions and services rendered by it fees ranging from JPY125,000 to approximately JPY550,000,000.

MJJK and MSFJ also maintain policies and procedures to address Japanese regulatory requirements.