IIGCC

From asset to portfolio alignment

Assessing climate target alignment with cumulative benchmark divergence

Introduction

This paper sets out the concept of 'Cumulative Benchmark Divergence' ('CBD') and shows how it can be applied to assess the alignment of forward-looking corporate carbon targets. CBD quantifies the projected *cumulative* emissions performance of a corporate (or real asset) relative to a Paris-aligned decarbonisation pathway, over a defined timespan. We suggest that its use can also complement the main approaches to portfolio alignment used by investors, such as those included within the Net Zero Investment Framework (NZIF).

Political discussions on the global ambition to limit warming to 1.5 °C generally focus on reaching net-zero emissions by 2050. Climate science emphasizes that while reaching net zero is necessary for warming to stop (at any level) it is the cumulative emissions on the pathway to that destination that determines the extent of global temperature rise (1; 2). The concept of cumulative emissions, or a carbon budget, which determines warming, is often missing from these political discussions.

In line with the political consensus on net zero, many corporates recognise the need to decarbonise their businesses in the interests of mitigating financial risk and are developing net zero targets and transition plans. Investors are making similar commitments at fund and portfolio levels, recognising the climate-related risks that threaten the value of assets (3; 4) and the positive role that the financial sector can play in accelerating the net-zero transition (5).

However, as it is both destination and pathway that matter for warming, it is not sufficient to just aim for net-zero by 2050 for targets to be considered aligned with the goals of the Paris Agreement. Over the period 2019-2050, an asset that delays emissions reductions until 2049 before reducing emissions by 100% will emit 2.5 times the carbon of an asset annually decarbonising at 7%. Without considering cumulative emissions performance, investors' ability to understand the transition risk of individual assets—and the portfolios in which they are held—is limited.

To bridge this gap, innovation in assessment methods is needed. While CBD-type approaches have been referred to previously (6), they are not yet widely used. We show here how, applied to benchmark and company pathway data from the Transition Pathway Initiative Centre (TPI Centre), CBD offers significant advantages on other corporate target assessment methods; it can provide a robust, transparent and quantitative measure of target (mis)alignment. These advantages extend to its use at a portfolio level, also providing consistency between asset and portfolio approaches. While its use is currently limited by data availability, we anticipate the underlying company-level disclosures and analysis ramping up significantly over the next few years, permitting wider investor adoption.

After setting out the concept, this paper describes the application of CBD at an asset and portfolio level, and compares against existing approaches in both instances. We provide example use cases, using methods outlined in the Appendix. While the focus in this paper is on the application of CBD to corporates—and particularly listed equity—the technique could be applied to other asset classes (e.g. sovereigns, real estate) in time. IIGCC members looking to apply CBD at both asset and portfolio level are directed to the accompanying Implementation Guidance.

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Asset-level target alignment

Once a company announces carbon targets, assessment methodologies are needed to judge if they are aligned or misaligned with climate objectives (or "science-based"). These alignment assessments form a basis for investor-led corporate engagement and some methods of assessing portfolio alignment. Here, we use 'alignment' as shorthand for the alignment of targets, but it is important to note that targets should be assessed in conjunction with broader examination of a corporate's transition plan to form a view on their credibility.

A good assessment methodology is needed to form robust conclusions on target alignment. The method should be informed by climate science; simple to use and communicate; applicable to a variety of asset classes; transparent; provide positive real economy incentives; and be aggregable up from the asset level to the portfolio level (7). It is also beneficial if the methodology can provide a quantitative measure of exactly how aligned or misaligned a company is with climate objectives.

To determine alignment, assessments typically compare a company's target to a *benchmark*: a pathway of declining carbon emissions through time that is defined relative to a particular temperature outcome and may be sector-and/or region-specific. The pathway and benchmark may be expressed using one of two different approaches—see *'Carbon intensity or absolute emissions?'*. Benchmarks are calculated using the output of coupled climate and economic models, and, in principle, divide the remaining carbon budget for the specified temperature outcome efficiently between sectors, while also factoring in output forecasts for each sector.

In this paper, we apply CBD to company pathways and global, 1.5 °C benchmarks provided by the TPI Centre (8). The approach can be applied to other pathways, but using robust data is critical for the credibility of the analysis. TPI's benchmarks are consistent with the Paris Agreement's objective of limiting global average temperature increase to 1.5 °C on pre-industrial levels and the transparent methodologies are familiar to investors and companies alike. Details on the construction of these pathways and benchmarks, their underlying assumptions and challenges, are outlined in the Appendix.

CBD metrics in context
We describe here—in the context of other methods—the use of CBD to assess corporate targets. Each method is linked; CBD metrics sit third in the list below, organised by increasing complexity of approach (but not necessarily usefulness—we argue the CBD offers certain advantages over ITR).

a) **Binary point-in-time assessments.** These test whether a company's carbon target pathway is above or below a Paris-aligned benchmark at discrete points in time (Fig. 1a). These are simple to compute and communicate but have certain caveats. The binary indicator does not capture the degree to which a company pathway is above or below the benchmark, and the point-in-time approach means that a company's cumulative carbon performance is not captured. Because warming is governed by cumulative emissions, the method is limited in its usefulness for determining alignment with climate objectives.

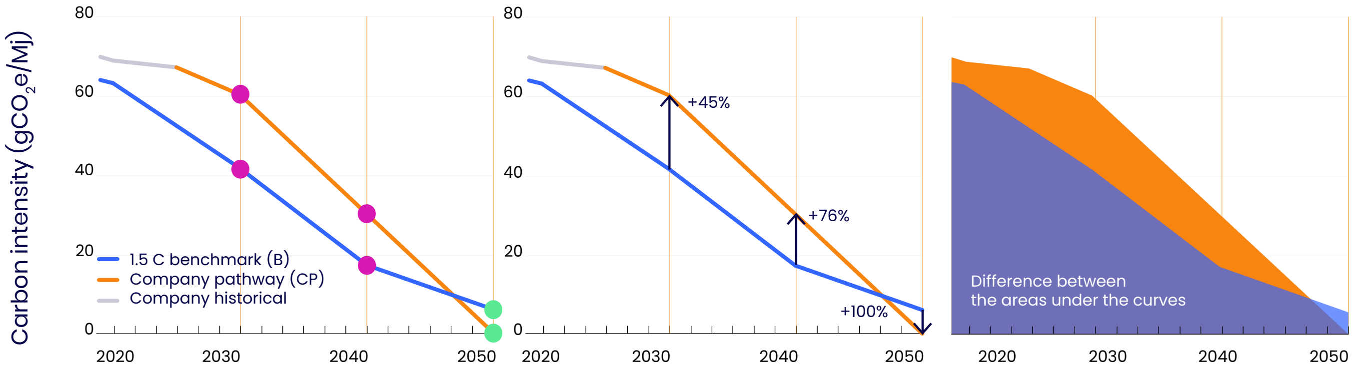
b) **Point-in-time benchmark divergence.** This method augments the first by capturing the relative performance of the target pathway versus the benchmark at discrete points in time (Fig. 1b). While this provides quantitative metrics, it may not be clear how to form an overall assessment based on several, potentially contrasting, results. Additionally, as the benchmark approaches zero, the calculation becomes unstable: the result tends to infinity (unless calculated by absolute difference). As a point-in-time approach, it also does not capture the importance of cumulative emissions and therefore cannot fully assess alignment.

c) **Cumulative benchmark divergence (CBD).** This method evaluates the cumulative divergence of the company target pathway from the benchmark through time, yielding a single % measure of relative alignment (Fig. 1c) that is robust because it reflects the fact that cumulative emissions determine climate warming (1). The more positive the value, the less aligned the company's targets: the more negative the value, the more the targets outperform the benchmark. The analysis can be done with either *carbon intensity* or *absolute emissions*. We outline the characteristics of CBD that apply regardless of this choice in *General Properties*, and explore the pros and cons of each approach in *Carbon intensity or absolute emissions?* In the *use cases* provided here, we present CBD using carbon intensity.

d) **Implied Temperature Rise (ITR).** An ITR expresses the implied rise in global temperature relative to a pre-industrial baseline if the global economy had the same carbon budget over/undershoot as the company in question. This over/undershoot is equivalent to a CBD metric with absolute emissions. A hypothetical climate response in 2100 is then obtained by applying a transient climate response to cumulative carbon emissions (TCRE) factor. A strength of this method is the communicability of the result, which can be easily related to high-level climate commitments. However, uncertainty and some lack of transparency in the calculation has the potential to undermine the credibility of the temperature reading (discussed in Appendix).

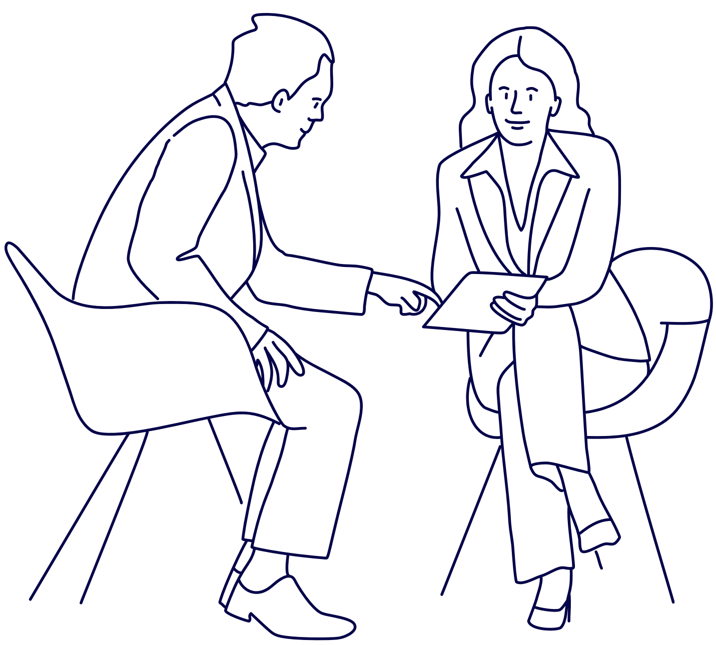
Figure 1. Comparison of carbon pathway alignment assessments. A company carbon intensity pathway is compared to a 1.5 °C sector benchmark from a base year (2019) to 2050, using: (a) a point-in-time binary approach; (b) point-in-time benchmark divergence metrics; (c) a cumulative BDM approach.

(a) Point-in-time binary | **(b) Point-in-time benchmark divergence** | **(c) Cumulative benchmark divergence**



	2030	2040	2050	2030	2040	2050	2019–2050
	✗	✗	✓	**+45%**	**+76%**	**-100%**	**+32%**

	(a) Point-in-time binary	(b) Point-in-time benchmark divergence	(c) Cumulative benchmark divergence
Pros	• Simple to compute and communicate	• Captures relative performance	• Captures relative performance • A more accurate measure of performance over pathway
Cons	• Binary output does not capture relative performance • Time points may not be representative of overall performance	• Time points may not be representative of overall performance • Unstable as B tends to zero	• More complicated to compute and communicate • One step removed from climate impact when using intensity rather than absolute emissions



A closer look at CBD metrics

General properties

The following considerations apply whether a CBD calculation is made with carbon intensity or absolute emissions (our CBD approach is made with carbon intensity).

The ability of CBD metrics to capture the **cumulative performance** of a company's carbon pathway relative to a benchmark, in a single metric, means that it overcomes the downsides of the point-in-time approaches, which cannot robustly establish alignment with climate objectives.

The **definition of alignment** implied by CBD requires that any excess emissions above the benchmark must be balanced by a deficit during another period of time: it is the area under the emissions pathway that matters, and how this compares to that of the benchmark.

In any cumulative approach, the **time period** assessed is important. Company pathways should have the same start (or *base year*) and end year as the benchmark and the window analysed should be comprehensive to robustly calculate alignment. Here, we use **2019-2050** which corresponds to the time period used by TPI's 1.5°C sector benchmarks. (Note that emissions after 2050 are not included in the calculation—any designation of alignment for companies that lack a net-zero by 2050 commitment should be treated with caution.)

It may nonetheless be useful to look at shorter time windows, e.g. from base year to present day, to evaluate the **historical emissions performance** of a company using CBD—another useful capability, though not a full test of alignment.

CBD calculations can further be used by companies themselves to **set targets** that would be aligned with a 1.5 °C pathway, given a particular history of emissions since the benchmark base year. This could support company transition planning and capital expenditure budgeting.

Similarly, CBD scores can be **recalculated annually** to incorporate the latest disclosures, providing an updated view on the alignment of the targets that reflects the emissions disclosure, new targets or benchmarks.

Carbon intensity or absolute emissions?

As shown in Equation 1, a company's carbon emissions can be separated into two factors: their output, or how much they produce per year (in terms of a physical unit relevant for the sector; X in Equation 1, e.g., MWh for an electricity utilities company), and the carbon intensity of this production, including all relevant emissions, in units of tonnes CO_2-equivalent per unit of production. Rearranging for carbon intensity, we see how this metric enables comparison of companies of all output levels:

Equation 1

$$\textbf{carbon intensity } (tCO_2e/X) = \frac{\textbf{absolute emissions } (tCO_2e/yr)}{\textbf{output } (X/yr)}$$

A company can establish targets based on absolute emissions or intensity, and investors are often interested in both metrics. Benchmarks can also be constructed in terms of either and may be sector and/or region specific. For absolute emissions, benchmarks can be scaled according to these and other criteria, e.g. the size of the company, and track a pathway downwards from a company's current emissions levels. With carbon intensity, on the other hand, benchmarks are sector specific but apply across companies; the starting point of a corporate may be above or below the benchmark.

A CBD calculation simply requires the presence of a target pathway and comparable benchmark: it can be performed with either carbon intensity or absolute emissions, and each approach has strengths and weaknesses. Cumulative emissions determine warming and therefore absolute emissions provides the most direct link to climate outcomes. On the other hand, carbon intensity pathways enable improved comparability of performance over time and between peers, and allow for low-intensity companies to grow their output (and capture market share) without being penalised.

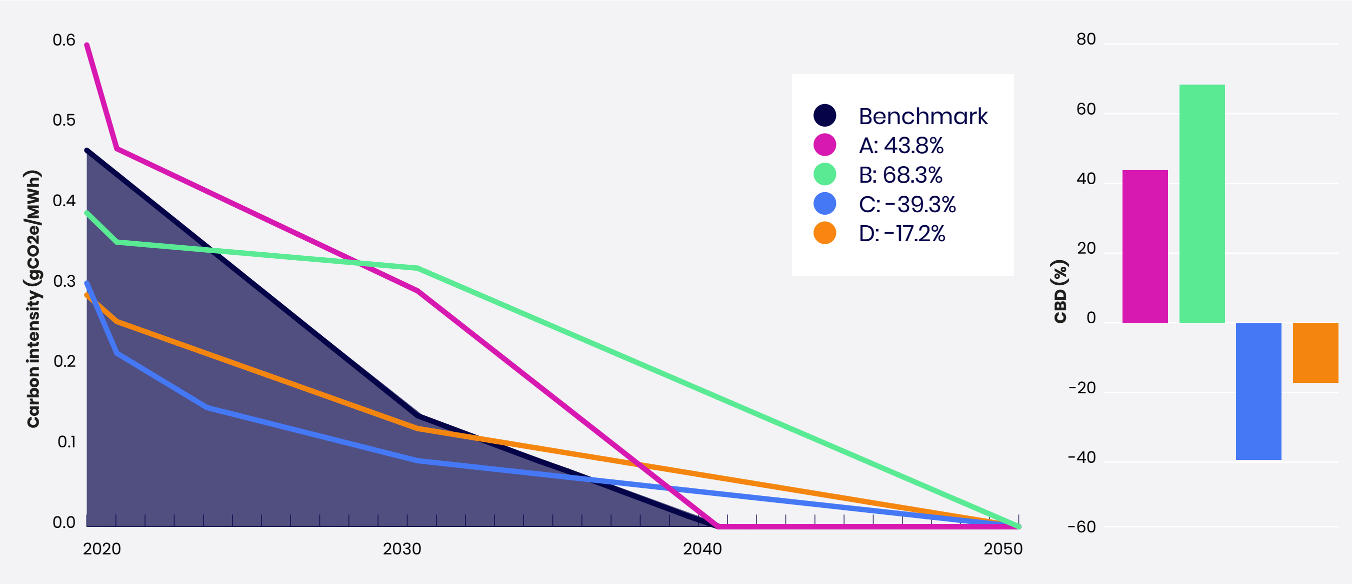
An important discriminator between the two approaches is the presence of credible methodologies for constructing pathways and benchmarks across sectors, and the availability of these data. On this front, the carbon intensity approach has an advantage, with analysis providers including SBTi and TPI providing company pathways and sector benchmarks in carbon intensity. The transparency and credibility of these methodologies underpins confidence in the resulting CBD metric. For this reason and those highlighted above, we use carbon intensity as the basis for the analysis here.

Asset-level use in practice

In Figure 2, we show projected carbon pathways for four companies in the electricity utilities sector, and associated benchmark. We take the pathways and benchmark from TPI data. Company A begins above the benchmark, while company B begins below; however, A's plan to reach net zero by 2040 is more ambitious (Fig. 2a). Over the course of the 2019-2050 window, the area under A's emissions intensity pathway is less than B's and therefore its CBD score is lower. However, both scores are positive; neither have set targets that are ambitious enough to be considered aligned (Fig. 2b).

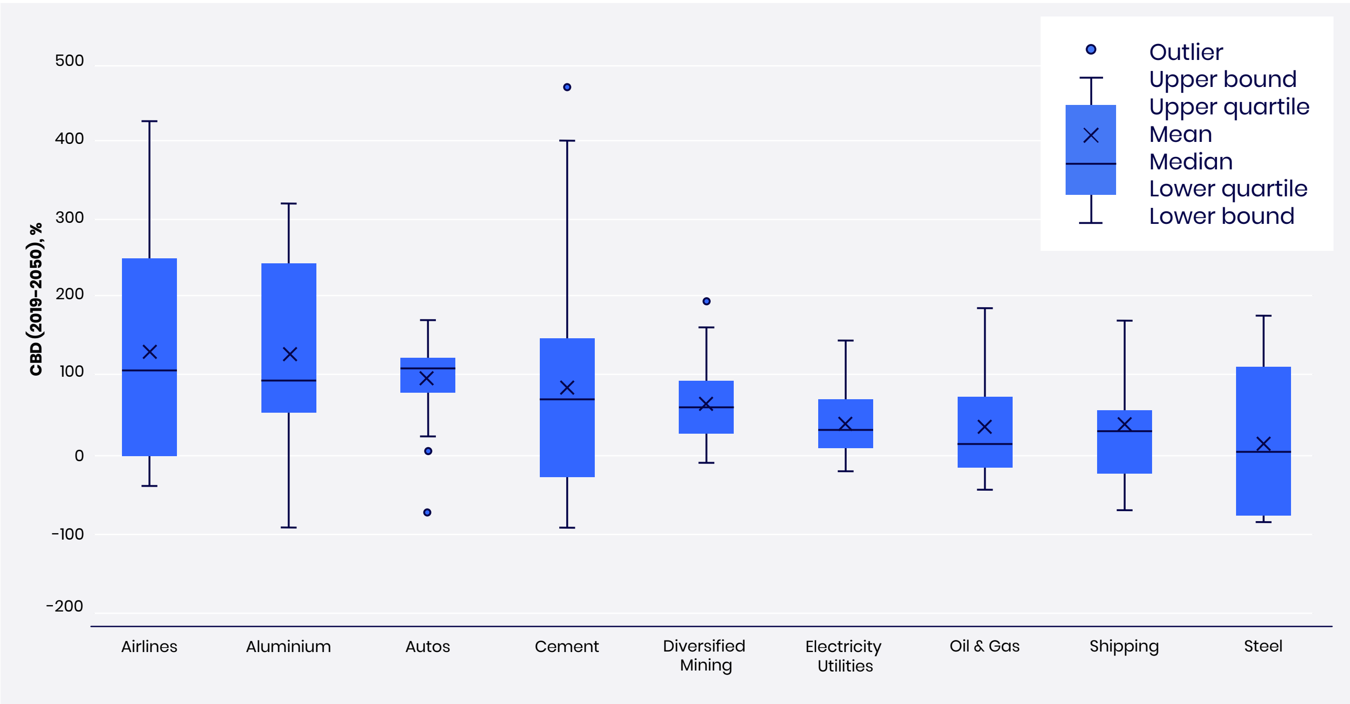
Utilities C and D have a similar starting point, with less carbon intensive production than the benchmark (Fig. 2a). While they have the same long-term target, company C has set more ambitious short- and medium-term targets than company D, resulting in a lower CBD score over 2019-2050 (Fig. 2b). Both utilities have negative CBD scores over this window. By operating at significantly lower carbon intensity than the benchmark up to 2030-2035, utilities C and D follow shallower intensity reduction pathways than the benchmark and still meet the alignment definition.

Figure 2: Selected company carbon pathways in Electricity Utilities (a) and respective 2019-2050 CBD scores (b). Benchmark plotted in blue. CBD scores for each company provided in the legend. A lower/more negative CBD scorerepresents improved cumulative carbon performance relative to peers Company pathways and benchmark from TPI.



In Fig. 3 we show the distributions of CBD metrics for 263 companies in nine high-emitting sectors. We use carbon pathway and sector benchmark data from TPI; further details on data and methods can be found in the Appendix. The results reveal the spread of company alignment with 1.5 °C within sectors, and differences in these distributions between sectors. Aluminium (+129%) and autos (126%) show the weakest alignment in the mean, while the diversified mining sector (+9%) shows the strongest mean alignment. We do not label each company here, but this analysis naturally enables a comparison of a company's carbon targets to others—within and across sectors—from the perspective of climate alignment.

Figure 3. Asset-level CBD metrics across sectors. Box and whisker plots showing the distribution of CBD metrics across 263 emission intensive companies assessed by TPI. Results are segmented into the eight sectors for which TPI currently has a 1.5 °C pathway and ranked in order of highest mean score from left to right. A score of 0 represents exact alignment with the benchmark; negative values represent lower emissions pathways and positive values higher emissions pathways. Number of companies in each sector in this analysis as follows: Airlines, 26; Aluminium, 9; Autos, 29; Electricity, 72; Oil & Gas, 50; Airlines, 26; Cement, 23; Steel, 28; Diversified Mining, 15; Shipping, 11.



Portfolio alignment

Assessing portfolio alignment is vital for investors in understanding their exposure to transition risk. Many are making portfolio decarbonisation commitments and targets, reflecting ambitions to drive down this risk (e.g., Net Zero Asset Managers, https://www.netzeroassetmanagers.org/signatories/; Paris Aligned Asset Owners, https://www.parisalignedinvestment.org/signatories/). Most institutional-level portfolio targets contain fififfinanced emissions (66%), binary coverage targets (16%), or maturity-scale alignment metrics (28%), none solely utilise ITRs (10). Few investors make full use of the carbon targets of underlying assets—information that CBD can capture.

CBD metrics can be aggregated from an individual asset to portfolio level and used to determine:

- The fraction of the portfolio that qualifies as aligned (has a zero or negative CBD score).
- A portfolio CBD score, which aggregates the degree of (mis)alignment in each asset. This communicates total, forward-looking (mis)alignment with climate objectives and can be used in assessing transition risk. The score can be updated annually, incorporating emissions disclosures and new targets as the data become available.
- The historical cumulative emissions performance of a portfolio, evaluated from the base year of a benchmark to the present (or most recent disclosures).

These applications of CBD involve important methodological considerations. In the Appendix, we discuss these judgements and the resulting methodologies, and provide use cases for the first two approaches with example portfolios. Below we outline commonly used portfolio alignment target-setting approaches, consider their strengths and weaknesses, and describe how CBD could augment each.

Portfolio target-setting approaches and the CBD

Financed emissions

Financed emissions targets combine measurements of relative investor ownership of corporate emissions and aggregated portfolio exposure to GHG emissions, with ambitions to bring these down over time. Typically, absolute emissions are summed (according to ownership fraction) and then divided by a financial metric: either revenue of underlying companies (weighted average carbon intensity; WACI), or by the company's total enterprise value including cash (EVIC). This approach to target setting at investor level is the most widely used due to its communicability and adoptability.

Weaknesses of this approach include the fact that scope 3 is commonly neglected in the accounting of emissions (despite representing the largest fraction of emissions in most sectors), and that because a financial denominator is used, emissions performance can be affected significantly by underlying economic factors, including inflation and foreign exchange rates (11; 12). As the method only uses current disclosures, exposure to *future* financed emissions at corporate, fund, and portfolio level is not projected, nor are the decarbonisation ambitions of individual assets considered. Additionally, while the financial denominator can adjust for the size of the company, there is no accounting for differences between sectors. This can incentivise divestment of assets in heavy-emitting sectors, leading to 'paper decarbonisation' but limited change in the real economy, and possibly undermining the diversification of the portfolio. It may similarly disincentivise transition-enabling investment in hard-to-abate sectors.

CBD could offer a forward-looking means to identify best-in-class assets as well as important corporates for engagement and stewardship efforts. Additionally, CBD metrics can be aggregated to a portfolio-level to project future fifinanced emissions (with assumptions about portfolio composition over time), supporting fund or portfolio level strategic asset allocation as well as engagement and stewardship. Note, however, that the data coverage for CBD is lower than that of emissions disclosures covering scopes 1, 2 and 3 cat. 11 (Fig. 4).

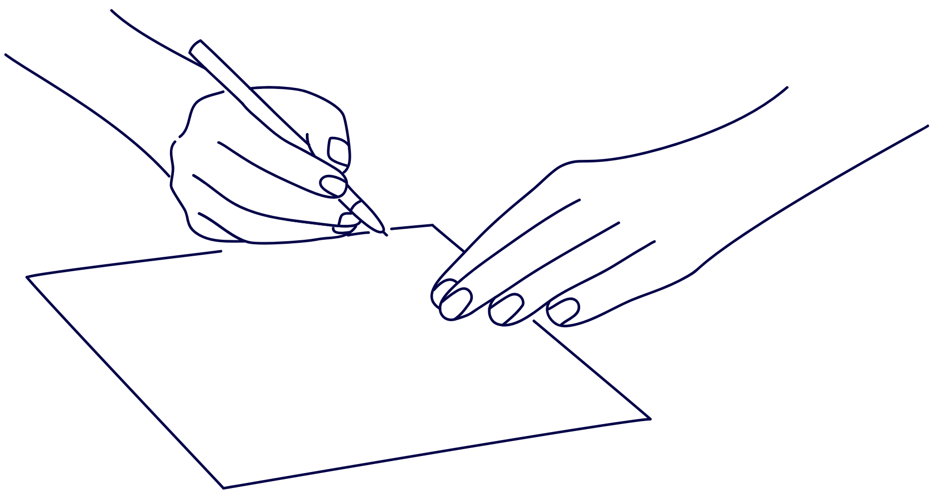
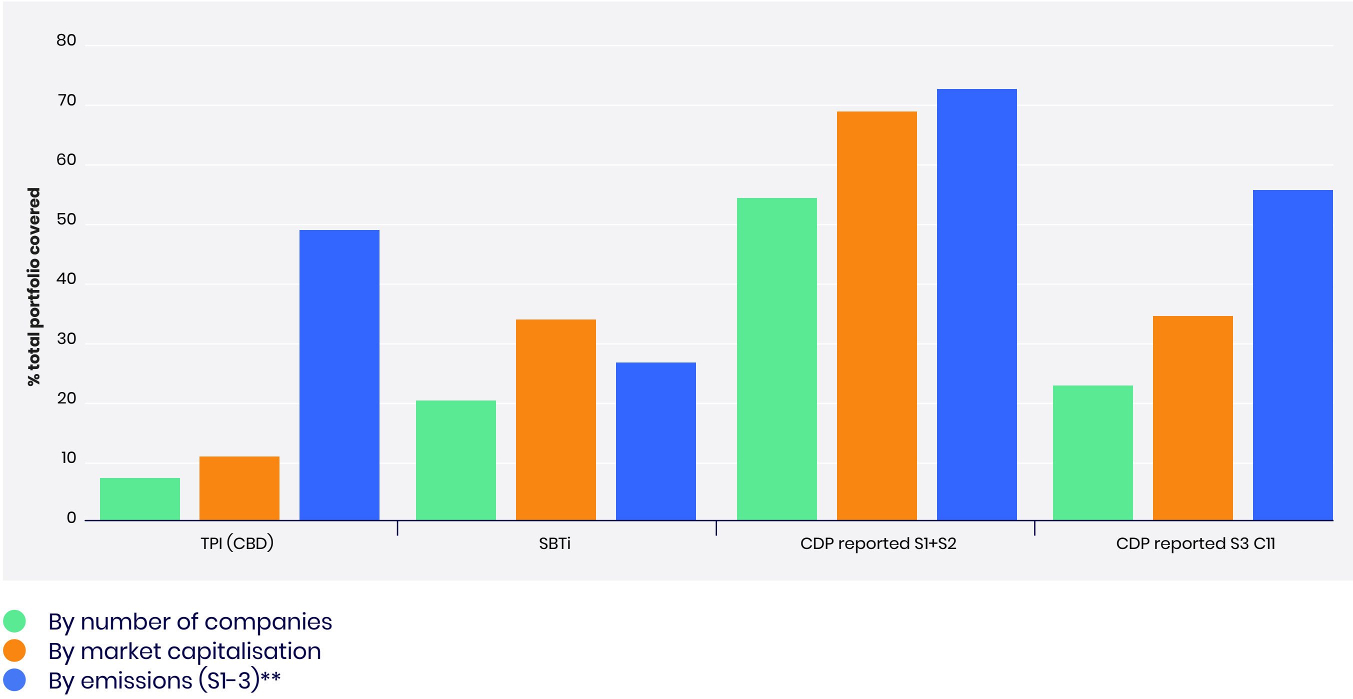


Figure 4. Data availability. Coverage of TPI and SBTi assessments of corporate carbon targets (left) and CDP emissions data (right) across a sample "Developed World" equity portfolio, measured as a percentage of: number of companies (blue), market capitalisation (orange), and estimated scope 1-3 emissions (grey). Coverage of reported emissions (right) is higher than coverage of methodologies to externally assess emissions targets (left). CDP reported data on scopes (S) 1 to 2 covers a greater fraction of the portfolio than reported scope 3 category 11 (C11; use of sold products). **Emissions S1-3 are estimated by a third party provider (note that these are less reliable than CDP reported emissions).



Binary coverage target

The binary coverage target approach measures the proportion of assets in a portfolio that meet a certain threshold, typically the presence of GHG targets made by investee companies. The main example of this approach is SBTi's Portfolio Coverage Approach, which requests 100% of portfolio companies to have verified science-based targets by the year 2040 (13). This approach to target setting at the portfolio level is widely used due to its communicability and ease of adoption.

A weakness of binary coverage approaches is the limited (binary) resolution they provide on the ambition of asset level targets. Additionally, high transition risk companies can be obscured upon aggregating as results are not (in SBTi's Portfolio Coverage Approach) weighted by emissions. Furthermore, the chosen threshold criterion may not be an optimal measure of alignment—limiting the investor's ability to manage future transition risk. Nor may the alignment criterion test what the corporate or asset is doing to achieve science-based targets.

An innovation to binary coverage approaches would be to use CBD to establish whether an asset's carbon targets are 1.5 °C-aligned. This can further be done on an ongoing basis, incorporating updated emissions disclosures to assess changes to the CBD score (and any need for ratcheting up of targets over time). This binary measurement of alignment can then be aggregated at a fund or portfolio level, as shown in Fig. 5.

Maturity scale alignment

Maturity scale alignment metrics combine several criteria (e.g. targets, emissions performance, transition plan, and capex alignment) into a single classification to assess portfolio alignment. This is the approach adopted by the Portfolio Coverage Target of the Net-Zero Investment Framework (NZIF), the most widely used framework for achieving net-zero targets. This is a target for increasing the percentage of AUM in material sectors that are categorised as 'achieving' or 'aligned' to a net zero by 2050 pathway based on six core criteria. This approach is increasingly utilised as it can credibly reflect how a target will be delivered through plans and capital allocation, and because these can be easily connected to engagement and stewardship. It is the only portfolio target-setting methodology that considers what actions a corporate or asset is taking to achieve its targets.

Weaknesses of the NZIF's Portfolio Coverage Target are its data intensiveness and the current omission of cumulative carbon performance during its assessment of corporate targets.

CBD can add value here by providing a more robust means of assessing alignment of corporate targets through the cumulative approach. Additionally, when applied at the portfolio level CBD can be used to assess over time if the portfolio is decarbonising in a manner consistent with what is required to limit global average temperature rise to 1.5°C (historical emissions performance is also an NZIF alignment criteria for corporates).

Implied Temperature Rise

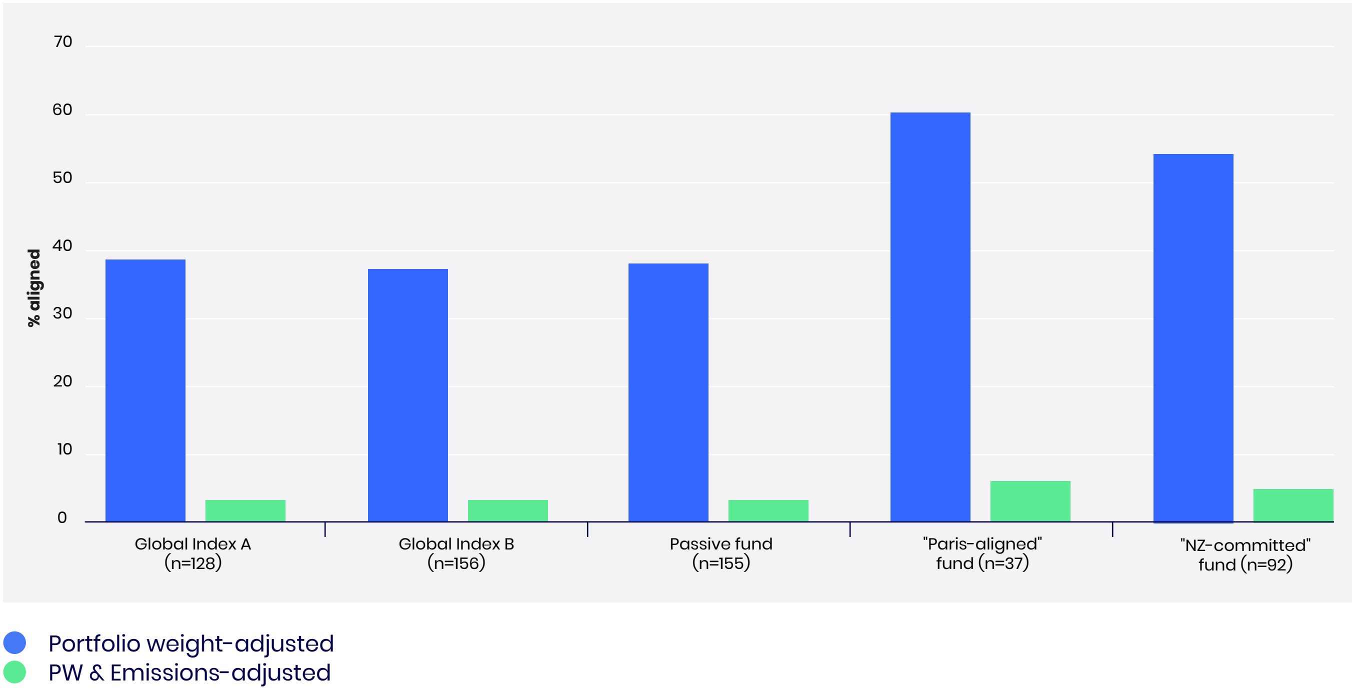
Implied Temperature Rise (ITR) is the least-used approach to determine portfolio alignment by investors (10), though is more commonly used to describe financial products and by data providers. At the portfolio level it can be calculated by aggregating asset-level absolute emissions budgets and respective under/overshoots. Typically, proprietary methods are used for establishing benchmarks, pathways, and for extending the analysis across portfolios where reported data are not present. The resulting divergence of aggregated pathways and benchmarks is a CBD-type metric based on absolute emissions. ITR is then calculated by applying a TCRE value (see details in *Asset-level target alignment*).

At the portfolio-level, ITRs are hampered by a lack of transparency on the methods employed to perform the analysis across whole portfolios. Data paucity and differing proprietary methods and assumptions lead to a well-known low correlation between the results of ITR methodologies (see Appendix). There is additional danger that ITRs can mislead, appearing to offer climate futures as an investable product, when a) these scores are highly uncertain, b) investing in such a product is no such guarantee of achieving particular climate objectives, and c) they belie the need for investor engagement in delivering real-economy change.

Portfolio-level use cases

In Fig. 5 we show the results of our portfolio alignment coverage tests using CBD, across two global indices and two funds, a "Paris-aligned" fund and a "Net zero (NZ) committed fund". Methods (including how the data are weighted) are described in the Appendix.

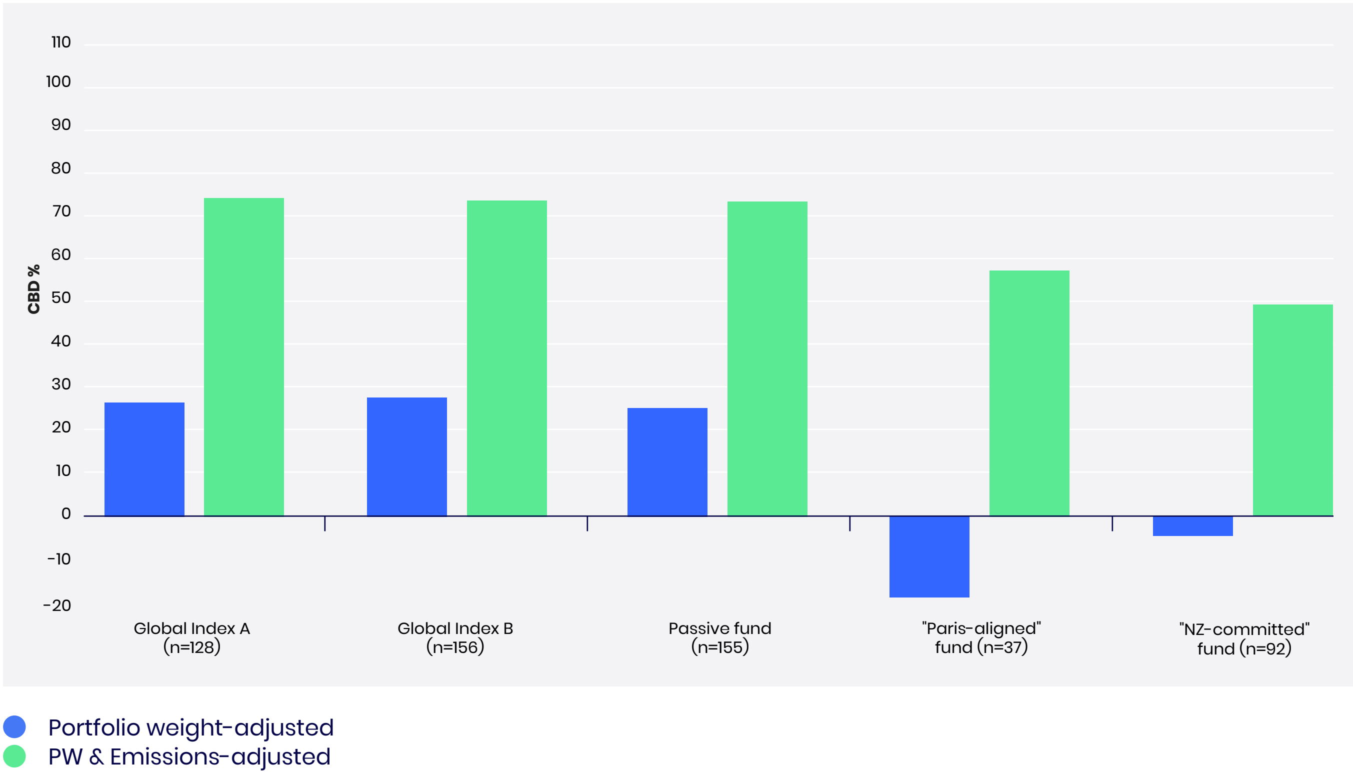
Figure 5. Portfolio alignment coverage using the CBD. The alignment criterion is that CBD scores for assets must be less than or equal to 0. Statistics are displayed for only the proportion of the portfolios covered by the TPI assessments. Coverage of portfolios is expressed in terms of portfolio weight (PW; light green columns) and both portfolio weight and share of current emissions (dark green columns). Emissions scopes are counted as per a simplified version of the TPI sector-wise approach (see Appendix).



All portfolios showed higher rates of alignment when analysed by portfolio weight than when additionally adjusted by emissions. Incorporating both portfolio and emissions weighting makes the result heavily subject to the binary score of a small number of heavy emitters that are, in general, less aligned than average. Analysed by just portfolio weight, the Paris-aligned fund is **60.2%** aligned, and the NZ-committed fund is **54.3%** aligned, both marked improvements on the global indices and passive fund, which show 37-39% alignment. All alignment percentages are reduced however when alignment is additionally weighted by emissions—the presence of a few misaligned heavy emitters strongly affects the score. Note that the sample size (n) is significantly smaller in the Paris-aligned fund than the others.

In Fig. 6 we aggregate the CBD score of all assessed assets within a portfolio to determine portfolio CBD scores (positive values indicate misalignment). The metrics are relatively consistent across the global indices and Passive fund, with a small improvement in performance in the Passive fund. The Paris-aligned and NZ-committed funds have overall scores of **-18.7%** and **-4.3%**, respectively, when CBD scores are aggregated by portfolio weight—which could be considered aligned, unlike the others, which have positive scores. However, when we include emissions in the weighting, the aggregated score increases to **57.0%** in the Paris-aligned fund and **45.2%** in the NZ-committed fund, both implying higher degrees of misalignment. One of the dynamics at play in this difference is that a sizeable holding in a low emissions automaker with a negative CBD score counts for a lot in the PW-adjusted approach; whereas this same stock is relatively insignificant when additionally weighted by emissions. Instead, a handful of misaligned large automakers and oil and gas producers are responsible for significant positive contributions to the score. Weighting by the emissions owned by the fund (see equity stake methodology in the Appendix) the scores fall slightly to **51.4%** and **45.2%** respectively.

Figure 6. Portfolio CBD scores. Calculated across two global indices, a passive fund, a 'Paris-Aligned' fund, and a "Net zero (NZ) committed" fund. Note how the number of stocks covered by the analysis, n, changes across the assessments. A lower score indicates a higher degree of alignment with a 1.5 °C pathway. Aggregated CBD scores are weighted either only by portfolio weight (PW; light yellow columns), by portfolio weight and current emissions using a sectoral approach for counting emissions scopes (dark yellow columns) or by current emissions and equity stake (blue columns). For further detail on weighting methodologies see Appendix).



Analysis of the underlying asset contributions shows that results of the portfolio analysis are very sensitive to the alignment of the companies with the largest shares of owned emissions: aligned heavy-emitters significantly improve the score while misaligned ones significantly weaken it. This can clearly be seen in Figure 7a which shows an example of asset-level contributions to a portfolio score and contrasts it to the current emissions exposure perspective on a portfolio (7b). It shows how Company A, a heavy emitting misaligned company significantly raises the overall portfolio score whilst company B, which is also a heavy emitting, lowers it because its pathway is aligned. This asset-level breakdown can help fund managers to prioritise engagement and decision making.

Figure 7. Asset contributions to a portfolio CBD score (a) and a current emissions exposure perspective of the same portfolio (b). In a) individual assets (A to Z) within a portfolio are ranked by weighted CBD score (lowest on the left to highest on the right) to highlight their contribution to the overall score (+38%). Aligned companies (orange) lower the overall score while misaligned companies (blue) increase it. In b) assets are ordered from A to Z in descending order of emissions footprint with colour indicating (mis)alignment. The charts use hypothetical data that closely mimics a real portfolio.

Figure 7a

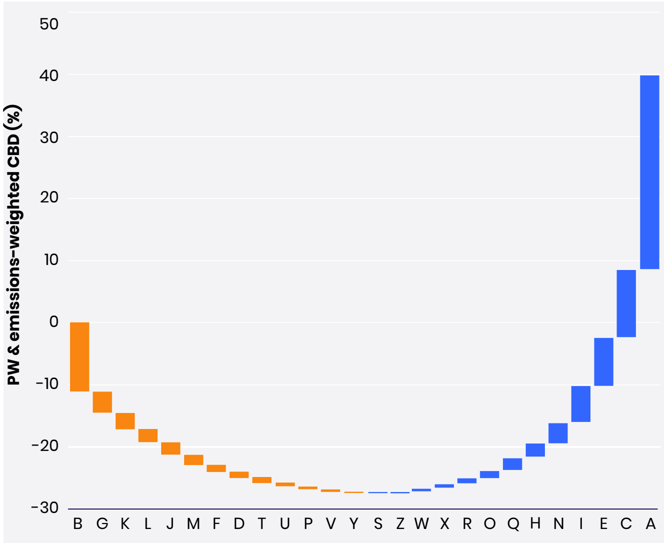
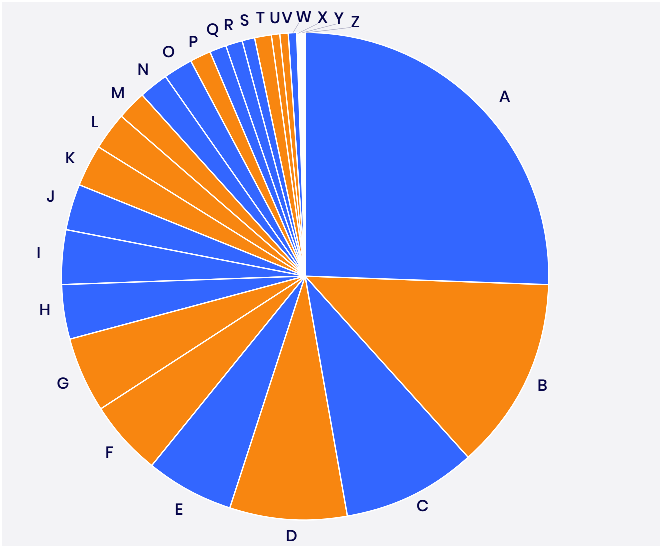


Figure 7b



Increase
Decrease

Conclusion

CBD compares the cumulative decarbonisation performance of a corporate (or real asset) over a defined period of time against a Paris-aligned benchmark. By making use of established, publicly available assessment data from the TPI and by taking a cumulative approach, it answers some of the weaknesses associated with current methodologies and provides a credible basis for investors to assess climate alignment. By comparison, assessments of targets at discrete points in time do not capture cumulative emissions, which determines climate change. Methods using ITRs involve additional processing steps and typically use estimated data and assumptions that are not transparent.

Whilst it has advantages over existing approaches, CBD should not be used in isolation to assess asset-level transition risk. Investors wishing to understand the alignment of a corporate with climate objectives should not take corporate carbon targets at face value or in isolation, but instead assess a broad range of criteria.

CBD also has the potential to assess transition risk in investors' portfolios. It can be used to measure the proportion of aligned assets in a portfolio (ie. Where the CBD score is less than or equal to zero). Alternatively, by aggregating individual asset level scores (weighted by emissions footprint and portfolio or equity share), an overall portfolio score can be calculated. As CBD utilises an established, science-based and forward-looking asset level alignment methodology and publicly available data, it provides a credible and transparent approach to calculating portfolio alignment; one that can support—and enhance—all existing methods.

Appendix

This section provides further details on aspects of the analysis presented in the main body of the paper. For more details on implementation of CBD including where to obtain the relevant data, how to calculate it and the investor processes for which it is relevant, IIGCC members should access the accompanying Implementation Guidance. For membership enquiries, please contact sfindlay@iigcc.org.

Data used
As described in Asset-level target alignment, a CBD method relies on the existence of company carbon pathways and relevant sectoral and/or regional benchmarks (Fig. 1c). Both require key judgements in construction (7). Carbon pathways require the existence of corporate carbon targets and clarity around what they cover, and benchmarks are based on outputs of coupled climate and economic model scenarios. In our CBD approach, we use corporate carbon intensity target pathways and benchmarks provided by the Transition Pathway Initiative (TPI) (16). TPI's corporate carbon pathways are referred to as Carbon Performance assessments. The TPI benchmarks are constructed from data published in the IEA's Net Zero Emissions by 2050 (NZE) scenario, which allocates the remaining carbon budget burnable for a 1.5 °C world in a lowest-cost manner between sectors (17). Here, we use global 1.5 °C pathways and benchmarks, but regional breakdowns could be used where relevant benchmarks exist.

All attempts to model future climate and socio-economic dynamics involve uncertainty, and every derived scenario will display model dependency and reflect underlying assumptions. In the case of socio-economic models, assumptions about, for instance, the future price of renewable technologies, can have an important impact on projected growth of those technologies and on decarbonisation pathways for the sector in question (18). While every scenario has its own idiosyncrasies, strengths and weaknesses, to protect the integrity of the global carbon budget, it is important to only use one scenario perform a multi-sector assessment of forward-looking carbon targets. Using different scenarios for different sectors could lead to an overall overshoot of the carbon budget with scenarios might be cherry-picked based on relative generosity to that sector. Another consideration regarding the construction of sector benchmarks is around the selection of a common denominator for emissions intensity. While the choice of unit is clear for, e.g., electricity utilities, for certain sectors with diverse value chains, e.g. diversified mining (19), the choice of denominator—and ability to aggregate accordingly across value chains—presents challenges.

Methods
The CBD at asset level
To compute CBD metrics, we require company target pathways and corresponding benchmarks, covering a defined time period beginning with the 'base year' of the benchmark. The TPI 1.5 °C benchmarks generally use a 2019 base-year and extend to 2050. Where company targets end before 2050 or no target is stated, we take the value from the last year in which intensity can be calculated and extend that to 2050. We compute CBD scores as the relative difference between the cumulative company pathway and cumulative benchmark. Emissions scopes included in company pathway reflect the TPI methodology and vary by sector as set out below.

Airlines	Aluminium	Autos	Cement	Diversified Mining	Electricity Utilities	Paper	Oil and Gas	Shipping	Steel
1	1 & 2	3 (cat 11 only)	1	1, 2 & 3 (cat 10 & 11) 3	1	No 1.5°C Benchmark available	1, 2 & 3 (cat 11 only)	1	1 & 2

Applying the CBD at portfolio level
Investors can aggregate CBD scores to indicate the transition risk of a portfolio (see Portfolio alignment). Three main applications are envisaged and these are discussed in more detail in the accompanying Implementation Guidance document:

1. **Binary coverage assessments.** For the portion of the portfolio where data is available, the fraction of assets that can be considered to have science-based targets (i.e. where CBD ≤ 0) can be calculated (Fig. 5). This approach answers the question: what fraction of underlying assets in the portfolio meets this alignment threshold?

2. **Portfolio CBD scores**. For the portion of the portfolio where data is available, CBD scores can be integrated from the asset level to yield a single fund or portfolio-level metric (Fig. 6). This variable metric aims to objectively and quantifiably assess investors' net zero strategies and their efforts to transition their portfolios.

3 **Maturity scale alignment**. The classification system of Net Zero Investment Framework (NZIF) includes emissions targets as one of its six alignment criteria. CBD can be used to measure ambition (criterion 1) and the alignment of short- and medium-term emissions targets (criterion 2) in particular.

In all these applications a judgement needs to be made about the weighting of constituent CBD scores to reflect their relative materiality. Investors have two main considerations here:

1. **Attribution by exposure or ownership.** CBD scores can be aggregated by portfolio weight or equity stake. The **portfolio weight** approach shown in Figures 5 and 6 weights CBD scores according to the % of the portfolio (covered by the analysis) invested in each asset. It is effectively a risk/opportunity exposure lens and can be applied to any asset class.
2. **Climate materiality.** Weighting CBD scores by current emissions **(emissions weighting)** helps ensure that the aggregated portfolio score reflects the likely transition risk of the portfolio and its overall climate impact. The relevant emissions footprint can be derived from applying the boundary used by TPI to assess emissions (see above) and company disclosure. This is a robust approach that can be performed over a wide range of sectors, and, where emissions footprints are available, asset classes.

Figures 5 and 6 show portfolio CDB scores adjusted first for portfolio weighting in isolation and then for emissions and portfolio weighting in combination. Reflecting both climate materiality and exposure this second option could be considered the most robust and widely applicable approach. However for equity portfolios multiplying the emissions footprint (above) by the equity stake enables "owned emission footprint" can be calculated and also summed across the portfolio. A variation on the emissions footprint approach would be to adjust by a forward-looking emissions factor that took into account the rate of decarbonisation which varies sector by sector. These considerations are discussed further in the implementation document.

Current ITR limitations
While a CBD approach effectively underpins ITR, CBD is less frequently used in their own right as an asset-level assessment methodology. However, it has advantages over ITR in several areas in our view.

Uncertainty and (lack of) transparency in ITR. Currently, ITR is used by commercial data providers, often using proprietary data and methods. This lack of transparency lessens the credibility of results. This issue is particularly acute at the portfolio level, where estimates and assumptions are needed to extend the analysis across entire portfolios (discussed in *Portfolio alignment*).

An ITR depends on a chosen value of TCRE: in 2021 the IPCC constrained the likely range to 1.0-2.3 °C per 1000 GtC, with a best estimate of 1.65 °C per 1000 GtC (1). Because the relationship between cumulative emissions and temperature rise is linear—and thus symmetrical about the benchmark—uncertainty in ITR will not skew the number of companies considered aligned but will alter the resulting absolute values. There is also uncertainty related to the pathways and temperature impacts of non-CO_2 climate pollutants (1). The CBD does not require this extra processing step, though similarly there is uncertainty in the relationship between the emissions benchmarks they rely upon and the warming level referenced.

Meaning and interpretation issues. A limitation on the meaningfulness of ITR is that quoted temperature responses are commonly projected to 2100, despite the budget over/undershoot being calculated up to 2050 or sometimes 2070 (9), leaving decades of impact on the temperature at 2100 unconstrained. The CBD avoids this as the computation is limited to a specified time window.

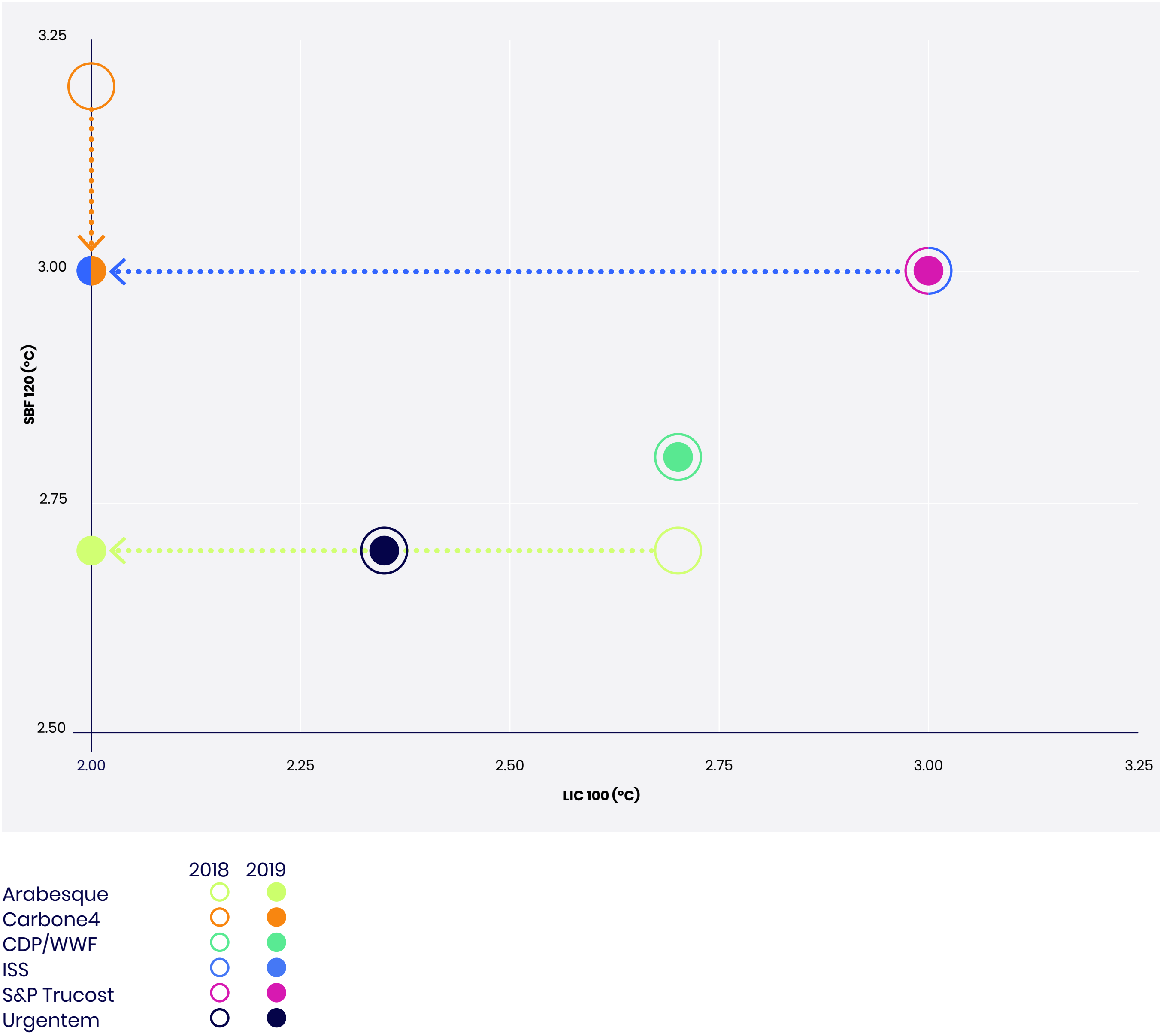
Similarly, ITR provides a single temperature reading, which may be interpreted as the temperature at which climate stabilises for a given carbon pathway. But if a carbon pathway does not go to net zero, associated temperatures will simply continue to rise (beyond the stated temperature).

There are further issues of perception: ITRs appear to offer a specific climate future as an investable product. Most relevant at the portfolio-level, we discuss this issue in *Portfolio alignment*.

Low correlation in portfolio analyses. The use of estimated data and assumptions to cover whole portfolios contribute to a low correlation between the results of different ITR methodologies. Fig. A1, based on data from the Institut Louis Bachelier (20), shows data for six ITR providers for two equity indices (the SBF 120 and LIC 100) over two years.

There is both divergence between the ITR reported by the different providers (particularly for the LIC 100) and variation in the response to changes in index composition between the two years. Both potentially limit an investor's ability to relate changes in fundamental factors to reported ITR.

Figure A1. ITRs for two indices from six providers. ITRs are shown in 2018 (open circles) and 2019 (filled circles), Where provider reports a range of values, the middle of the range is plotted here. The reported ITRs range from 2-3°C for LIC 100 and from 2.7 – 3°C for SBF 120. CDP/WWF, S&P Trucost and Urgentem show no response to the change in the composition of the indices between 2018 and 2019. By contrast, ISS and Arabesque see a 0.75-1°C reduction for the LIC 100 and Carbone4 saw a decline in the ITR for SBF 120. The components of the indices change over the two periods should result in some change in the reported ITR with the extent of the movement an indication of the sensitivity of the methodology to individual names in the index.



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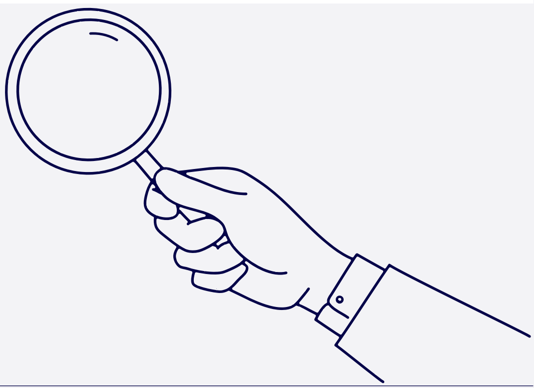

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