Forward-looking climate analytics

Methodology document

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ROBECO
The Investment Engineers

Contents

1. Introduction

The impacts of climate change are already being felt today. 2023 saw another year of significant economic losses from extreme weather events[1]. Consequently, there has been an increase in the number of policies relating to climate change[2]. It is critical as an asset manager to understand our exposure to these risks and climate data and analytics are key to this.

When it comes to climate analytics, much of the available data is backward-looking. Indeed, carbon emissions data, for example, is often lagging by one to two years. To successfully navigate the future, however, it is essential to have reliable and science-based forward-looking climate analytics. This is important because the future may look very different from the past, both in terms of global temperatures and global policies designed to address climate change. We need to understand how companies and countries look ahead to manage this shift.

Forward-looking climate analytics are still in their infancy. The underlying models are complex and continue to evolve, hence their outputs are uncertain and volatile. For example, the Institutional Investors Group on Climate Change (IIGCC) data catalogue for investors showed significant divergence across data providers in their assessment of how well companies align with the Paris Agreement (Figure 1)[3].

Robeco uses forward-looking climate analytics to make better informed investment decisions on behalf of our clients. At any time, we must be able to explain to clients how we incorporate climate factors in our investment decisions and why. For this reason, we cannot take the climate metrics from third-parties at face value, so we have carefully reviewed the underlying assumptions, methodologies and data used in climate analytics from a dozen data providers. Following this review, we developed a Robeco approach to climate analytics outlined in this paper.

Figure 1 | Significant variation between providers' assessment of alignment
% of companies rated 2°C or less/considered aligned or aligning
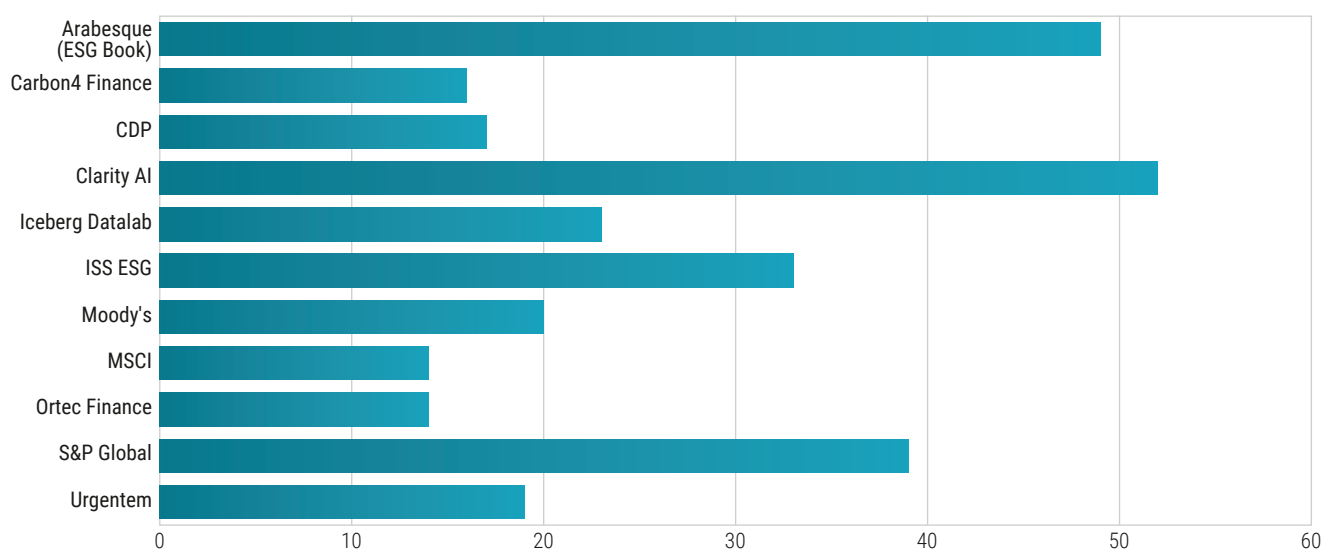
Source: IIGCC, dummy portfolio of 57 companies. Percentage of companies considered "aligned" or "aligning" – based on authors' assumptions and definitions.

1. [National Centers for Environmental Information: National Oceanic and Atmospheric Administration](#)
2. [The Climate Action Monitor 2022 (oecd.org)](#)
3. [IIGCC launches data vendor catalogue for investors – IIGCC](#)

2. Robeco's approach to climate change analysis

2.1 Double materiality

Robeco looks at climate change through the lens of double materiality (see Figure 2):

- On the one hand, we need to manage the risk that climate change poses to our investments, i.e. the financial impact of climate change. To do this we ask key questions such as: how much will it cost for a company to decarbonise its operations and supply chain? What physical risks and policy risks is the company exposed to and how will this impact valuations? And finally, which companies are set to benefit from the low-carbon transition through increased revenues for low-carbon products?

- On the other hand, given our net zero commitment, we need to understand the climate impact of our investee companies and countries. In this instance the key questions we ask are: How much is the company currently contributing to climate change? Is the company providing any solutions to the climate change crisis? What plans does the company have to reduce its emissions? And how ambitious and credible are these?

To answer these questions, we require robust knowledge of how the net zero transition is likely to play out across different sectors of the economy, and how this affects the decarbonization strategies, costs, risks and opportunities for companies. This is the focus of Robeco's sector decarbonization pathway research, an in-house research program conducted by the industry experts in our SI Research Team.

2.2 Sector decarbonization pathways

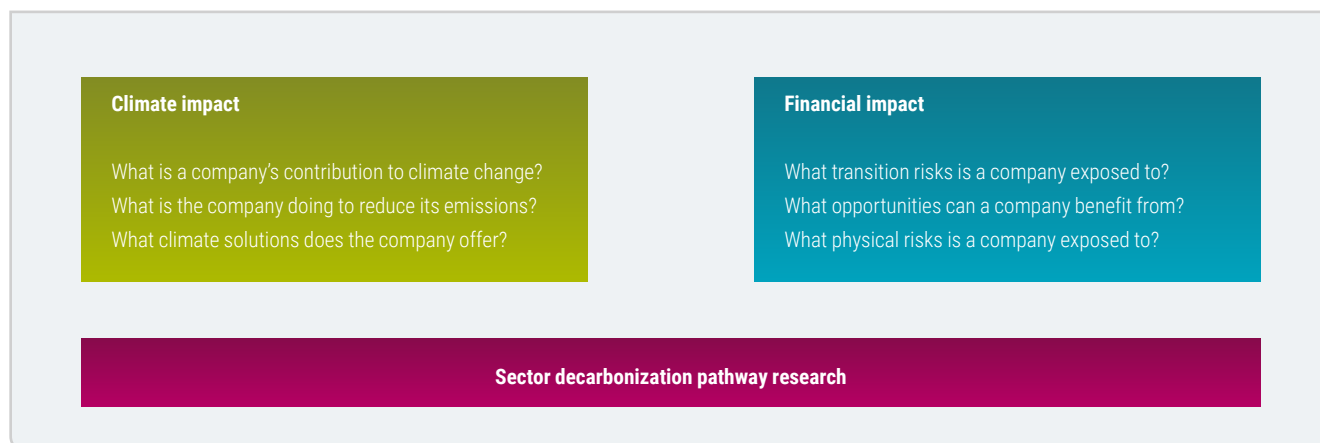For each sector, our SI Research analysts identify the following:

1. The remaining carbon budget allocated to that sector in science-based transition scenarios to achieve well below two degrees global warming
2. The required and most likely pathway to reduce sectoral emissions and remain within the carbon budget, based on available technologies and their cost and maturity
3. The expected total production change for the sector (demand growth or destruction)
4. The GHG emissions scopes that are most material and that the sector can be held accountable for (Scopes 1, 2 and/or 3)

Based on this, a sector decarbonization pathway is derived using the most relevant emissions intensity metric (tCO2/unit of production or revenue). The pathway indicates how much the emission intensity of a product, such as steel or cement, should decline over time. In practice, the International Energy Agency (IEA), Transition Pathway Initiative (TPI) and Science-Based Targets Initiative (SBTi) are used as the primary sources for these pathways.

For example, in the automotive sector, the pathway focuses on end use-phase emissions (scope 3 downstream) which represent the largest share of emissions across a vehicle's lifecycle. In order to normalise emissions and make them comparable to the sector benchmark, the unit used is kilometres driven. The metric used for assessing decarbonization in the automotive sector is therefore Scope 3 downstream in gCo2 per kilometre driven.

Where relevant, the sector pathways are broken down regionally, since decarbonization glidepaths differ from region to region, in accord with the fair share principle of the Paris Agreement ("common but differentiated responsibilities"). In section 3.5 we describe how we do this.

Figure 2 | Key investment questions related to the double materiality of climate change

Climate impact

What is a company's contribution to climate change?
What is the company doing to reduce its emissions?
What climate solutions does the company offer?

Financial impact

What transition risks is a company exposed to?
What opportunities can a company benefit from?
What physical risks is a company exposed to?

Sector decarbonization pathway research

Source: Robeco

Figure 3 | Sectoral pathways for the automotive and European electrical utilities sectors (well below 2 °C)
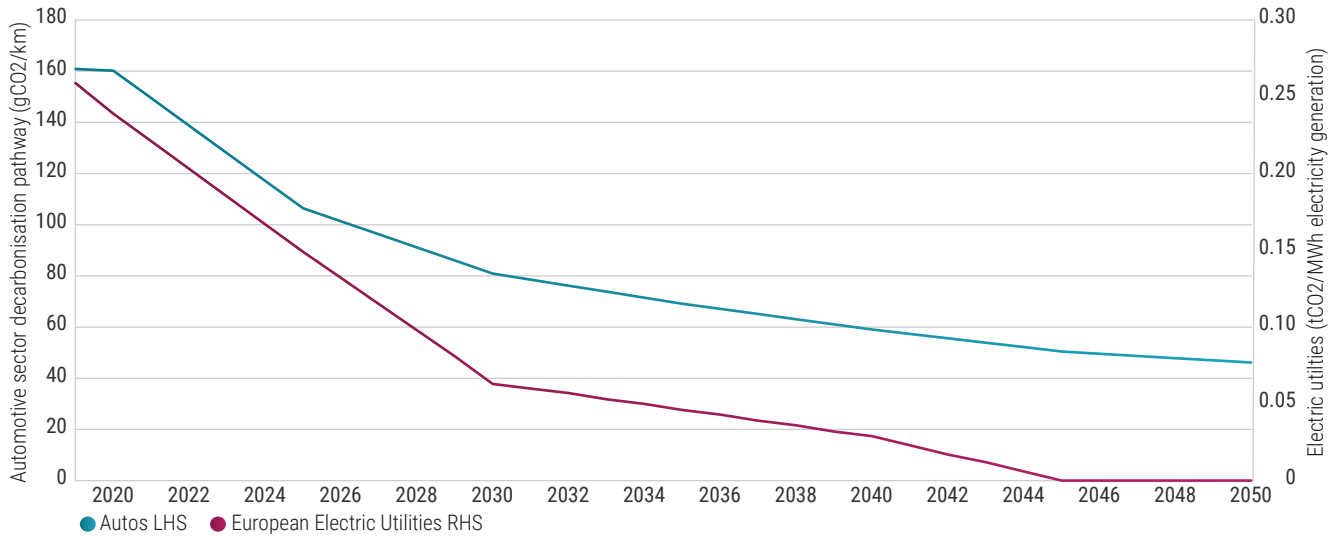
Source: Transition Pathway Initiative, as at 31st March 2023.

In Figure 3, we show the sectoral pathways for the automotive, and electric utilities sectors.

Based on these pathways, we can assess how ambitious the company's emissions reductions plans are relative to the sector decarbonization pathway. In other words, whether the company is Paris-aligned within its sector.

We measure this by projecting a company's emissions' intensity into the future using the company's emissions reduction targets

and then comparing this to the relevant sector decarbonization pathway. The alignment is initially assessed by measuring the distance of the company's pathway from the sector pathway.

For example, in Figure 4 we show the sector decarbonization assessment for two companies in the steel sector. In this illustrative example, Company A's projected emissions (blue) are below the sector pathway line (orange) and therefore aligned. Company B's projected emissions (rose) are significantly above the sector pathway line and therefore misaligned.

Figure 4 | Sector decarbonization pathway alignment in the steel sector
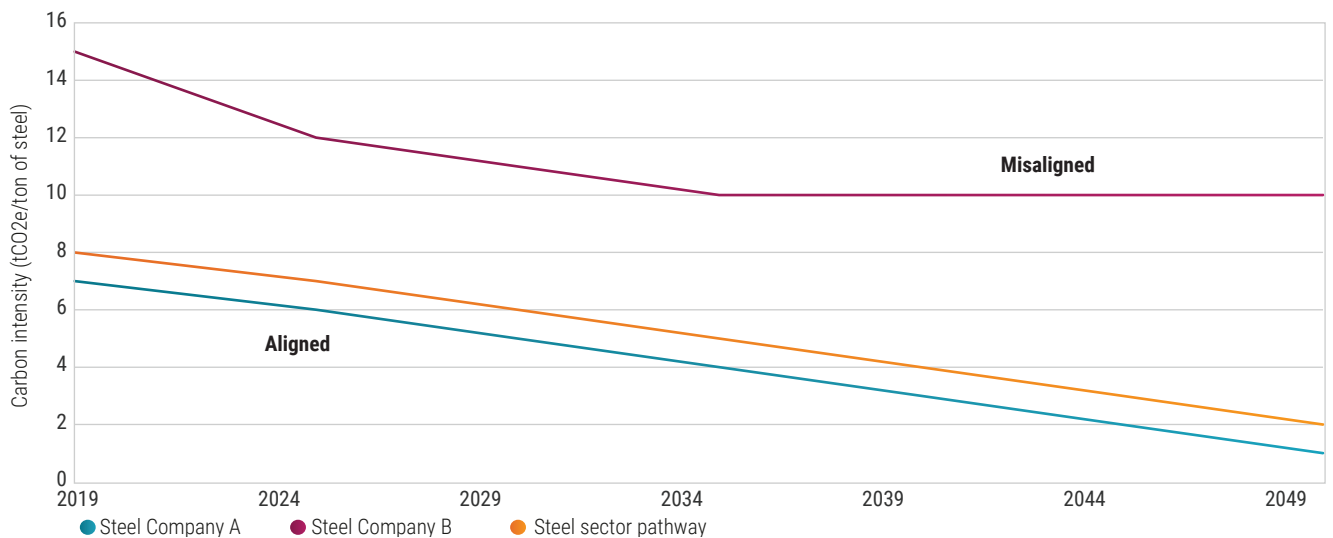
Source: Robeco, for illustrative purposes only.

2.3 Transition risk and opportunities

Following this, we assess the financial implications of a company's decarbonization pathway. We calculate how much the company will need to spend to reach its targets, how much is needed to align with the sector pathway, and how that compares to the company's stated capex plans. In order to achieve this, it is necessary to have a clear understanding of the technologies available to decarbonize a company's operations and supply chain within a given sector, how much those technologies will cost and how much capacity for decarbonization each has.

For each sector, the drivers of transition risk and opportunities are assessed by our SI research analysts using the following:

- Capex costs from investment in new infrastructure and technologies to decarbonize operations and end products, for example building a new electric vehicle (EV) production plant
- Opex costs from increased spending needed to decarbonize, for example purchasing batteries for EVs
- Demand destruction or creation from behavioural changes or regulation, for example a drop in oil demand as a result of higher electrification of the economy or an increase in revenues from renewable power generation
- Policy risks from increased taxation or fines as a result of regulatory changes and carbon pricing, for example the cost relating to a company purchasing more carbon credits in the EU as the free allowances are phased out

For each of the relevant drivers, on a sector by sector basis, a fundamental model is developed to estimate these costs. This differs depending on the technologies available to decarbonize the sector, and on the expected policy response. This in-depth fundamental assessment gives us a bottom-up view on transition risks and opportunities across the companies in our investment universe.

For example, in the automotive sector, the primary decarbonization technology is EVs. In order to shift production towards more EVs, existing manufacturing plants will need to be converted to EV manufacturing plants or new plants will need to be built. Auto manufacturers also require batteries for their EVs. These can either be sourced contractually, by purchasing them directly from a battery manufacturer, or companies can build their own battery plants independently or as part of a joint venture. Each of these technology options goes along with certain capex and opex costs. For individual companies, we can approximate their overall decarbonization costs by triangulating their emission reduction targets with their technology options.

Take, for example, a company in the automotive sector that has set a 15% reduction target for 2025, (Figure 5), however to be in line with the required sector pathway, they should be decarbonizing by 30%. Based on these targets, we calculate what their auto production mix should be by 2025, and in particular how many EVs will be needed. We can then calculate how many plants and batteries will be required to deliver that number of EVs and this gives us the capex and potentially opex cost the company will incur to achieve their targets or to reach the required sector pathway line. These costs can then be compared to those announced by the company. This gives financial analysts an understanding of whether the company is likely to face higher costs than they anticipate, and whether a company is likely to meet their targets.

For policy and regulatory costs, a regional perspective is needed. For example, currently only auto manufacturers in the EU will incur fines for not meeting certain thresholds of EV sales. This is factored into our fundamental assessment.

Figure 5 | Assessing decarbonization costs
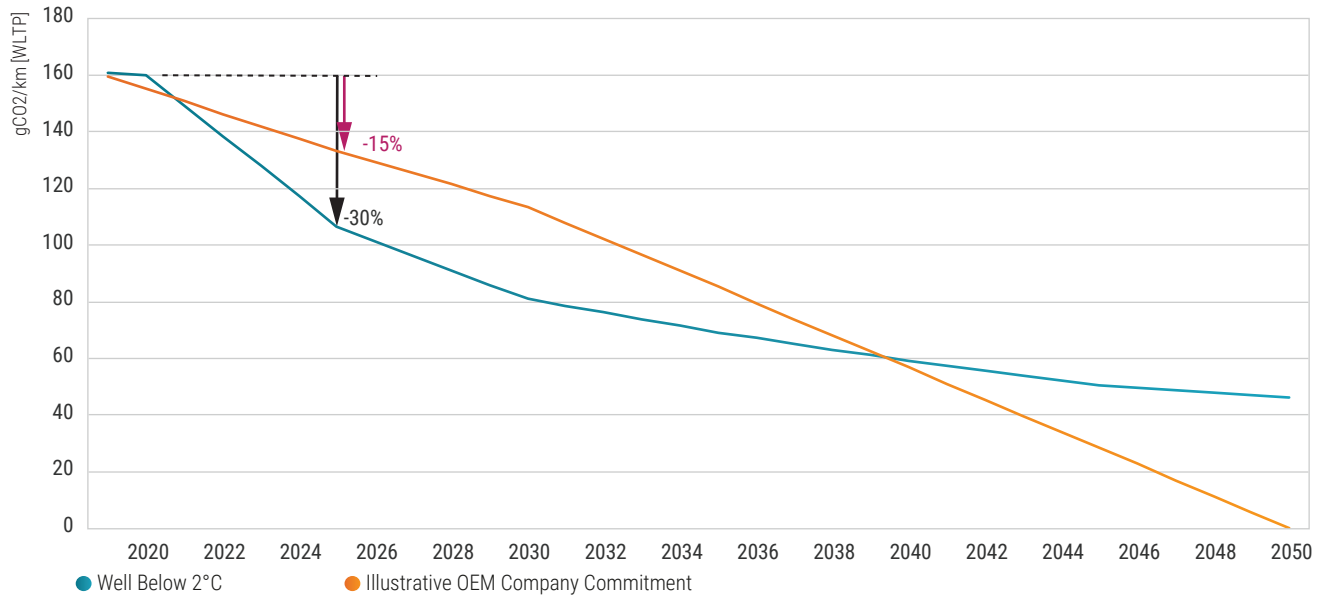
Source: Robeco, Transition Pathway Initiation, for illustrative purposes only

3. Climate impact

Building on the sector pathway research, we develop forward-looking analytics to evaluate how companies are both contributing to and mitigating climate change, in other words their 'climate impact.' Our headline metric for this is the Robeco Climate Score, which gives positive scores to climate leaders and negative scores to climate laggards (using a range from -3 to +3).
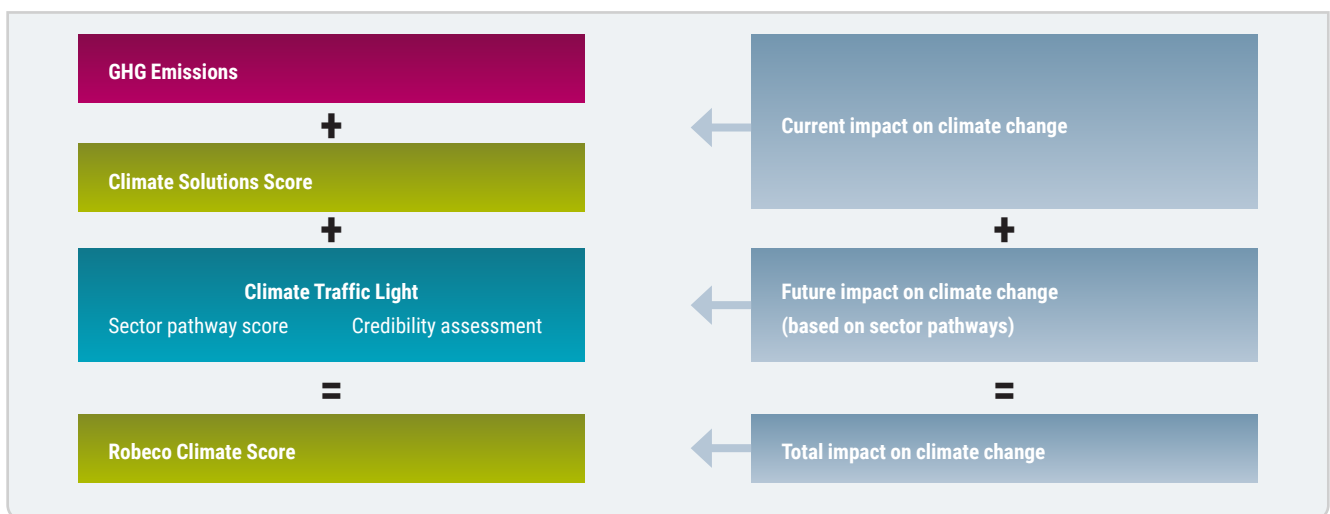
3.1 Climate Score

The primary impact a company has on climate change is measured by the carbon emissions it produces. These emissions tend to be sector dependent and do not paint a full picture of climate impact. Often, the sectors which have the most emissions are providing a critical function to the global economy, for example steel and cement, and therefore cannot simply stop their emission-intensive processes. In these cases, how the company plans to reduce their emissions is equally important. Furthermore, there are other companies that are emitting carbon to produce technologies and solutions which are crucial for the decarbonization of the whole economy, an example of this is batteries produced for energy storage. These companies should be recognized for their positive contribution to climate change mitigation.

Based on this reasoning, the Climate Score is composed of three elements, as shown in Figure 6:

1. GHG Emissions: a company's current carbon footprint
2. Climate Solutions Score: a company's contribution to climate solutions
3. Climate Traffic Light: a company's GHG reduction targets and the credibility of these targets, i.e. the Paris Alignment of a company

The combination of backward-looking and forward-looking elements means that companies that currently have very high carbon footprints can only receive a neutral score if they have strong and credible targets, otherwise they will receive a negative score. If these companies increase their share of green revenue from climate solutions, they could achieve low positive scores. Companies with low emissions generally have a lower impact on climate change unless they are providing a specific climate solution. For this reason, scores for those companies range from -1 to +1. Only climate solutions providers are able to achieve the highest climate scores, provided they have a good decarbonization plan for their own operations. This is because the solutions they provide are likely to enable greater decarbonization across the whole economy. Figure 7 provides a description for each climate score and examples for each of the aforementioned archetypes.

Figure 6 | The Robeco Climate Score is composed of current and forward-looking elements

Source: Robeco, for illustrative purposes only.

Figure 7 | Climate score descriptors

Company profile[5]/Climate score outcome	-3	-2	-1	0	+1	+2	+3	Company examples
High/Medium emitter, bad targets	■	■						Energy company with no targets
High/Medium emitter, good targets			■	■	■			Steel company installing electric arc furnaces to reduce emissions
Low emitter, bad targets			■					Healthcare company with no energy efficiency targets
Low emitter, neutral/good targets				■	■			Data centre planning to use renewable energy for all its centres
Solutions provider, bad targets				■	■			Wind turbine manufacturer with no plans to use low-carbon steel
Solutions provider, good targets						■		Battery manufacturer with plans for battery recycling

Source: Robeco, for illustrative purposes only.

The climate score is a rules-based score constructed initially using external data sources. As much of this external data is in its infancy and often comes with a time lag, our analysts are able to enhance the inputs by drawing on their knowledge of the company.

In the next few sections we explain the underlying components of the climate score. Whereas the climate score is useful in summing up our assessment of the company climate impact in a single number, the underlying components are equally informative and useful for different aspects of our investment and stewardship processes.

3.2. GHG Emissions

This component captures the current (in most cases negative) impact a company has on climate change. Here we look at the carbon footprint (tCO2/$EVIC) of companies, based on data from Bloomberg. We measure production phase emissions (Scope 1, 2 and 3 upstream) as a basis for all sectors. For sectors where Scope 3 downstream is most material and where companies have the highest level of complicity with the end emissions, we also include Scope 3 downstream. These are sectors where we deem that companies are able to significantly influence their downstream emissions. The full list is shown in Table 1.

Table 1 | Sectors for which we include Scope 3 downstream emissions in the climate score

Aerospace & Defence
Agricultural & Farm Machinery
Automobile manufacturers
Beverages
Building products
Construction Machinery & Heavy Transportation
Energy
Financials
Gas and Multi-Utilities
Mining
Real Estate

We assign thresholds to determine what qualifies as a very high/high/medium/low emitter and give an overall GHG emissions score on this basis, as shown in Table 2. The thresholds are based on an analysis of sectoral footprints as well as an assessment of relative contribution to global emissions. For example, within our investment universe, companies with emissions >3000 represent approximately 55% of total carbon emissions, whereas those with <300 represent less than 10% of total carbon emissions, despite representing 80% of the total enterprise value.

Table 2 | GHG emissions score based on issuer carbon footprint

Carbon footprint (tCO2e/EVIC)	GHG emissions score	Emitter type
>3000	-3	Very high
1000-3000	-2	High
300-1000	-1	Medium
10-300	0	Low
<10	0	Very low

In addition to carbon footprint, we also look at revenues from thermal coal extraction, generation and supporting products and services because of the strong scientific and policy consensus on the need for near-term phase-out of thermal coal. We assign a -3 score to companies with revenues from thermal coal greater than 10%, in line with the threshold set in Robeco's Sustainable Development Goals (SDG) framework[4].

3.3 Climate Solutions Score

Robeco's Climate Solutions Score aims to identify and reward companies who are at the forefront of developing innovative products, technologies and services which enable economy wide emissions reductions. Achieving a successful decarbonization of the economy requires not only a focus on reducing emissions, but also significant investments in low-carbon solutions. These solutions are particularly important in reducing the emissions of hard to abate sectors, such as cement, steel and shipping. The Climate Solutions Score aims to reward companies who are already investing and generating revenues from such climate solutions.

There are 3 steps in assigning a company level Climate Solutions Score:

1. Defining which activities constitute climate solutions. For this, a proprietary taxonomy of climate solutions has been created based on the latest legislative and scientific guidance.
2. Defining thresholds for these activities, which companies much meet to be considered a Climate Solutions provider.
3. Establish whether a company meets these thresholds based on available financial data.
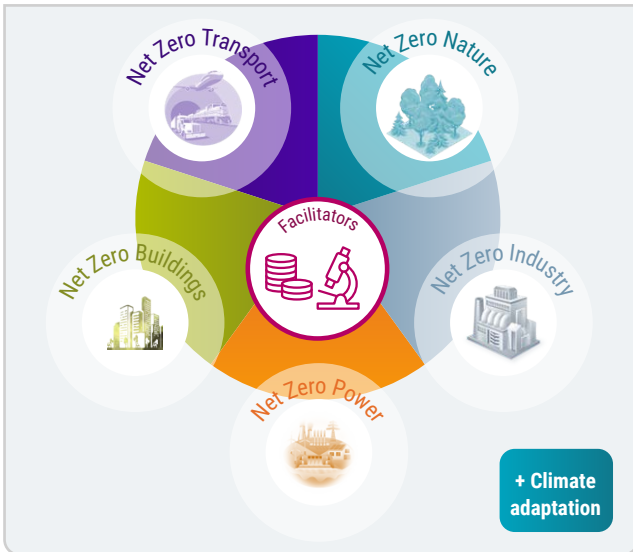
Step 1: Taxonomy of climate solutions activities

Our definition of what constitutes a climate solution has been developed by aligning with legislative and scientific guidance from the IPCC, IIGCC, GFANZ, EU Taxonomy and Singapore Taxonomy:

"A climate solution is an activity which contributes to climate change mitigation and/or adaptation. In the case of mitigation, the activity should directly or indirectly lead to long-term and significant reductions in economy-wide emissions. It must be compatible with a well below 2°C world in 2050. It includes direct solutions and enablers but does not include activities which result only in emission reductions in the production phase of a company's value chain."

This definition is used to examine whether an activity can be included within our taxonomy on climate solutions. To illustrate how we apply this definition in practice, we can use the example of two companies- Company A and Company B. Company A produces low carbon Cement, through the use of an innovative carbon capture technology, which has been developed by Company B. According to our definition, we would not classify Company A as being a climate solution provider. This is because Company A's emissions reductions only occur within the production phase of their value chain. Instead, Company B would be the climate solutions provider in this example. This is because the carbon capture technology which they are developing, is enabling significant, economy wide emissions reductions, which go beyond their own value chain, as they would be selling this to multiple companies in the cement sector.

The examples of Company A and Company B here also illustrate how the Climate Solutions Score is distinct from the Climate Traffic Light. In the case of company A, the reduction in their own operational emissions through the use of carbon capture, would be captured in their Traffic Light assessment, but not in their Climate Solutions score. Conversely, Company B's activities in selling carbon capture technology would not be directly captured in the Traffic Light as it does not result in a reduction in their scope 1, 2 or 3 upstream emissions, but it would be in the Climate Solutions Score. Of course, there may be overlap, whereby a company is effectively reducing their own emissions, whilst also selling products which enable economy wide emissions reductions. These companies would score positively in both the Traffic Light assessment and the Climate Solutions score, and can be considered "Climate Leaders".

4. Robeco SDG framework Explanation

In order to cluster activities within the Robeco Taxonomy of Climate Solutions, 5 distinct categories have been developed: net zero transport, buildings, power, industry and nature (see image above).

For example, contained within the net zero transport category, would be the sale of EVs; within power there is solar panels and windmills.

We recognise the importance that climate adaptation will have, even in the most positive mitigation scenarios, by also including adaptation activities in our taxonomy of climate solutions. Examples of climate adaptation activities included within the taxonomy include natural catastrophe reinsurance, and the development of drought resistant seeds.

Step 2: Establishing thresholds for substantial contribution

The next step is to set measurable thresholds for assessing which companies qualify as a climate solution provider. We do this based on revenue thresholds, which are set with a view on the maturity of the uptake of the climate solution technology in the market. We are also exploring capex thresholds but this is not yet possible due to data limitations.

Well-established since a number of years, the Robeco SDG framework sets revenue thresholds for identifying which companies are making a substantial contribution to the UN Sustainable Development Goals (SDGs). For the climate solution score we utilize the same revenue thresholds that are being used for the climate solutions that are included in SDG 7 (Affordable and Clean Energy) and SDG13 (Climate Action). A number of these thresholds are provided in Table 3 below. These thresholds are typically set at 33% but may be lower based on the level of maturity of an activity. For example, for industries that are transitioning to low-carbon solutions, like the automotive and food industry, relevant KPIs (e.g., plant-based food revenues) may have a lower threshold. These thresholds will be ratcheted up over time as the net zero transition unfolds.

Many climate solutions in our taxonomy are already embedded in the Robeco SDG framework. For some climate solutions there is lack of data or lack of clear definitions and by consequence these cannot be included in the SDG framework. These will then also not be reflected in the climate solution score. Only well-defined and well-measurable climate solutions are included.

Table 3 | Climate related activities and their revenue thresholds

Sector	Activity	Revenue thresholds & associated climate solutions score
Automotive suppliers	Manufacturing vehicle batteries	19.9% -> +1 29.9% -> +2
Building materials and products excluding cement	Insulation	32.9% -> +2
Energy exploration and production	Wind energy equipment	64.9% -> +1
Metals and mining	Lithium mining	32.9% -> +1 65.9% -> +2
Utilities	Renewable energy generation	32.9% -> +1 65.9 -> +2

Step 3: Establish whether a company meets these thresholds based on available financial data

Revenue data is used to determined whether a company meets the threshold for a certain climate solution activity. The company is then awarded the corresponding score, which ranges from 0-3.

3.4 Climate Traffic Light

This component assesses the future impact of a company on climate change by answering two questions:

1. Are the company's projected emissions in line with its required sector decarbonization pathway under a well below 2°C scenario (regionally adjusted where needed)?
2. Does the company have verified targets and a credible plan for achieving its emission-reduction goals?

Together, the two questions form our overall assessment of a company's Paris Alignment. We visualize this assessment using the Robeco Climate Traffic Light which indicates whether a company is 'aligned', 'aligning' or 'partially aligning' to 'misaligned' with the goals of the Paris Agreement, taking into consideration the "common but differentiated responsibilities" of different nations (see Figure 8).

Figure 8 | Robeco Climate Traffic Light
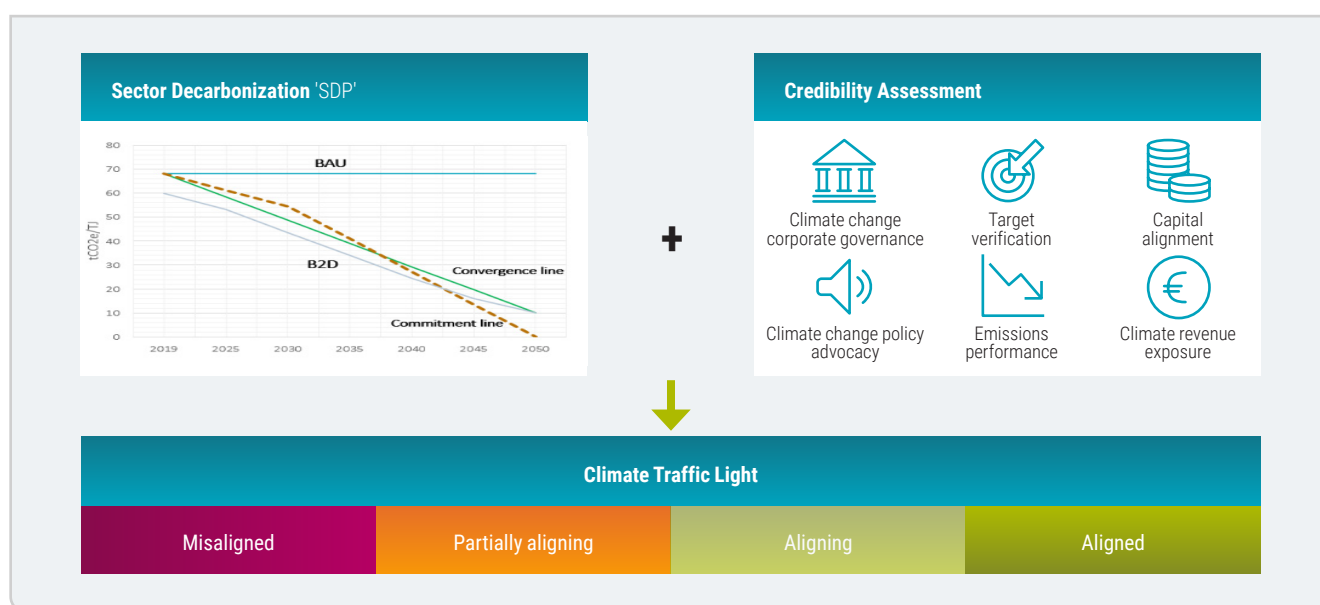
Source: Robeco. For illustrative purposes only.

The assessment of the first question, whether the company's decarbonization plan is aligned with its sectoral benchmark, is based on the sector pathway research described earlier in this paper (section 2.2). In this step, each company receives a sector decarbonization pathway (SDP) score, from 0 to 100, where 100 is fully aligned and 0 is fully misaligned.

The second question focuses on six aspects that together paint a picture of the credibility of the company's decarbonization plans:

a. Target verification: Does the company have targets and have they been approved by the Science Based Targets initiative?
b. Climate change corporate governance: Does the company's board have oversight of climate change risks and impact? Does the company disclose relevant emissions?
c. Capital alignment: Has the company set out a capital expenditure plan that will enable it to meet its targets?
d. Climate change policy advocacy: Is the company lobbying against climate change policy either directly or through an industry body of which it is part?

e. Climate revenue exposure: Does the company have significant revenues from highly emitting activities that require phasing out under the Paris agreement? Is the company contributing significantly to climate change mitigation through its products and services?
f. Emissions performance: Is the company already showing evidence of decarbonization?

Each of the above components are scored from 0 to 100. They are then combined using a weighting table to reflect the level of importance of each component, shown in Table 4. The weights are different for high impact and low impact sectors, as defined by Robeco based on Institutional Investors Group on Climate Change (IIGCC) definition of high impact sectors contained within the Net Zero Investment Framework. Based on this, credibility assessment score of 0 to 100 is obtained.

Table 4 | Credibility component weights vary based on their relative importance

Credibility component	High impact sector	Low impact sector
Target verification	30%	40%
Climate change corporate governance	10%	20%
Capital alignment	15%	0%
Climate change policy advocacy	10%	0%
Climate revenue exposure	15%	0%
Emissions performance	20%	40%

The SDP score and credibility assessment score are then combined using the matrixes displayed in Figure 9. The matrix approach ensures that a company cannot be considered aligned only on the basis of its targets or simply on its excellent governance and disclosure. Both are required to be considered aligned.

Figure 9 | Combining the SDP score and credibility assessment to obtain a final Climate Traffic Light

		Sector decarbonisation pathway score				
		100-80	80-60	60-40	40-20	20-0
Credibility assessment score	100-80	Aligned	Aligning	Aligning	Partially aligning	Misaligned
	80-60	Aligned	Aligning	Partially aligning	Partially aligning	Misaligned
	60-40	Aligning	Partially aligning	Partially aligning	Misaligned	Misaligned
	40-20	Partially aligning	Partially aligning	Misaligned	Misaligned	Misaligned
	20-0	Partially aligning	Misaligned	Misaligned	Misaligned	Misaligned

Source: Robeco. For illustrative purposes only.

In order to be used for the climate score, the Climate Traffic Light is converted into a score which reflects the level of contribution to climate mitigation if emission reductions are successful. For example, high and very high emitters can make a significant contribution to emissions reduction if they establish and achieve ambitious reduction targets. An example would be a steel company that converts to electric arc furnaces for all of their steel production. Figure 10 shows the conversion for high and low emitters.

Figure 10 | Converting the traffic light into a climate score component

Carbon footprint	Climate Traffic Light	Paris Alignment Score
High emitters	Misaligned	-1
	Partially aligning	+1
	Aligning	+2
	Aligned	+3
Low emitters	Misaligned	-1
	Partially aligning	+0
	Aligning	+0
	Aligned	+1

3.5 Regional adjustment of the Climate Traffic Light

Known as the 'fair share principle', the Paris Agreement recognizes that countries have "common but differentiated responsibilities" for climate mitigation. Industrialized countries are historically responsible for most emissions, and have ample financial means, hence need to decarbonize earlier. Other regions have more time for emissions to peak and subsequently come down. This is reflected in the National Determined Contributions, for example, China targets net zero by 2060 and India by 2070.

Country-level targets influence that the decarbonization strategies of companies and the markets in which they operate. Following the fair share principle, this should be recognized in the sector decarbonization pathways against which we measure company performance.

We have therefore developed regionally adjusted sector decarbonisation pathways. The adjustment consists of using current median regional intensities as a starting point, and the country's NDC as the end point. This makes the pathway tailored to the market and policy context in which emerging market companies are operating.

We have made this adjustment for five high impact climate sectors: Power, Oil and Gas, Cement, Steel and Banks. These sectors were chosen for regional adjustment, as they are hard to abate, and they are driven by domestic decarbonization targets and/or domestic demand. Other sectors, which are more global in nature, will still follow the global pathway specific to their industry. We believe that for sectors which are more global in nature, such as the automotive sector, emerging market companies must be analyzed versus their global peers given the global sales mix of these companies and the global regulations they are exposed to.

Also the second component of the climate traffic light – the credibility assessment – requires regional adjustment. Disclosure regulation is generally less advanced in emerging markets, which generates a bias against emerging markets when assessing their governance, strategy and related data point.

To counterbalance the disclosure bias against emerging market companies, we introduce an additional bandwidth for aligning companies in the scoring matrix, as shown in Figure 11.

Figure 11: Scoring Matrix used to generate the Traffic Lights of EM Companies

		Sector decarbonisation pathway score				
		100-80	80-60	60-40	40-20	20-0
Credibility assessment score	100-80	Aligned	Aligning	Aligning	Aligning	Misaligned
	80-60	Aligned	Aligning	Aligning	Partially aligning	Misaligned
	60-40	Aligning	Aligning	Partially aligning	Misaligned	Misaligned
	40-20	Aligning	Partially aligning	Misaligned	Misaligned	Misaligned
	20-0	Partially aligning	Misaligned	Misaligned	Misaligned	Misaligned

Source: Robeco. For illustrative purposes only.

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