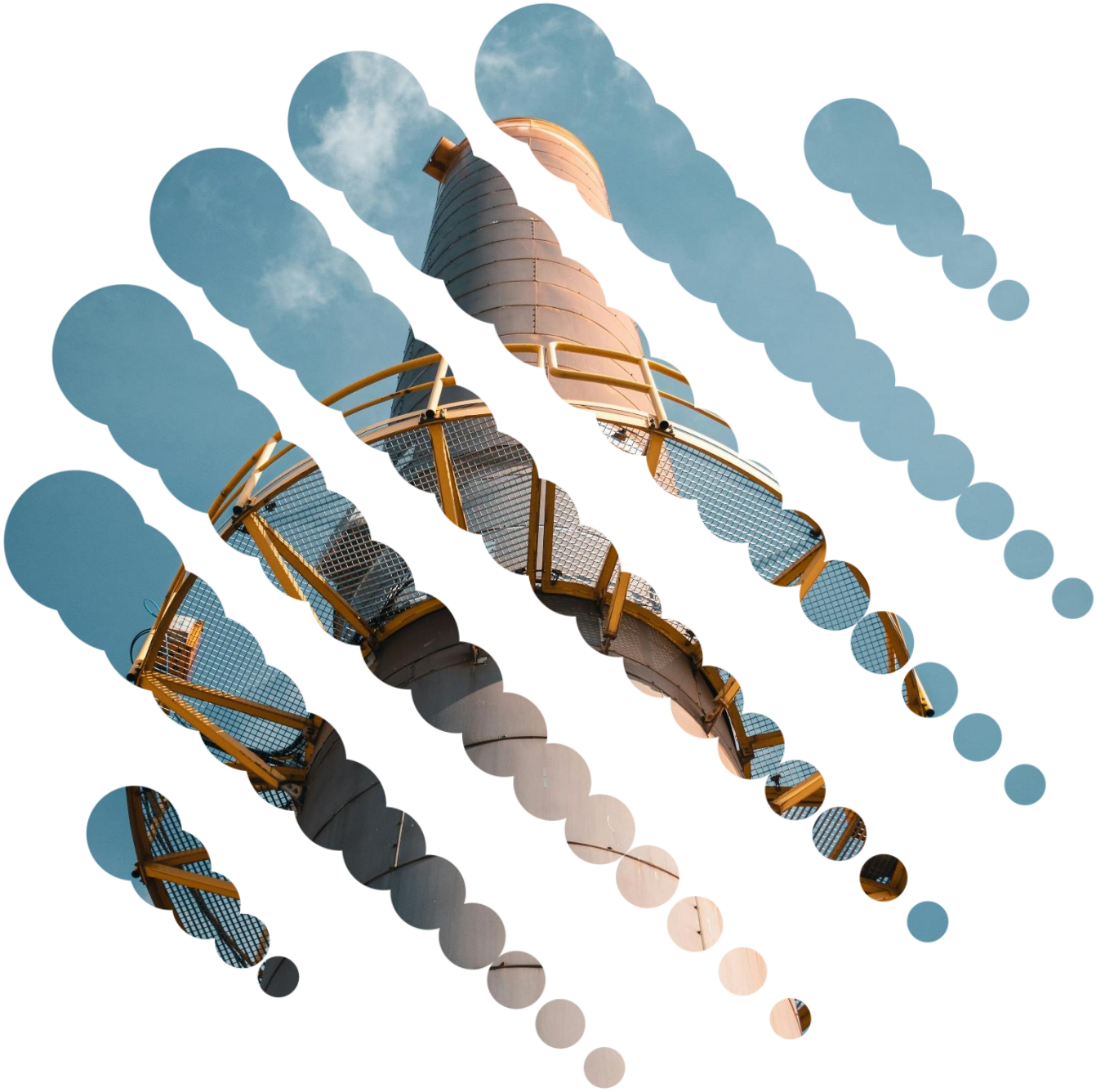
# Carbon Performance assessment of cement producers: note on methodology

October 2024



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Transition Pathway Initiative

LSE Grantham Research Institute on Climate Change and the Environment

## About the LSE Transition Pathway Initiative Centre

The Transition Pathway Initiative Centre (TPI Centre) is an independent, authoritative source of research and data on the progress of corporate and sovereign entities in transitioning to a low-carbon economy.

The TPI Centre is part of the Grantham Research Institute on Climate Change and the Environment, which is based at the London School of Economics and Political Science (LSE). It is the academic partner of the Transition Pathway Initiative (TPI), a global initiative led by asset owners and supported by asset managers, aimed at helping investors assess companies' preparedness for the transition to a low-carbon economy and supporting efforts to address climate change. As of October 2024, over 150 investors globally, representing over US$80 trillion combined Assets Under Management and Advice, have pledged support for TPI.[1]

The TPI Centre provides research and data on publicly listed equities, corporate bond issuers, banks, and sovereign bond issuers. The TPI Centre's company data:

- Assess the quality of companies' governance and management of their carbon emissions and of risks and opportunities related to the low-carbon transition.
- Evaluate whether companies' current and planned future emissions are aligned with international climate targets and national climate pledges, including those made as part of the Paris Agreement.
- Form the basis for the Climate Action 100+ Net Zero Company Benchmark Disclosure Framework assessments.
- Are published alongside the methods online and fully open access at www.transitionpathwayinitiative.org.

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[1] This figure is subject to market price and foreign exchange fluctuations and, as the sum of self-reported data by TPI supporters, may double count some assets.

# Contents

# 1. The TPI Centre's use of the Sectoral Decarbonisation Approach (SDA)

The TPI Centre's Carbon Performance assessments to date have been predominantly based on the Sectoral Decarbonisation Approach (SDA).[2] The SDA translates greenhouse gas emission reduction targets made at the international level (e.g. under the 2015 UN Paris Agreement) into benchmarks against which the performance of individual companies can be compared.

The SDA recognises that different sectors of the economy (e.g. oil and gas production, electricity generation and automobile manufacturing) face different challenges arising from the low-carbon transition, including where emissions are concentrated in the value chain and how costly they are to reduce. Other approaches to translating international emissions targets into company benchmarks have applied the same decarbonisation pathway to all sectors, regardless of these differences [1]. Such approaches may result in suboptimal insights, as not all sectors have the same emissions profiles or face the same challenges: some sectors may be capable of faster decarbonisation, while others require more time and resources.

Therefore, the SDA takes a sector-by-sector approach, comparing companies within the same sector against each other and against sector-specific benchmarks, which establishes the performance of an average company aligned with international emissions targets.

The SDA can be applied by taking the following steps:

- A global carbon budget is established, which is consistent with international emissions targets, for example keeping global warming below 2°C. To do this rigorously, some input from a climate model is required.
- The global carbon budget is allocated across time and to different regions and industrial sectors. This typically requires an Integrated Assessment Model (IAM), and these models usually allocate emissions reductions by region and by sector according to where it is cheapest to reduce emissions and when. Cost-effectiveness is, however, subject to some constraints, such as political and societal preferences, and the availability of capital. This step is therefore driven primarily by economic and engineering considerations but with some awareness of political and social factors.
- In order to compare companies of different sizes, sectoral emissions are normalised by a relevant measure of sectoral activity (e.g. physical production or economic activity). This results in a benchmark pathway for emissions intensity in each sector:

$$\text{Emissions intensity} = \frac{\text{Emissions}}{\text{Activity}}$$

[2] The Sectoral Decarbonisation Approach (SDA) was created by CDP, World Resources Institute (WRI) and the World Wide Fund for Nature (WWF) in 2015. See: https://sciencebasedtargets.org/resources/files/Sectoral-Decarbonization-Approach-Report.pdf.

- Assumptions about sectoral activity need to be consistent with the emissions modelled and therefore should be taken from the same economy–energy modelling where possible.
- Companies' recent and current emissions intensity is calculated, and their future emissions intensity is based on emissions targets they have set (this assumes companies meet their targets).[3] Together, these establish emissions intensity pathways for companies.
- Companies' emissions intensity pathways are compared with each other and with the relevant sectoral benchmark pathway.

[3] Alternatively, companies' future emissions intensity could be calculated based on other data provided on their business strategy and capital expenditure plans.

# 2. Applying the SDA to the cement sector

## 2.1. Deriving the benchmark pathways

The TPI Centre evaluates companies against benchmark pathways, which translate the emission reductions required by the Paris Agreement goals into a measurable trajectory at the sectoral level. For each sector benchmark pathway, the key inputs are:

- A timeline for economy-wide carbon emissions that is consistent with meeting a particular climate target (e.g. limiting global warming to 1.5°C) by keeping cumulative carbon emissions within the associated carbon budget.
- A breakdown of this economy-wide emissions pathway into emissions from key sectors (the numerator of sectoral emissions intensity), including the sector in focus.
- Consistent estimates of the timeline of physical production from, or economic activity in, the sector in focus (the denominator of sectoral emissions intensity).

For the cement sector, TPI obtains all three of these inputs from the International Energy Agency (IEA), via its Energy Technology Perspectives 2020, Net Zero by 2050 and World Economic Outlook 2023 reports [2] [3] [4]. The IEA has established expertise in modelling the cost of achieving international emissions targets. It also provides unprecedented access to the modelling inputs and outputs in a form suitable for applying the SDA.

The IEA's economy-energy model simulates the supply of energy and the pathway of emissions in different sectors burning fossil fuels, or consuming energy generated by burning fossil fuels, given assumptions about key inputs, such as economic and population growth.

In low-carbon scenarios, the IEA model minimises the cost of adhering to a carbon budget by always allocating emissions reductions to sectors where they can be made most cheaply, subject to some constraints as mentioned above. These scenarios are therefore cost-effective, within some limits of economic, political, social and technological feasibility.

The IEA's work can be used to derive three benchmark emissions pathways, against which companies are evaluated by TPI:

1. A National Pledges scenario, which is consistent with the global aggregate of emissions reductions related to policies introduced or under development as of mid-2023. According to the IEA, this scenario does not take for granted that all government targets will be achieved. Instead, it takes a granular, sector-by-sector look at existing policies and measures. This scenario gives a probability of 50% of holding the global temperature increase to 2.4°C by 2100 [4].
2. A Below 2°C scenario, which is also consistent with the overall aim of the Paris Agreement to limit warming, albeit at the lower end of the range of ambition. This scenario gives a probability of 50% of holding the global temperature increase to 1.7°C by 2100 [4].
3. A 1.5°C scenario, which is consistent with the overall aim of the Paris Agreement to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels" [5]. This scenario gives a probability of 50% of holding the global temperature increase to 1.4°C by 2100 [4].

For each scenario, IEA modelling output provides sector-specific emissions pathways. It also provides associated estimates of production in each sector. Alternatively, assumptions on overall economic growth can be used as a measure of sectoral activity (under the assumption that the sector grows at the same rate as the overall economy). Emissions are then divided by activity to derive sectoral pathways for emissions intensity.

For the cement sector, TPI uses the metric of "specific net $CO_2$ emissions per tonne of cementitious product" in its company assessments. This is one of the main $CO_2$ accounting metrics put forward by the Global Cement and Concrete Association (GCCA, formerly the Cement Sustainability Initiative) [6][7].

Net emissions are direct (i.e. Scope 1) emissions from cement production, including from burning fossil fuels to heat kilns, from the calcination process and from on-site use of the company's vehicles, but excluding $CO_2$ emissions from on-site power generation,[4] emissions from alternative fuels and raw materials,[5] and emissions from off-site use of the company's vehicles.

$CO_2$ emissions from on-site power generation (outside the kiln system) are excluded from the GCCA's measures of Scope 1 emissions, because some cement producers purchase their power from electricity utilities (therefore creating Scope 2 emissions), whereas others generate it themselves, making comparisons difficult.

The argument for excluding alternative fuels and raw materials is that their use leads to equivalent emissions reductions in the waste management industry.

The production measure, 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. It excludes clinker bought from third parties.

Three adjustments are necessary to make the total cement output and total Scope 1 emissions data from the IEA model comparable to the emissions intensity as defined by the GCCA.

- Conversion of total cement output into cementitious product: TPI adjusted the IEA's activity output with an average cementitious/cement ratio of 101.38%, calculated with data for the period 2005-2019 from the GCCA Getting the Numbers Right (GNR) project [8].
- Subtraction of $CO_2$ emissions from on-site power generation: the GNR database includes data on the global on-site power generation and a split by countries. TPI assumes that the emissions intensity of self-generated electricity is comparable to the global grid intensity in the three considered scenarios. The 2019 total on-site power generation is multiplied by the global grid intensity which changes over time.[6] The resulting emissions from on-site power generation are then subtracted from the total Scope 1 cement $CO_2$ emissions.
- Subtraction of $CO_2$ emissions from the use of alternative fuels: according to GCCA definitions, 'gross' emissions in the cement sector exclude emissions from on-site power generation but include emissions from the use of alternative fuels as opposed to 'net' emissions. GNR data shows that net intensities were on average 4.4% lower than gross intensities in 2019. TPI adjusted Scope 1 emissions accordingly by a factor of 95.6% for all years.

[4] Specifically, these are $CO_2$ emissions from on-site power generation, which is separate from the kiln system and which uses fuel energy other than waste heat from the kiln system.

[5] Alternative fuels and raw materials that can be burnt in kilns include solvents, paint residues, sewage sludge, filter cake, fly ash and slag. This class of fuel does not include biofuels. When emissions from alternative fuels and raw materials burned in kilns are included, the resulting intensity measure is referred to by the GCCA as *gross* emissions. Emissions from burning biofuels are not included in either the gross or net measure.

[6] In the previous version of the cement sector methodology note (November 2021), we used the grid emissions intensity of non-OECD countries, as most on-site power generation in the cement sector occurs there. In this update, we use the global emissions intensity of the electricity sector. The change has a negligible effect on the benchmarks.

Figure 2.1 below shows the benchmark emissions intensity pathways for the cement sector, while Table 2.1 provides the underlying data on emissions and cement production. For example, under the National Pledges scenario in 2030, global specific 'net' emissions from the cement sector are projected to be 2,392 million metric tonnes or megatonnes (Mt) of $CO_2$. Under the same scenario in 2030, cementitious production is projected to be 4,516 Mt. Therefore, the average carbon intensity of a cement producer aligned with the National Pledges pathway is 2,392 / 4,516 = 0.53 tonnes of $CO_2$ per tonne of cementitious material produced.

Figure 2.1. Global emissions intensity benchmarks by warming scenario for the cement sector

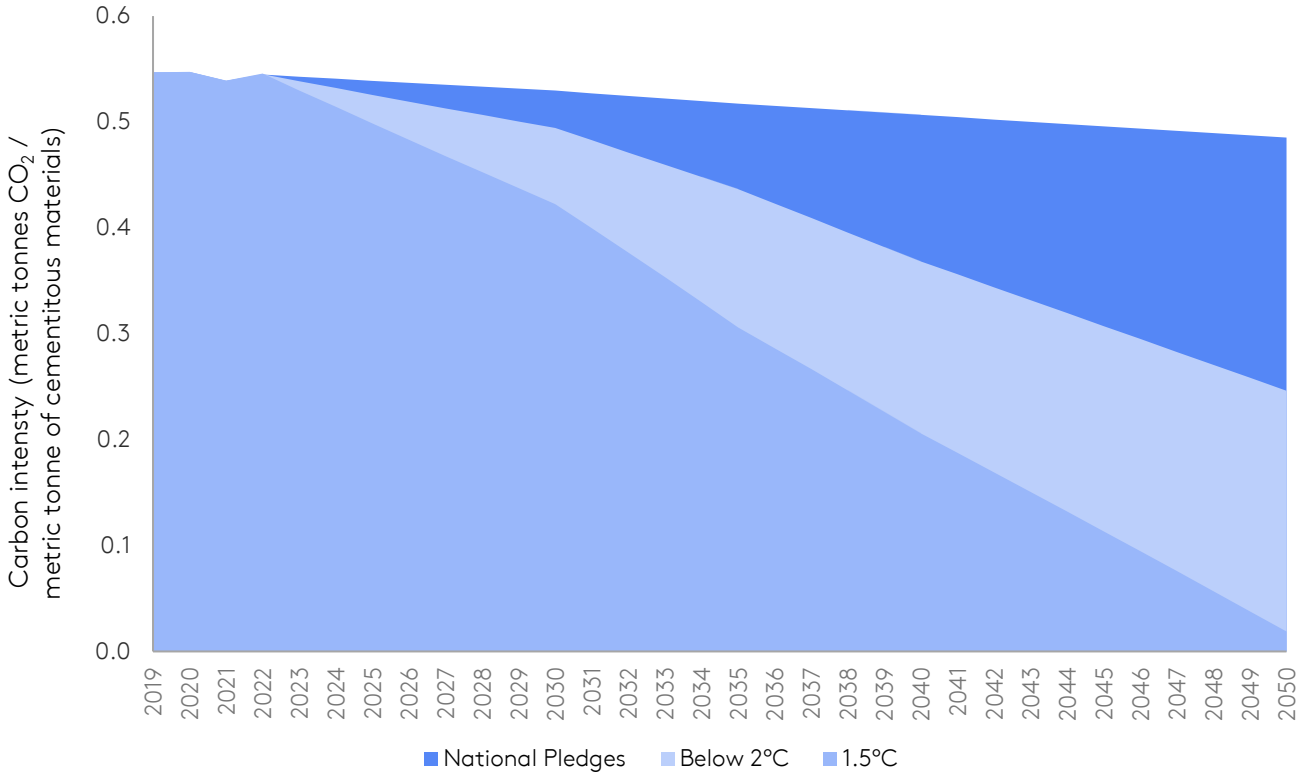


Table 2.1. Projections of emissions and cement production used to calculate emissions intensity pathways

| | 2022 | 2030 | 2040 | 2050 |
|---|---|---|---|---|
| **National Pledges scenario** | | | | |
| Specific 'net' $CO_2$ emissions from cement production (Mt) | 2,289 | 2,392 | 2,429 | 2,376 |
| Cementitious production (Mt) | 4,200 | 4,516 | 4,794 | 4,896 |
| **Carbon intensity ($tCO_2$ / tonne)** | **0.545** | **0.530** | **0.507** | **0.485** |
| **Below 2°C scenario** | | | | |
| Specific 'net' $CO_2$ emissions from cement production (Mt) | 2,290 | 2,185 | 1,637 | 1,092 |
| Cementitious production (Mt) | 4,200 | 4,419 | 4,445 | 4,437 |
| **Carbon intensity ($tCO_2$ / tonne)** | **0.545** | **0.494** | **0.368** | **0.246** |
| **1.5°C scenario** | | | | |
| Specific 'net' $CO_2$ emissions from cement production (Mt) | 2,292 | 1,819 | 836 | 75 |
| Cementitious production (Mt) | 4,200 | 4,307 | 4,062 | 3,974 |
| **Carbon intensity ($tCO_2$ / tonne)** | **0.545** | **0.422** | **0.206** | **0.019** |

# 3. Carbon Performance assessment of cement companies

## 3.1. Calculating company emissions intensities

TPI Centre's Carbon Performance assessments are based on public disclosures by companies. Disclosure that is useful to our assessments tends to come in one of three forms:

1. Emissions intensity. Some companies disclose their recent and current emissions intensity and some companies have also set future emissions targets in intensity terms. Provided these are measured in a way that can be compared with the benchmark scenarios and with other companies (e.g. in terms of scope of emissions covered and measure of activity chosen), these disclosures can be used directly. In some cases, adjustments need to be made to obtain estimates of emissions intensity on a consistent basis. The necessary adjustments will generally involve sector-specific issues.
2. Absolute emissions. Some companies disclose emissions on an absolute (i.e. un-normalised) basis. Provided emissions are appropriately measured, and an accompanying disclosure of the company's activity can be found that is also in the appropriate metric, historical emissions intensity can be calculated by TPI.
3. Absolute emission targets. Some companies set future emissions targets in terms of absolute emissions. This raises the particular question of what to assume about those companies' future activity levels. The approach taken by the TPI centre is to assume company activity increases at the same rate as the sector as a whole (i.e. assuming a constant market share), using sectoral growth rates from the same model that is used to derive the benchmark pathways, in order to be consistent. While companies' market shares are unlikely to remain constant, there is no obvious alternative assumption that can be made, that treats all companies consistently. Sectoral growth rates from the National Pledges Scenario (based on IEA's Stated Policies Scenario) are used.

The length of companies' emissions intensity pathways will vary depending on how much information companies provide on their historical emissions, as well as the time horizon for their emissions reduction targets.

## 3.2. Emissions reporting boundaries

Companies disclose emissions using different organisational boundaries. There are two high-level approaches: (i) the equity share approach and (ii) the control approach, within which control can be defined as financial or operational. Companies are free to choose which organisational boundary to set in their voluntary disclosures, and there is variation across the companies assessed by the TPI centre.

The TPI Centre accepts emissions reported using any of the above approaches to setting organisational boundaries, as long as:

- The boundary that has been set appears to enable a representative assessment of the company's emissions intensity.

- The same boundary is used for reporting company emissions and activity, to obtain a consistent estimate of emissions intensity.

Currently, limiting the assessment to one particular type of organisational boundary would severely restrict the breadth of companies that can be assessed.

When companies report historical emissions or emissions intensities using both equity share and control approaches, a reporting boundary is chosen based on which method provides the longest available time series of disclosures or is the most consistent with disclosure on activity and any targets.

## 3.3. Data sources and validation

All TPI Centre's data are based on companies' own disclosures. The sources for the Carbon Performance assessment include responses to the annual CDP questionnaire, as well as companies' own reports, e.g. sustainability reports.

Given that our Carbon Performance assessment is both comparative and quantitative, it is essential to understand exactly what the data in company disclosures refer to. Company reporting varies not only in terms of what is reported but also in terms of the level of detail and explanation provided. The following cases can be distinguished:

- Companies that provide data in a suitable form and with enough detail for analysts to be confident that appropriate measures can be calculated or used.
- Companies that provide enough detail in their disclosures, but not in a form that is suitable for the assessment (e.g. they do not report the measure of company activity needed). These companies cannot be included in the assessment.
- Companies that do not provide enough detail on the data disclosed (e.g. the company reports an emissions intensity estimate but does not explain precisely what it refers to). These companies are also excluded from the assessment.
- Companies that do not disclose their greenhouse gas emissions or activity.

Once a preliminary Carbon Performance assessment has been made, it is subject to the following procedure to provide quality assurance:

- Internal review: the preliminary assessment is reviewed by an analyst who was not involved in the original assessment.
- Company review: the reviewed assessment is sent to the company, which has the opportunity to review it and confirm the accuracy of the disclosures used. This review includes all companies, including those who provide unsuitable or insufficiently detailed disclosures.
- Final assessment: feedback from the company is reviewed and incorporated if it is considered appropriate. Only information in the public domain can be accepted as a basis for any change.

## 3.4. Responding to companies

Giving companies the opportunity to review their Carbon Performance assessments is an integral part of the TPI Centre's quality assurance process. Each company receives its draft assessment and the data that underpins the assessment, offering them the opportunity to review and comment on the data and assessment. We also allow companies to contact us at any point to discuss their assessment.

If a company seeks to challenge its result or representation, our process is as follows:

- The TPI Centre reviews the information provided by the company. At this point, additional information may be requested.
- If it is concluded that the company's challenge has merit, the assessment is updated.

- If it is concluded that there are insufficient grounds to change the assessment, the original assessment is published.
- If the company requests an explanation regarding its feedback after the publication of its assessment, the TPI Centre explains the decisions taken.
- If a company requests an update of its assessment based on data publicly disclosed after the research cut-off date communicated to the company, the new disclosure is noted. For corrections, we take this into consideration immediately, whereas general assessment updates will be incorporated in the next assessment cycle.

If a company chooses to further contest the assessment and reverts to legal means to do so, the company's assessment is withheld from the TPI Centre website and the company is identified as having challenged its assessment.

## 3.5. Presentation of assessment on the TPI Centre website

The results of the Carbon Performance assessments are posted on the TPI Centre's online tool (www.transitionpathwayinitiative.org/tpi/sectors). On each company page, its emissions intensity pathway is plotted on the same chart as the benchmark pathways for the relevant sector. Different companies can also be compared on the toolkit main page, with the user free to choose which companies to include in the comparison.

# 4. Specific considerations for the assessment of cement companies

## 4.1. Measure of emissions intensity

In applying the SDA to the cement sector, a key consideration is that the vast majority of lifecycle emissions stem from emissions from cement manufacturing, i.e. burning oil and gas to heat kilns, from the calcination process and from on-site use of the company's vehicles. Therefore, the scope of a company assessment should include emissions from the use of sold products.

Hence, in the cement sector, the specific measure of emissions intensity used by TPI is:

- Specific 'net' $CO_2$ emissions per unit of cementitious product, in units of (metric) tonnes of $CO_2$ per tonne of cementitious product.

Most cement producers assessed by TPI, who report any information whatsoever on their emissions intensity, include this metric in their reporting. This is also the metric in which companies tend to express their targets.

Cement producers' Scope 2 emissions from heat and power purchases are excluded. According to IEA modelling that underpins the benchmark pathways, as well as company disclosures, Scope 1 emissions from cement production amount to around 90% of combined Scope 1 and 2 emissions. Therefore, Scope 2 emissions are a relatively small share of the sector's overall direct and indirect contribution to climate change, although not entirely trivial. The main practical reason for omitting Scope 2 emissions is that companies in the sector generally do not disclose the intensity of their combined Scope 1 and 2 emissions.

## 4.2. Coverage of targets

Compared with other sectors such as electricity, and steel production, there is unusual uniformity in the cement sector in terms of how companies state their emissions targets. This is attributable to the coordinating role of the GCCA. Almost all targets are in intensity terms and cover specific net $CO_2$ emissions, as described above.

One aspect of companies' emissions targets, which does vary within the cement sector, is the percentage of specific net emissions covered by the target. In most cases, it is 100% of specific net emissions in the target base year, but in some cases, it is less than 100%, usually due to acquisitions after the target was set. When coverage is less than 100%, we assume that any specific net emissions, which are not covered by the target, remain unchanged, either from the base year, where the company set a partial target to begin with, or from the date at which an acquisition took place, if the target originally had 100% coverage.

## 4.3. Worked examples

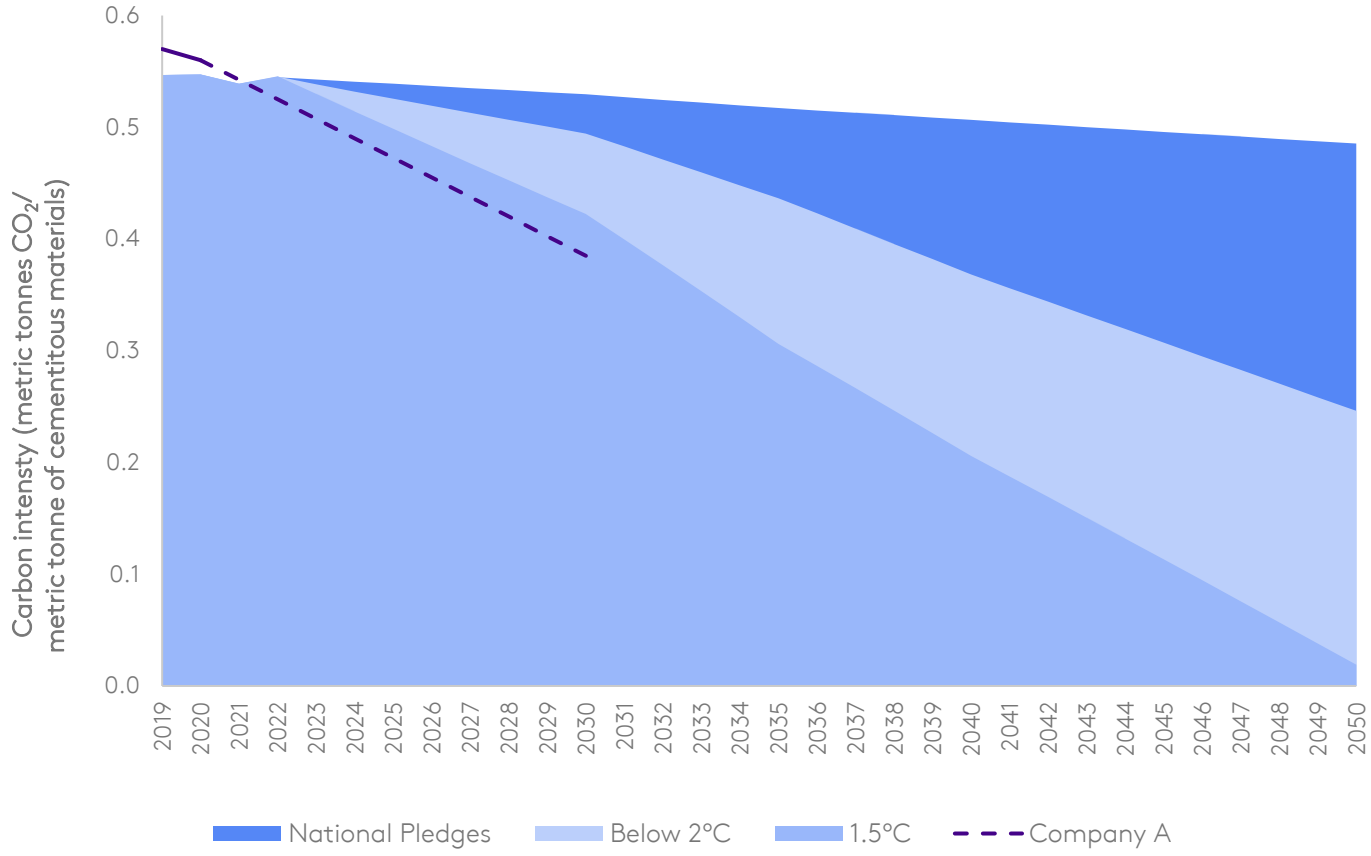
### Company A: a simple case

Company A reports its specific net emissions intensity for 2019 and 2020. For example, in 2020 it was 0.56 tonnes $CO_2$ per tonne of cementitious product (0.56t $CO_2$/t). Since Company A has aligned its reporting with the GCCA methodology, we accept its disclosures.

Company A has also set a target to reduce the intensity of its specific net emissions by 50% below the 1990 level by 2030. This target is stated to cover 100% of the company's specific net emissions.

In 1990, the company's emissions intensity was 0.77t$CO_2$/t. Therefore in 2030, the target is to reduce its emissions intensity to (1–50%) x 0.77 = 0.39t$CO_2$/t.

Figure 4.1. Worked example: Company A with a target covering 100% of the company's specific net emissions



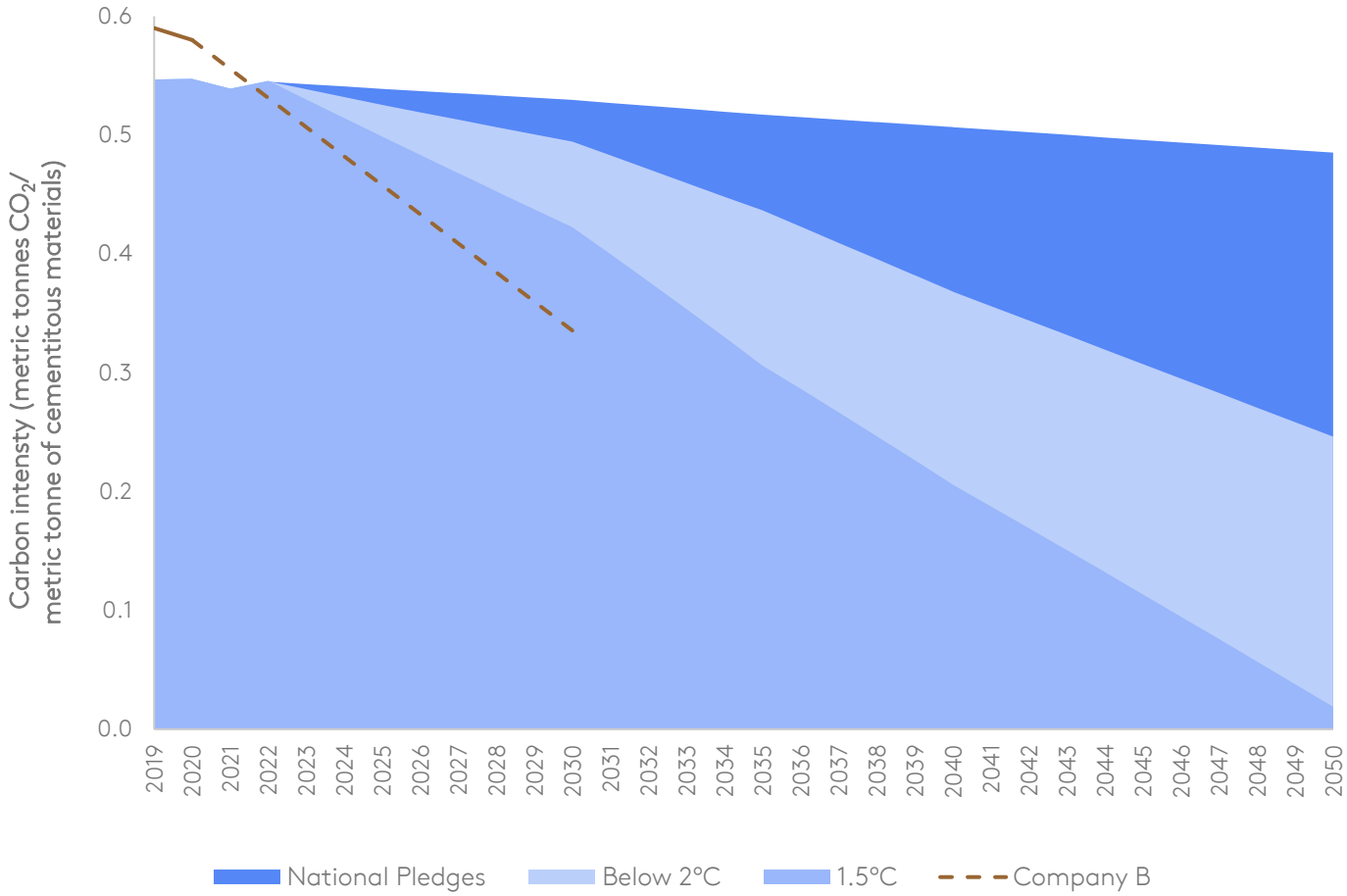
## Company B: less than 100% target coverage

Company B reports its specific net emissions intensity for 2019 as 0.58t$CO_2$/t. Since Company B has also aligned its reporting with the GCCA methodology, we accept its disclosures.

Company B has also set a target to reduce the intensity of its specific net emissions by 60% below the 1990 level by 2040. This target is stated to apply to 95% of the company's specific net emissions, so TPI assumes the 5% of base year emissions that are not covered by the target remain constant in intensity terms up to the target year.

In 1990, the company's emissions intensity was 0.78t$CO_2$/t. The company's 2040 emissions intensity is therefore 0.78 x (1-60%) x 95% + 0.78 x 5% = 0.34t$CO_2$/t.

**Figure 4.2.** Worked example: Company B with a target covering less than 100% of the company's specific net emissions



# 5. Discussion

This note has described the methodology followed by the TPI Centre in carrying out Carbon Performance assessment of cement companies.

The Carbon Performance assessment is designed to be robust yet easy to understand and use. There are inevitably many nuances surrounding each company's individual performance, how it relates to the benchmarks, and why. Investors may wish to dig deeper into companies' assessments in their engagements with them to better understand these.

## 5.1. General issues

The methodology builds on the SDA, which compares a company's emissions intensity with sector-specific benchmarks that are consistent with international targets (i.e. limiting global warming to 1.5°C, well below 2°C, and/or the sum of National Pledges).

TPI mainly uses the modelling of the IEA to calculate the benchmark pathways. Models have a number of advantages, but they are also subject to limitations, like all other economy-energy models. In particular, model projections often turn out to be wrong. This would impact the accuracy of the benchmark and potentially lead to investors drawing inaccurate conclusions about a company's alignment. Models tend to be regularly updated with the aim of improving their accuracy, and the TPI Centre updates its benchmark pathways accordingly. Nevertheless, in such a forward-looking exercise there is no way to avoid the uncertainty created by projecting into the future.

We predominantly use disclosed emissions and activity data to derive emissions intensity pathways. While much of this data is audited, the emissions intensity estimates can only be as accurate as the underlying disclosures.

Estimating the historical and especially the future emissions intensity of companies involves a number of assumptions. Therefore, it is important to bear in mind that, in some cases, the emissions pathway drawn for each company is an estimate made by TPI, based on information disclosed by companies, rather than the companies' own estimate or target. In other cases, the information disclosed by companies is sufficient on its own to completely characterise the emissions intensity pathway.

## 5.1. Issues specific to cement producers

The work of the GCCA and formerly the Cement Sustainability Initiative (CSI) means that there is a high degree of uniformity among leading cement producers in the type of emissions disclosures made and the form which emissions targets take. Conversely, those cement producers looked at by the TPI Centre, who do not follow the GCCA methodology, tend not to report enough information on their emissions, certainly in a metric consistent with those used by GCCA companies, for their carbon performance to be quantified, either today or in the future.

In other sectors such as electricity production, TPI has sought to independently verify any emissions intensities stated by companies using companies' standalone disclosures of emissions and production. However, this is not a viable approach in the cement sector. It is rare to find specific net $CO_2$ emissions explicitly disclosed on an absolute basis, and the production measure, cementitious product, is also rarely disclosed. This is because cementitious product is not a relevant measure of companies' final product for the purposes of financial accounting and reporting to investors. Therefore, stated intensities are taken at face value, as long as there is enough confidence in the measure.

In principle, TPI aims to evaluate companies' carbon footprint in the most holistic way possible. In the cement sector, we chose the GCCA's specific 'net' emissions intensity metric for our analysis, even

though this metric excludes companies' $CO_2$ emissions from on-site power generation and from the use of alternative fuels. The reasons for choosing specific 'net' emissions are pragmatic.

Companies very rarely report their emissions intensity including $CO_2$ emissions from on-site power generation. Moreover, emissions targets are almost always stated in specific 'net' emissions as opposed to specific 'gross' emissions which include emissions from burning alternative fuels and raw materials in kilns. However, TPI acknowledges that it is debatable whether emissions produced by burning alternative fuels and raw materials in cement kilns are always avoided one-for-one in the waste management industry. Overall, fewer assumptions are necessary to calculate cement producers' emissions pathways when using specific 'net' emissions.

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