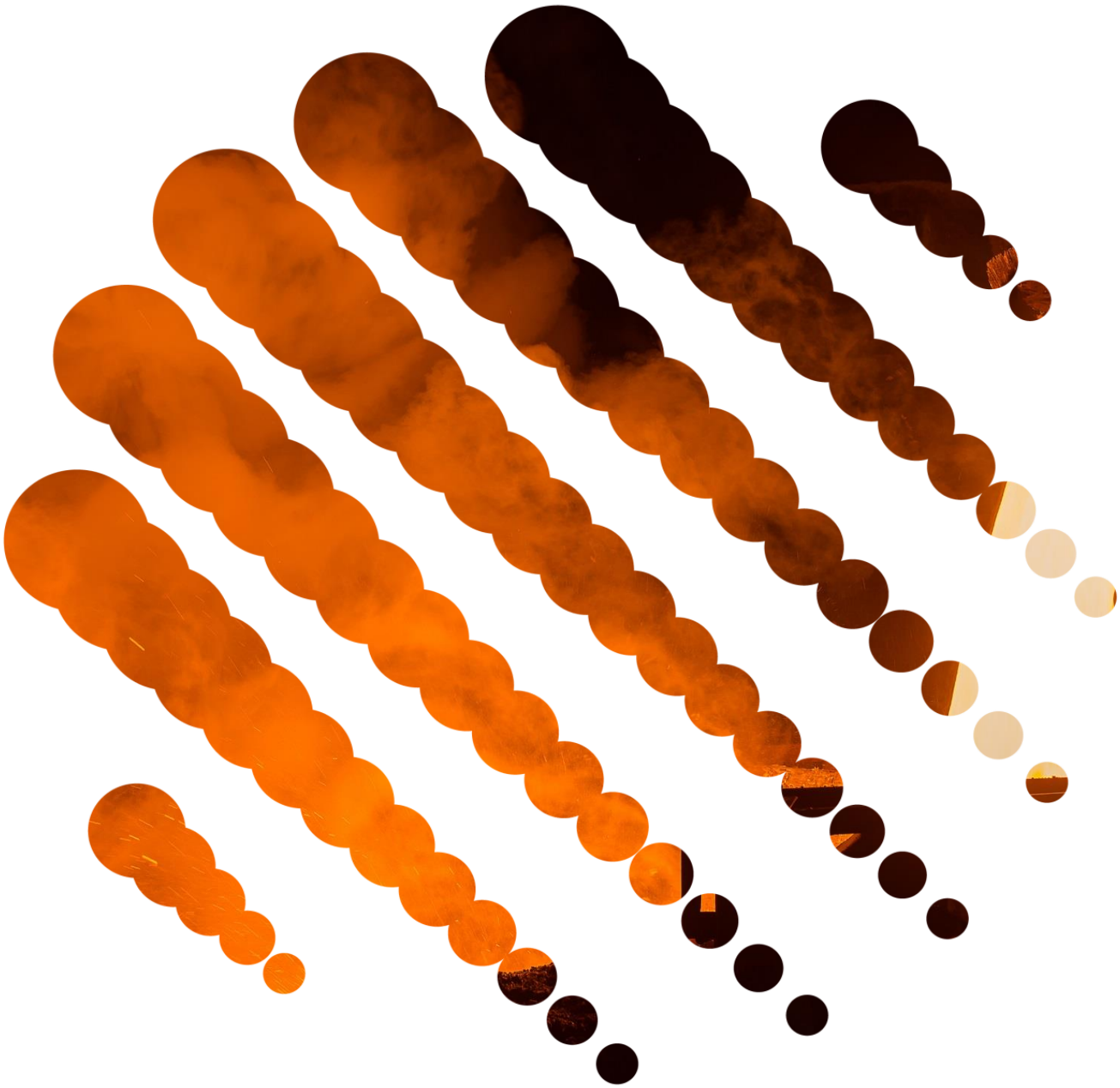
Carbon Performance assessment of steel makers: note on methodology

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1. INTRODUCTION

The Transition Pathway Initiative (TPI) is a global initiative led by asset owners and supported by asset managers. Established in January 2017, TPI investors now collectively represent over US$23 trillion of assets under management.

On an annual basis, TPI assesses how companies are preparing for the transition to a low-carbon economy in terms of their:

- Management Quality – all companies are assessed on the quality of their governance/management of greenhouse gas emissions and of risks and opportunities related to the low-carbon transition;
- Carbon Performance – in selected sectors, TPI quantitatively benchmarks companies' carbon emissions against the international targets and national pledges made as part of the 2015 UN Paris Agreement.

TPI publishes the results of its analysis through an open access online tool hosted by the Grantham Research Institute on Climate Change and the Environment at the London School of Economics (LSE): www.transitionpathwayinitiative.org.

Investors are encouraged to use the data, indicators and online tool to inform their investment research, decision making, engagement with companies, proxy voting and dialogue with fund managers and policy makers, bearing in mind the Disclaimer that can be found in section 6. Further details of how investors can use TPI assessments can be found on our website.

The purpose of this note is to provide an overview of the methodology being followed by TPI in its assessment of the Carbon Performance of steel makers. It is an update on the original steel sector Methodology Note of September 2017.

2. THE BASIS FOR TPI'S CARBON PERFORMANCE ASSESSMENT: THE SECTORAL DECARBONIZATION APPROACH

TPI's Carbon Performance assessment is based on the Sectoral Decarbonization Approach (SDA).[1] The SDA translates greenhouse gas emissions targets made at the international level (e.g. under the Paris Agreement to the UN Framework Convention on Climate Change) into appropriate benchmarks, against which the performance of individual companies can be compared.[1]

The SDA is built on the principle of recognising 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 it is to reduce emissions. Other approaches to translating international emissions targets into company benchmarks have applied the same decarbonization pathway to all sectors, regardless of these differences.[2]

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

Applying the SDA can be broken down into 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 economy-energy model, and these models usually allocate emissions reductions by region and by sector according to where it is cheapest to reduce emissions and when (i.e. the allocation is cost-effective). Cost-effectiveness is, however, subject to some constraints, such as political and public 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, economic activity). This results in a benchmark pathway for emissions intensity in each sector:

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

  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.

[1] Another initiative that is also using the SDA is the Science Based Targets Initiative (http://sciencebasedtargets.org/).

- Companies' recent and current emissions intensity is calculated and their future emissions intensity can be estimated based on emissions targets they have set (i.e. this assumes companies exactly meet their targets).[2] Together these establish emissions intensity pathways for companies.
- Companies' emissions intensity pathways are compared with each other and with the relevant sectoral benchmark pathway.

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

3. HOW TPI IS APPLYING THE SDA

3.1. Deriving the benchmark paths

The key inputs to calculating the benchmark paths are:

- A time path for carbon emissions, which is consistent with the delivery of a particular climate target (e.g. limiting global warming to 2°C). Consistency requires that cumulative carbon emissions are within the associated carbon budget.
- A breakdown of this economy-wide emissions path into emissions from key sectors (the numerator of sectoral emissions intensity).
- Consistent estimates of the time path of physical production from, or economic activity in, these key sectors (the denominator of sectoral emissions intensity).

For the steel sector, TPI obtains all three of these inputs from the International Energy Agency (IEA), via its biennial *Energy Technology Perspectives* report.[3] 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 path 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 paths, against which companies are evaluated by TPI:

1. A **Below 2 Degrees** 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".[4]
2. A **2 Degrees** scenario, which is also consistent with the overall aim of the Paris Agreement to limit warming, albeit at the low end of the range of ambition.
3. A **Paris Pledges** scenario, which is consistent with the global aggregate of emissions reductions pledged by countries as part of the Paris Agreement in the form of Nationally Determined Contributions or NDCs. Several studies have documented that this aggregate is currently insufficient to put the world on a path to limit warming to 2°C, even if it will constitute a departure from a business-as-usual trend.[5]–[7]

For each scenario, IEA modelling output provides sector-specific emissions paths. It also provides associated estimates of production in each sector. Alternatively input 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.

Figure 1 shows the benchmark emissions intensity paths for the steel sector, while Table 1 provides the underlying data on emissions and steel production. In 2020, TPI extended the time horizon of our benchmarks from 2030 to 2050. For example, under the Paris Pledges scenario in 2020, global Scope 1 and 2 emissions from the steel sector are projected to be 2,788 million metric tonnes or megatonnes of CO_2. Under the same scenario in 2020, steel production is projected to be 1,670 megatonnes. Therefore the average carbon intensity of a steel maker aligned with the Paris Pledges path is 2788 / 1670 = 1.67 tonnes of CO_2 per tonne of steel produced.

Figure 1 Benchmark global carbon intensity paths for the steel sector

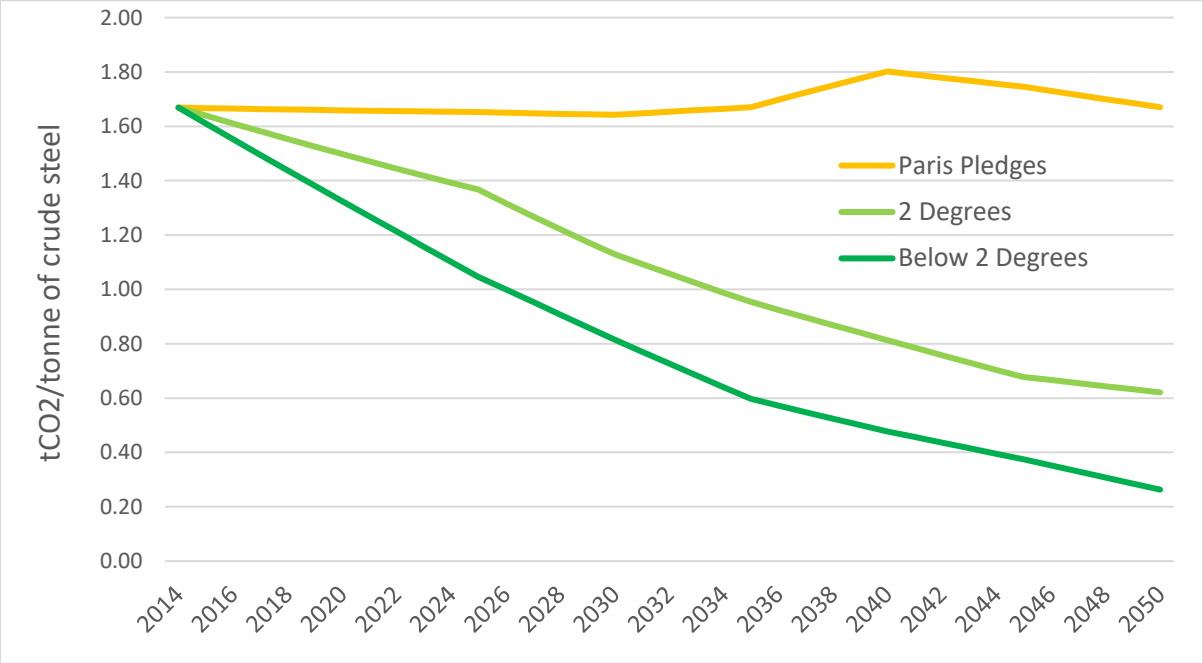


Table 1 Projections of emissions and crude steel production used to calculate intensity paths (Source: IEA and own calculations)

	2014	2020	2025	2030	2035	2040	2045	2050
Paris Pledges scenario								
Scope 1+2 CO2 emissions (Mt)	2,787	2,862	2,927	3,047	3,275	3,658	3,655	3,625
Steel production (Mt)	1,670	1,725	1,771	1,855	1,961	2,030	2,094	2,170
Carbon intensity (tCO2 / t steel)	1.67	1.66	1.65	1.64	1.67	1.80	1.75	1.67
2 Degrees scenario								
Scope 1+2 CO2 emissions (Mt)	2,787	2,584	2,421	2,095	1,870	1,651	1,417	1,347
Steel production (Mt)	1,670	1,725	1,771	1,855	1,961	2,030	2,094	2,170
Carbon intensity (tCO2 / t steel)	1.67	1.50	1.37	1.13	0.95	0.81	0.68	0.62
Below 2 Degrees scenario								
Scope 1+2 CO2 emissions (Mt)	2,787	2,216	1,753	1,355	1,019	844	666	480
Steel production (Mt)	1,670	1,673	1,675	1,663	1,708	1,770	1,779	1,825
Carbon intensity (tCO2 / t steel)	1.67	1.32	1.05	0.82	0.60	0.48	0.37	0.26

TPI calculates a sector's Scope 2 emissions by multiplying its power consumption by the emissions intensity of the electricity grid, along each of the IEA scenario paths. However, in the case of steel makers (like paper producers, for example), it is necessary to apply a further adjustment to account for the fact that some steel makers generate a substantial portion of the electricity they consume. In order to estimate the proportion of power consumption that is purchased from outside by steel makers, we draw on data published in steel company responses to the CDP Climate Change questionnaire. Question CC11.5, introduced in the 2016 and 2017 questionnaires, specifically asks respondents to list their power consumption and production/purchases; it is therefore possible to calculate, for each respondent, the ratio of electricity purchased to total electricity consumed.[3] The average ratio in 2016 and 2017 for steel makers responding to CDP was 66%.

TPI thus calculates Scope 2 emissions for the sector as:

Scope 2 emissions = 66% x Power consumption x Grid intensity

[3] Due to anomalies in company data on electricity *purchases* reported to CDP, for the steel sector we in fact calculate 1 – electricity produced / electricity consumed, where 1 – electricity produced is a proxy for electricity purchased.

For example, in 2014 the power consumption of the steel sector was 1,190 terawatt hours (TWh) and the global grid intensity was 0.572 megatonnes of CO_2 per TWh (both IEA estimates), so the steel sector's Scope 2 emissions are estimated at 66% x 1190 x 0.572 = 449 megatonnes of CO_2 in 2014.

3.2. Calculating company emissions intensities

TPI is based on public disclosures by companies. In any given sector, disclosures that are useful to TPI's carbon performance assessment tend to come in one of three forms:

1. 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 (see below).
2. Some companies disclose their recent and current 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, recent and current emissions intensity can be calculated by TPI.
3. 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 in the TPI is to assume company activity increases at the same rate as the sector as a whole (i.e. this amounts to an assumption of constant market share), using sectoral growth rates from the IEA in order to be consistent with the benchmark paths. While companies' market shares are unlikely to remain constant, there is no obvious alternative assumption that can be made, which treats all companies consistently. Sectoral growth rates from the Paris Pledges (IEA RTS) scenario are used. These lie in the middle of the range from the IEA's three scenarios, close to the average of them.

The length of companies' emissions intensity paths will vary depending on how much information companies provide on their emissions since 2013, as well as the time horizon for their emissions targets.

3.3. Emissions reporting boundaries

Company emissions disclosures vary in terms of the organisation boundary that a company sets. There are two high-level approaches: the equity share approach and the control approach, and within the control approach there is a choice of financial or operational control. Companies are free to choose which organisation boundary to set in their voluntary disclosures and there is variation between companies assessed by TPI.

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

1. The boundary that has been set appears to allow a representative assessment of the company's emissions intensity;
2. The same boundary is used for reporting company emissions and activity, so that a consistent estimate of emissions intensity is obtained.

At this point in time, limiting the assessment to one particular type of organisation boundary would severely restrict the breadth of companies TPI can assess.

When companies report historical emissions or emission intensity under *both* the equity share and control approaches, as is sometimes the case, TPI chooses the reporting boundary that seems most appropriate, based on the criteria of consistency with the reporting of activity, consistency with the target, and the length of the available time series of disclosures.

3.4. Data sources and validation

All company data in TPI come from 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 TPI's 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:

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

Once a company's preliminary performance assessment has been made based on the principles and procedures described above, it is subject to the following quality assurance:

- *Internal findings review*: the preliminary assessment is reviewed by analysts who were not originally involved in making it.
- *Company review*: once the initial findings review is complete, TPI writes to companies with their assessment and requests companies to review it and confirm the accuracy of the company disclosures being used. The company

review includes all companies, i.e. it also includes those who provide unsuitable or insufficiently detailed disclosures.

- *Final assessment*: company assessments are reviewed and, if it is considered appropriate, revised.

3.5. Responding to companies

Allowing companies the opportunity to review and, if necessary, correct their assessments is an integral part of TPI's quality assurance process. We send each company its draft TPI assessment and the data that underpin 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/representation, our process is as follows:

- TPI 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, TPI publishes its original assessment.
- If the company requests an explanation regarding its feedback after the publication of its assessment, TPI 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, TPI can note the new disclosure on the company's profile on the TPI website.
- 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 website and the company is identified as having challenged its assessment.

3.6. Presentation of assessment on TPI website

The results of the carbon performance assessment will be posted on the TPI website, within the TPI tool. On each company page, its emissions intensity path will be plotted on the same chart as the benchmark paths 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 IN THE ASSESSMENT OF STEEL MAKERS

4.1. Measure of emissions intensity

In the steel sector, the specific measure of emissions intensity used by TPI is:

- Scope 1 and 2 greenhouse gas emissions from steel-making, per unit of crude steel produced, in units of (metric) tonnes of CO2 equivalent per tonne of crude steel.

Unlike some other sectors, whose carbon performance is being assessed by TPI (e.g. cement, and electricity utilities), Scope 2 emissions from purchases of power are sufficiently important in the steel sector that they should be included in the measure of company emissions, alongside direct or Scope 1 emissions. According to the IEA modelling used to derive the benchmark paths (and adjusting for steel makers' own electricity generation using CDP data), global Scope 2 emissions from steel production were 16% of total Scope 1 and 2 emissions in 2014, for example.

The objective is to measure emissions from steel-making specifically, so that emissions arising from any other activities that companies are engaged in are excluded, otherwise companies' emissions intensity may be over-estimated. However, some steel companies assessed by TPI label their disclosed emissions as being operations-wide, rather than steel-making-specific. When this is the case, further assessment is required of whether the company in question has included significant sources of emissions other than steel production, or whether operations-wide and steel-making-specific emissions are equivalent, or at least approximately so.

There is also variation between companies in terms of how steel production is quantified. It is common to disclose production of crude steel and this is the desired measure, as the IEA benchmark paths are also based on modelling of crude steel production. However, some companies report production in a metric that may or may not be equivalent to crude steel. Examples of terminology in use include "liquid steel", "steel products", or simply "product", or "steel". Under these circumstances, further assessment is also required of whether the production measure can be equated to crude steel, at least approximately.

Emissions from steel-making of greenhouse gases other than CO_2 are negligible, so emissions measured in tonnes of CO_2 and tonnes of CO_2 equivalent are approximately identical.

4.2. Coverage of steel-making facilities

While some steel makers disclose emissions from all their facilities, others explicitly do not, or it is unclear from their disclosures. When it is explicitly incomplete or unclear, further assessment is required of whether coverage is incomplete, to what extent it is incomplete and whether the omission of some facilities is likely to bias the estimate of a company's emissions intensity. Ultimately TPI makes a judgement on whether its estimate of a company's emissions intensity is likely to be biased, and sufficiently so for the company to be excluded from the carbon performance assessment, in line with the principles set out in Section 3.3 above.

4.3. Coverage of target

There are often differences in the scope of companies' emissions targets. In the steel sector, some companies have set specific targets for Scope 1 and 2 emissions combined, while others have set targets covering Scope 1, 2 and 3 emissions. Where a target covers more than just Scope 1 and 2 emissions from steel-making, it is assumed – in the absence of any other specific information – that the percentage reduction in emissions is uniform across scopes, so the target percentage (e.g. a 20% cut) can be directly applied to Scope 1 and 2 emissions from steel-making.

Some companies set targets that only apply to a subset of emissions in scope, e.g. 90% of Scope 1 and 2 emissions from steel-making. Relevant emissions that are not covered by the target are assumed to be unchanged from the base year to the target year.

Companies often express targets relative to emissions in a base year (e.g. 2007), but they do not always report Scope 1 and 2 emissions from steel-making in the base year, rather they sometimes report base-year emissions in a different scope (e.g. they include upstream Scope 3 emissions in 2007). If a company does not report Scope 1 and 2 emissions from steel-making in the base year, these are estimated using the ratio of Scope 1 and 2 emissions from steel-making to emissions in the company's chosen scope over the last three years (cumulatively).[4]

4.4. Worked examples[5]

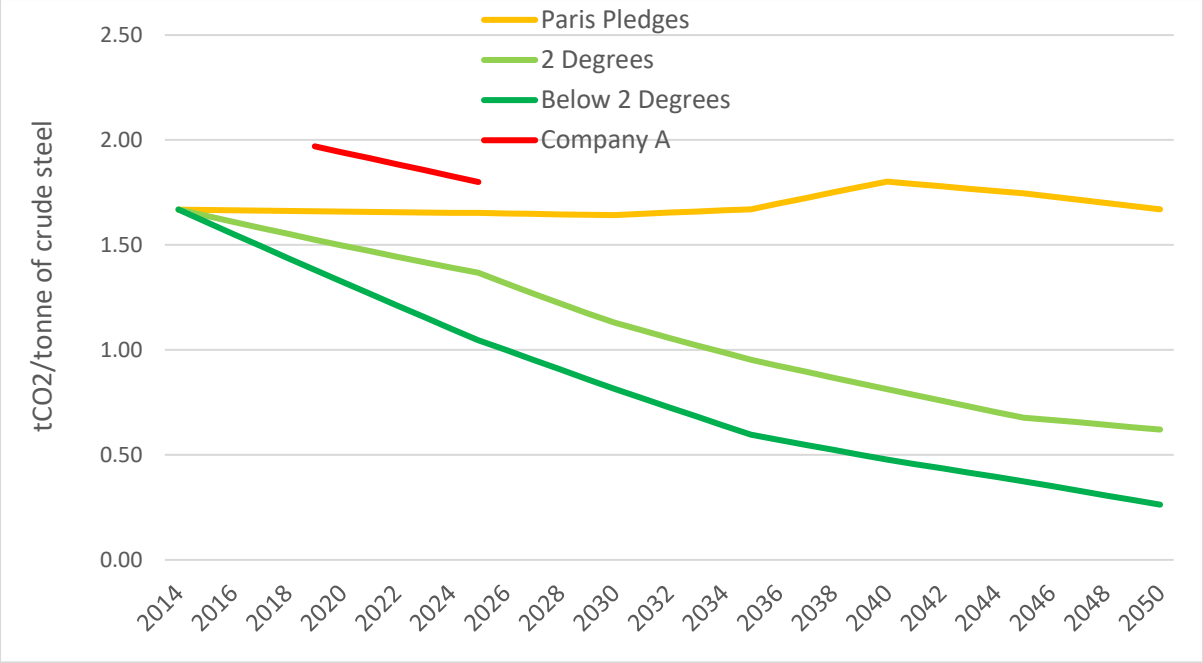
Company A: a simple case

Company A reports its historical emissions intensity and it does so in the required metric, i.e. Scope 1 and 2 emissions from steel-making per tonne of crude steel. For example, in 2019 it was 1.97 tCO2e / t steel. After independently verifying the estimates using separate disclosures of emissions and steel production, these figures are used directly without adjustment.

Company A has also set a target to reduce the intensity of its Scope 1 and 2 emissions by 8% below the 2008 level by 2025. This target is stated to cover 100% of the company's Scope 1 and 2 emissions.

In 2008, the company's emissions intensity was 2.0 tCO2e / t steel. Therefore in 2025 the target is to reduce its emissions intensity (total scope 1+2 emissions) to (1-0.08) x 2.0 = 1.8 tCO2e / t steel.

[4] Due to the occasional practice of companies re-basing their emissions, this adjustment is preferred to using disclosures of base-year Scope 1 and 2 emissions from steel-making from past years' reporting.
[5] In the following examples various numbers are rounded for ease of presentation.



Company B: an absolute emissions target

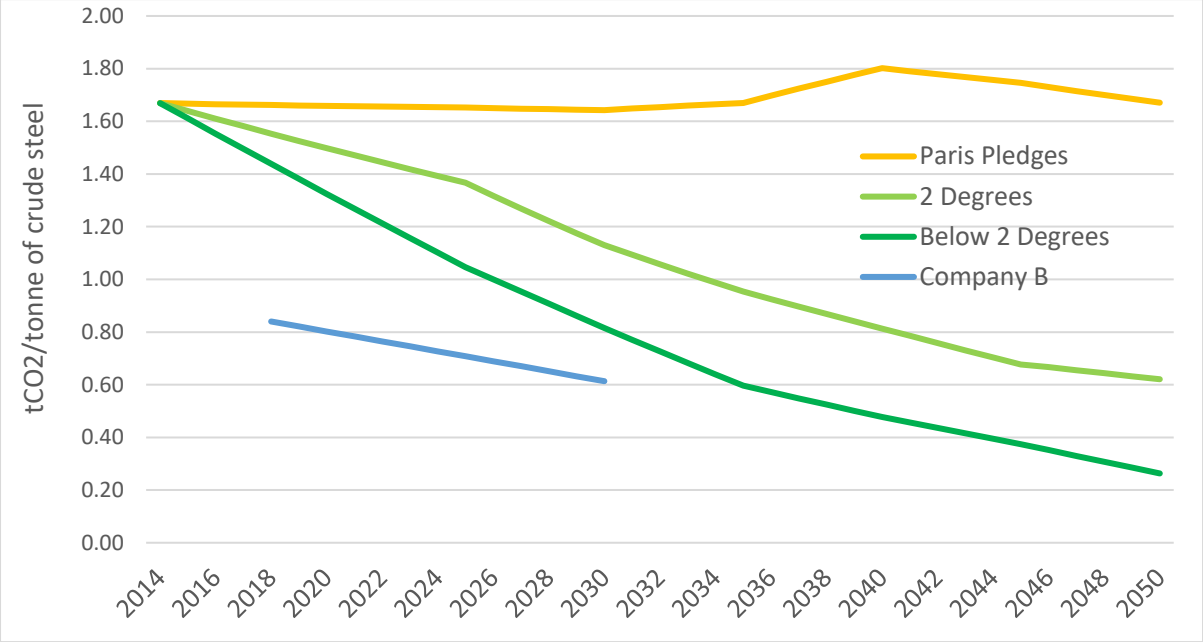
Company B reports an operations-wide emissions intensity of steel production per tonne of crude steel for 2018. In 2019, they report their intensity per tonne of 'production volume'. Further investigation indicates that there are no significant sources of company emissions other than steel production, so operations-wide emissions are taken to be equivalent to steel-making-specific emissions. In 2018, the company's Scope 1 and 2 emissions intensity was 0.84 tCO2e / t steel. The company's 2019 emissions intensity is excluded, due to the switch to another measure of steel production that appears different to crude steel.

Company B has a target to reduce the absolute quantity of its Scope 1 and 2 emissions by 7% below the 2013 level by 2030. This target can be shown to cover 83% of the company's total Scope 1 and 2 emissions in 2013. In order to translate this information into an estimate of emissions intensity in 2030, the following steps are taken:

- The company's target covers 83% of total Scope 1 and 2 emissions in 2013. The company reports that Scope 1 and 2 emissions covered by the target in the base year of 2013 were 13.2 $MtCO_2e$. This means that 2.7 MtCO2e were not covered by the target. We assume that those uncovered emissions remain constant between the base year and the target year.
- Total Scope 1 and 2 emissions in 2030, consistent with the target, can be estimated as 13.2 x (1 – 7%) + 2.7 = 15.0 MtCO2e.
- As the company does not provide an intensity target, its steel production between 2018 and 2030 is assumed to grow at the same rate as global steel production according to the IEA scenarios. In particular, IEA projects that global crude steel production grows by 8.69% between 2018 and 2030.

Therefore, the company's crude steel production in 2030 is its 2018 value, 22.5 Mt, multiplied by (1 + 8.69%) = 24.45 Mt steel.

- Dividing the company's estimated 2030 emissions by this estimate of steel production in 2030 gives an estimated intensity of 15.0 / 24.45 = 0.61 tCO2e / t steel in 2030.



5. DISCUSSION

This note has described the methodology followed by TPI in carrying out carbon performance assessment of companies, with a particular focus on steel makers.

TPI's carbon performance assessment is designed to be easy to understand and use, while robust. 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 to understand these.

5.1. General issues

The assessment follows the Sectoral Decarbonization Approach (SDA), which involves comparing companies' emissions intensity with sector-specific benchmark emissions intensities that are consistent with international targets (i.e. limiting global warming to well below 2°C, no more than 2°C, and the sum of the Paris Pledges).

TPI uses the modelling of the International Energy Agency (IEA) to calculate the benchmark paths. The IEA modelling has a number of advantages, but it is also subject to limitations, like all other economy-energy modelling. In particular, model projections often turn out to be wrong. The comparison between companies and the benchmark paths might then be inaccurate. However, there is no way to escape the need to make a projection of the future in forward-looking exercises like this. IEA updates its modelling every two years with the aim of improving the accuracy of its projections and TPI plans to update its benchmark paths accordingly.

TPI uses companies' self-reported emissions and activity data to derive emissions intensity paths. Therefore companies' paths are only as accurate as the underlying disclosures.

Estimating the recent, current 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 path 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 path.

5.2. Issues specific to steel makers

The principal challenge in the steel sector, relative to other sectors whose carbon performance TPI is assessing, is inconsistent reporting of emissions and steel production, particularly in terms of whether emissions disclosures are steel-making-specific or operations-wide, whether production is measured in tonnes of crude steel, an equivalent measure or something different (which itself is not always clear), and whether disclosures cover all or merely a subset of a company's production facilities.

On the other hand, most of those companies with emissions targets have set them in intensity terms and with nearly or exactly 100% coverage of Scope 1 and 2

emissions from steel-making, so relatively few assumptions are necessary in order to convert companies' stated emissions targets into intensity paths.

6. DISCLAIMER

1. Data and information published in this paper and on the TPI website is intended principally for investor use but, before any such use, you should read the TPI website terms and conditions to ensure you are complying with some basic requirements which are designed to safeguard the TPI whilst allowing sensible and open use of TPI data. References in these terms and conditions to "data" or "information" on the website shall include the carbon performance data, the management quality indicators or scores, and all related information.
2. By accessing the data and information published in the report and on this website, you acknowledge that you understand and agree to these website terms and conditions. In particular, please read paragraphs 4 and 5 below which details certain data use restrictions.
3. The data and information provided by the TPI can be used by you in a variety of ways – such as to inform your investment research, your corporate engagement and proxy-voting, to analyse your portfolios and publish the outcomes to demonstrate to your stakeholders your delivery of climate policy objectives and to support the TPI in its initiative. However, you must make your own decisions on how to use TPI data as the TPI cannot guarantee the accuracy of any data made available, the data and information on the website is not intended to constitute or form the basis of any advice (investment, professional or otherwise), and the TPI does not accept any liability for any claim or loss arising from any use of, or reliance on, the data or information. Furthermore, the TPI does not impose any obligations on supporting organisations to use TPI data in any particular way. It is for individual organisations to determine the most appropriate ways in which TPI can be helpful to their internal processes.
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