

Carbon Performance Assessment of Paper Producers: Note on Methodology

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1. INTRODUCTION

The purpose of this note is to provide an overview of the methodology followed by the Transition Pathway Initiative (TPI) in its assessment of the Carbon Performance of paper producers.¹

TPI is a global initiative led by asset owners and supported by asset managers. Established in January 2017, TPI investors now collectively represent over \$15.5 trillion combined Assets Under Management and Advice.²

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): <http://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 at <http://www.lse.ac.uk/GranthamInstitute/tpi/about/how-investors-can-use-tpi/>.

¹ The companies analysed in this report are typically involved in the production of pulp, paper and paperboard, and where necessary we will specifically refer to pulp, paper and paperboard. However, for the sake of brevity we will often simply refer to these companies as 'paper producers' engaged in 'paper making' and, following convention, we will refer to the sector as the 'paper sector'.

² As of 4th of December 2019.

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.³

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 path 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.

- 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.

³ Another initiative that is also using the SDA is the Science Based Targets Initiative (<http://sciencebasedtargets.org/>).

this assumes companies exactly meet their targets).⁴ Together these establish emissions intensity paths for companies.

- Companies' emissions intensity paths are compared with each other and with the relevant sectoral benchmark path.

⁴ 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 paper 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.⁵ Alternatively input assumptions on overall economic growth can be used as a measure of sectoral activity (under the

⁵ Where paper and paperboard products are produced from both virgin pulp and recycled pulp.

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.

The IEA emissions intensity paths for the paper sector only include CO₂ emissions, but, according to the United States Environmental Protection Agency (EPA), between 2013 and 2018 an average of 1.9% of the paper sector’s Scope 1 greenhouse gas emissions measured on a CO₂-equivalent basis was composed of methane (CH₄) and nitrous oxide (N₂O) [8]. Other sources, for example from the EU, suggest that the non-CO₂ emissions from paper are less than 5%, or generically call them “small” [9] [10][11]. We therefore assume the US average share of non-CO₂ emissions in CO₂e emissions provides an approximation of the global average share. Accordingly, we estimate the sector’s non-CO₂ emissions and add them to the sector’s Scope 1 CO₂ emissions to obtain a CO₂-equivalent benchmark including all relevant greenhouse gases in the paper sector. We apply this adjustment to all future years, assuming that non-CO₂ greenhouse gas emissions from paper production will fall in proportion to CO₂ emissions.

Figure 1 shows the benchmark emissions intensity paths for the paper sector, while Table 1 provides the underlying data on emissions and production. For example, under the Paris Pledges scenario in 2030, global Scope 1 and 2 emissions from the paper sector are projected to be 296 million metric tonnes or megatonnes of CO₂e. Under the same scenario in 2030, pulp, paper and paperboard production is projected to be 460 megatonnes. Therefore, the average CO₂e intensity of a paper producer aligned with the Paris Pledges path is 296/460 = 0.643 tonnes of CO₂e per tonne of pulp, paper and paperboard produced.

Figure 1. Benchmark global carbon intensity paths for the paper sector (tonnes of CO₂e per tonne of pulp, paper and paperboard), consistent with limiting warming to below 2°C, to 2°C and with the sum of the Paris Pledges

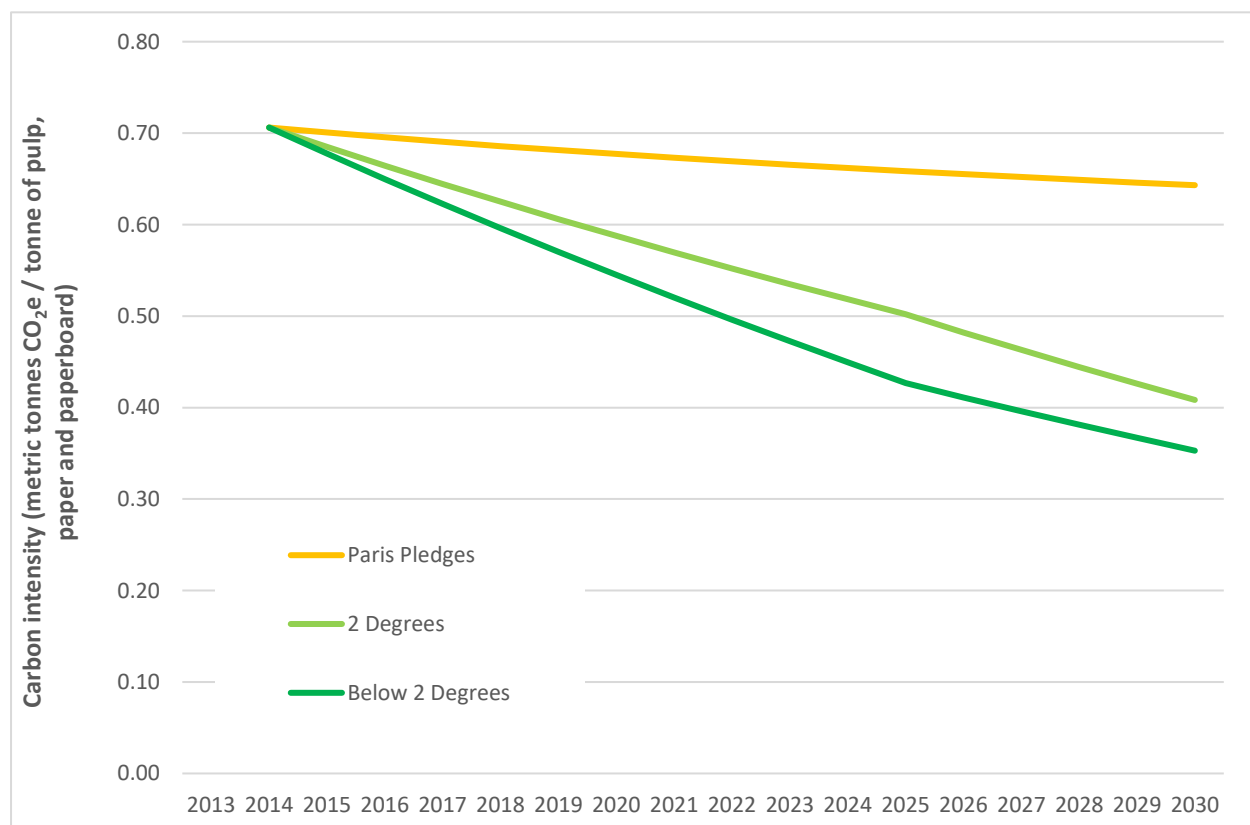


Table 1. Projections of emissions and paper and paperboard production used to calculate intensity paths (Source: IEA)

	2014	2020*	2025	2030
Paris Pledges scenario				
Scope 1 CO ₂ emissions (Mt)	194	206	216	225
Scope 1 non-CO ₂ emissions (Mt CO ₂ e)**	4	4	4	4
Scope 2 CO ₂ emissions (Mt)**	84	76	71	67
Pulp, paper and paperboard production (Mt)	400	423	442	460
Carbon intensity (tCO ₂ e/t paper and paperboard)	0.706	0.677	0.659	0.643
2 Degrees scenario				
Scope 1 CO ₂ emissions (Mt)	194	176	161	145
Scope 1 non-CO ₂ emissions (Mt CO ₂ e)**	4	3	3	3
Scope 2 CO ₂ emissions (Mt)**	84	69	57	40
Pulp, paper and paperboard production (Mt)	400	423	442	460
Carbon intensity (tCO ₂ e/t paper and paperboard)	0.706	0.588	0.502	0.408
Below 2 Degrees scenario				
Scope 1 CO ₂ emissions (Mt)	194	161	133	123
Scope 1 non-CO ₂ emissions (Mt CO ₂ e)**	4	3	3	2
Scope 2 CO ₂ emissions (Mt)**	84	66	53	37
Pulp, paper and paperboard production (Mt)	400	423	441	460
Carbon intensity (tCO ₂ e/t pulp, paper and paperboard)	0.706	0.545	0.427	0.353

* Emissions and production for the year 2020 are estimated by TPI by linearly interpolating between the 2014 and 2025 data points. Carbon intensity is calculated as the ratio of those interpolated data points.

** Scope 2 emissions for the sector are estimated by TPI based on IEA and CDP data.

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 paper producers it is necessary to apply a further adjustment to account for the fact that paper producers typically generate a substantial part of the electricity they consume. In order to estimate the proportion of power consumption that is purchased from outside by paper producers, we draw on data published in company responses to the CDP Climate Change questionnaires. Question CC11.5, introduced in the 2016 and 2017 questionnaires, specifically asks respondents to list their power consumption and purchases; it is therefore possible to calculate, for each respondent, the ratio of electricity purchased to total electricity

consumed. The average ratio of the 29 CDP responses contributed by 15 paper producers⁶ in 2016 and 2017 was 51.8%.

TPI thus calculates Scope 2 emissions for the sector as:

$$\text{Scope 2 emissions} = 51.8\% \times \text{Power consumption} \times \text{Grid intensity}$$

For example, in 2014 the power consumption of the paper sector was 285 terawatt hours (TWh) and the global grid intensity was 0.572 megatonnes of CO₂ per TWh, so that the paper sector's Scope 2 emissions are estimated at 51.8% x 285 x 0.572 = 84.4 megatonnes of CO₂ 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. unnormalised) 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. For the paper sector, IEA makes a single set of assumptions about production growth rates, which are the same across all of its scenarios. We use the growth rate of global aggregate production, in view of the multi-national nature of some companies' production bases.

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

⁶Ahlstrom Corporation (2016 only); Arkhangelsk Pulp and Paper Mill; Catalyst Paper Corporation; Empresas CMPC; FIBRIA Celulose S/A; Hansol Paper Co; Holmen; International Paper Company; Metsä Board; Mondi PLC; Nippon Paper Industries Co Ltd; Resolute Forest Products Inc; Sappi; Stora Enso Oyj; UPM-Kymmene Corporation; and BillerudKorsnäs.

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.

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 Climate Change 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 may also be 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 and the company is informed.
- If it is concluded that there are insufficient grounds to change the assessment, this decision is explained to the company.
- 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 are posted on the TPI website (<http://www.lse.ac.uk/GranthamInstitute/tpi/the-toolkit/>). On each company page, its emissions intensity path is plotted on the same chart as the benchmark paths for the relevant sector. Different companies can also be compared on the main page of the online tool, with the user free to choose which companies to include in the comparison.

4. SPECIFIC CONSIDERATIONS IN THE ASSESSMENT OF PAPER PRODUCERS

4.1. Measure of emissions intensity

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

- Scope 1 and 2 greenhouse gas emissions from the production of pulp, paper and paperboard, per unit of pulp, paper and paperboard, in units of (metric) tonnes of CO₂ equivalent per tonne of pulp, paper and paperboard.

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 paper 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, global Scope 2 emissions from paper-making were 36% of total Scope 1 and 2 emissions in 2014, for example. This compares with 10% in the cement sector.

Most paper companies report their emissions in terms of CO₂e, capturing both CO₂ and non-CO₂ greenhouse gas emissions. In cases where companies disclose only CO₂ emissions, we assume that they report CO₂ only because non-CO₂ emissions are negligible. However, pulp-only producers are expected to emit a larger amount of non-CO₂ greenhouse gas emissions. Hence, for paper companies exclusively producing pulp it is not reasonable to assume that non-CO₂ greenhouse gas emissions are irrelevant, and their intensities cannot be published without non-CO₂ disclosure.

The objective is to measure emissions specifically from the production of pulp, paper and paperboard, 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 paper producers assessed by TPI label their disclosed emissions as being operations-wide, rather than paper-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 paper-making, or whether operations-wide and paper-making-specific emissions are equivalent, or at least approximately so.

There is also variation between companies in terms of how production is quantified. Paper producers often report an aggregate tonnage across "market pulp",⁷ paper and paperboard. In some cases, the tonnage is specified as "air dry tonnes" (ADt), referring to an amount of pulp consisting of 900 kg of "bone-dry" pulp (pulp with no moisture left at all) and 100 kg of moisture.⁸ Where the tonnage of paper and paperboard is expressed in terms of the amount of pulp required for the production of such paper and paperboard, reporting the aggregate tonnage is appropriate, as the weight of all three products is assessed on a consistent basis. However, it is sometimes unclear from companies' disclosures how the aggregate tonnage disclosure is arrived at, or even what it includes. Examples of terminology in use include "pulp and paper mill production", "total production", "production volume" or simply tonne of "product" or "saleable product". Under these circumstances, further assessment is also required of whether the production measure can be equated to pulp, paper and paperboard, at least approximately. Some paper producers do not disclose an aggregate tonnage across

⁷ "Market pulp" refers to pulp that is manufactured by a paper producer and not used by them in their own paper production, but rather sold to other paper producers for their paper production.

⁸ See, for example, www.temap.com/knowledge-base/calculators/air-dry-calculators.

pulp, paper and paperboard production. In this case, the aggregate is calculated using production volumes from the individual paper products, excluding pulp used internally. Where saleable production is available, this is preferred over production data as it already excludes internally consumed production. When the internally used production is not specified, further research is needed to determine the appropriate aggregate production and the associated emissions intensity.

Finally, a further note of explanation is required for market pulp and pulp that is not used in paper-making (“non-paper pulp”):

- Market pulp is an intermediate product, with negligible industrial applications outside paper-making. IEA’s measure of emissions for the paper sector includes those associated with the production of pulp, paper and paperboard, but their production measure only includes paper and paperboard. This is in line with an assumption that the sector as a whole does not produce any market pulp, as one company’s market pulp production goes into another company’s paper and paperboard production.
- Non-paper pulp refers to pulp with industrial applications outside of paper-making. Non-paper pulp includes “fluff pulp” and “dissolving wood pulp”, with applications in household products and textiles, amongst others. The carbon intensity of paper-makers engaged in the production of non-paper pulp is therefore only consistent with the benchmarks if their disclosures allow for separating the carbon intensity of this activity. In practice, this is rarely possible. However, further investigation indicates that in most cases non-paper pulp production is a negligible proportion of paper-makers’ total pulp, paper and paperboard production – and where it is more than a negligible proportion, adjusting the carbon intensity for non-paper pulp leads to a negligible difference in carbon intensity (approximately 1%). As a result, TPI does not adjust carbon intensity for non-paper pulp.4.2.

4.2. Coverage of paper-making facilities

While some paper producers 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 paper sector, some companies have set targets covering Scope 1 and 2 emissions from paper-making specifically, while others have set targets covering operations-wide Scope 1 and 2 emissions. Where a target covers more than just Scope 1 and 2 emissions from paper-making, it is assumed – in the absence of any other specific information – that the percentage reduction in emissions is uniform across activities, so the target percentage (e.g. a 20% cut) can be directly applied to Scope 1 and 2 emissions from paper-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 paper-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 paper-making in the base year, rather they sometimes report operations-wide base-year emissions. If a company does not report Scope 1 and 2 emissions from paper-making in the base year, these are estimated using the ratio of Scope 1 and 2 emissions from paper-making to emissions in the company's chosen designation for the base year, over the last four years (cumulatively).⁹

4.4. Worked examples¹⁰

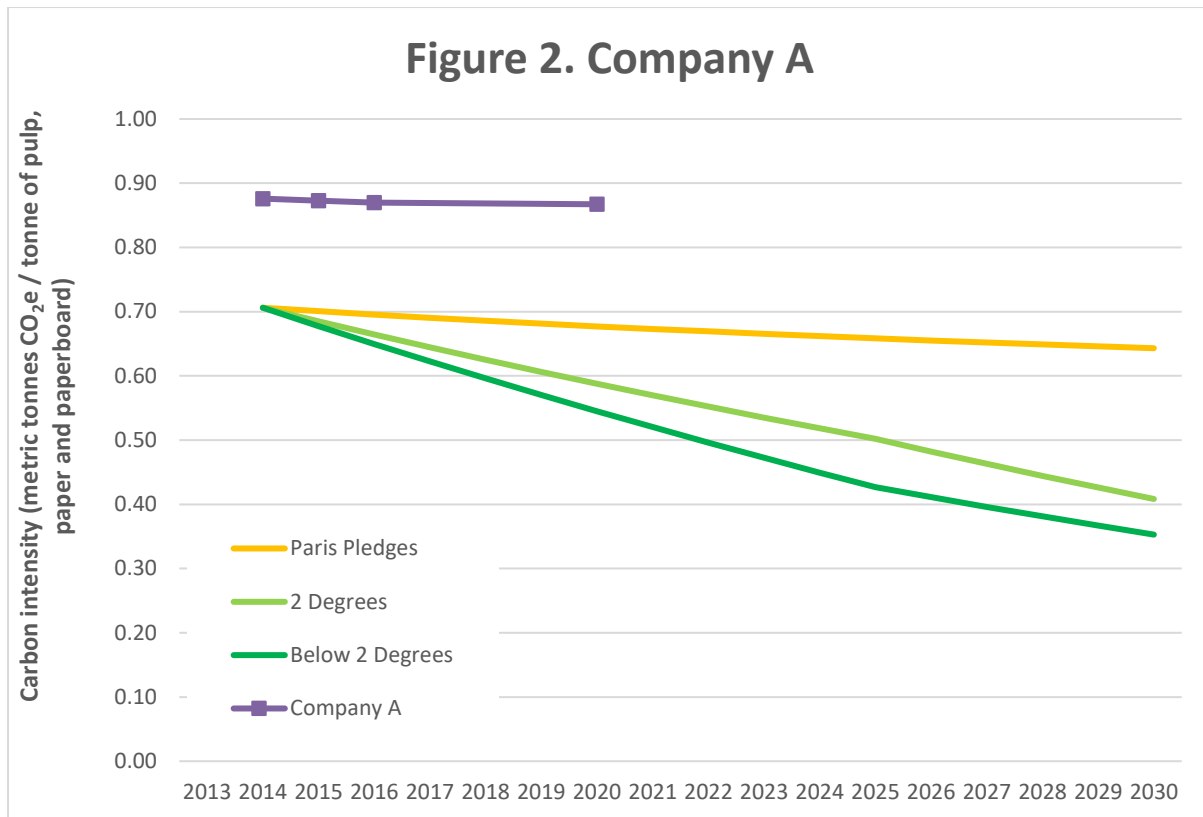
Company A: a simple case

Company A reports an operations-wide emissions intensity for the years 2013 to 2016 in terms of Scope 1 and 2 emissions per air dry tonne of saleable product (ADt), which includes pulp, paper and paperboard. For example, in 2016 it was 0.870 tCO₂/ADt. Though the emissions are operations-wide, TPI reviewed the company's operations and ascertained that the emissions intensity was representative of paper-making. After independently verifying the estimates using separate disclosures of emissions and production, these figures are accepted. The company's CO₂ disclosure is used, as the difference between an intensity stated on a CO₂ versus CO₂e basis is likely to be small according to EPA data and cannot reliably be inferred from a global average on a company level. For some companies, especially those with high use of biomass, this can be a significant assumption, however, so we make a note in our assumptions section instead.

Company A has also set a target to reduce the intensity of its Scope 1 and 2 emissions by 1% below the 2014 level by 2020. This target is stated to cover 100% of the company's Scope 1 and 2 emissions. In 2014, the company's emissions intensity was 0.876 tCO₂/ADt. Therefore, in 2020, the target is to reduce its emissions intensity (total Scope 1+2 emissions) to $(1-0.01) \times 0.800 = 0.867\text{tCO}_2/\text{ADt}$.

⁹ 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 paper-making from past years' reporting.

¹⁰ In the following examples various numbers are rounded for ease of presentation.



Company B: an absolute emissions target

Company B reports an emissions intensity specific to paper production for the years 2013 to 2016. For example, in 2016 it was 0.669 tCO₂e/tonne of paper. Further investigation indicates that the disclosed intensities do indeed specifically relate to paper manufacturing, excluding pulp manufacturing.

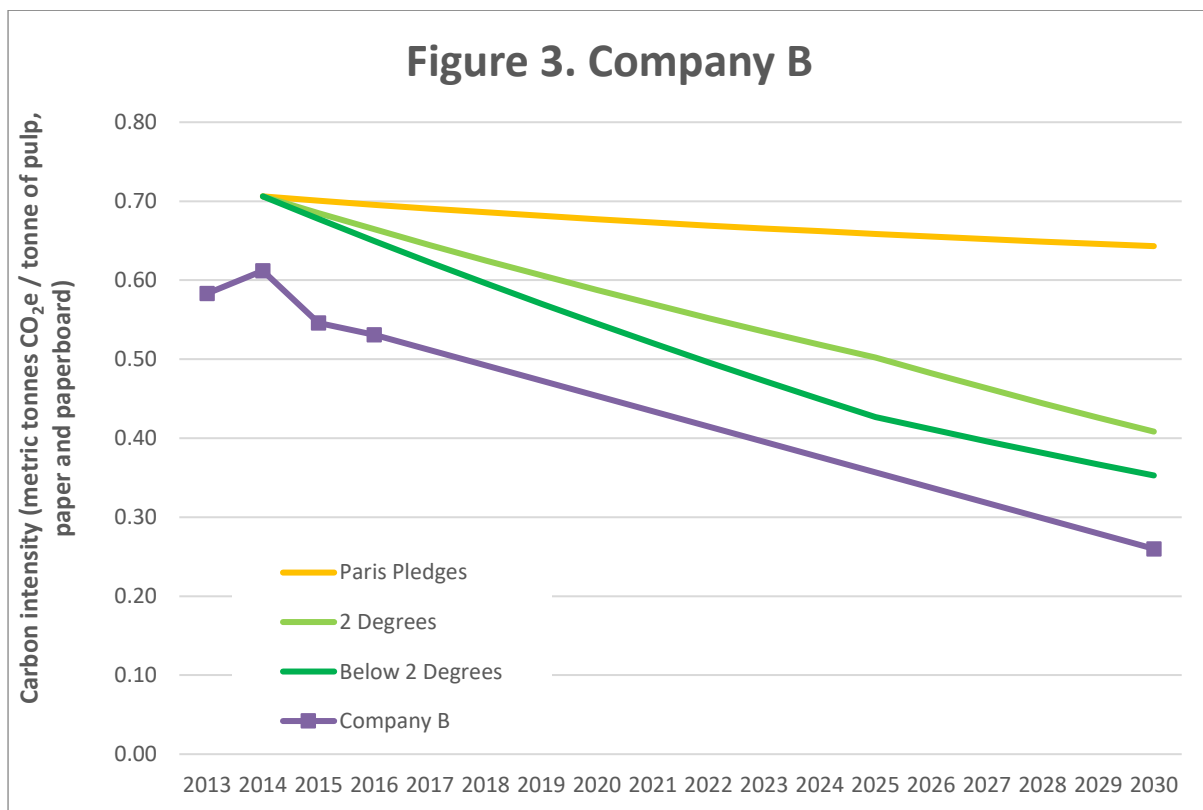
However, in other documents the company also disclose both the emissions associated with the “pulp and paper” activity, and the saleable production of “market pulp” and paper. For example, in 2016 these were 6,855 thousand tonnes of CO₂e and 12,900 thousand tonnes of pulp and paper, resulting in an emissions intensity of pulp and paper production of 6,855 / 12,900 = 0.531 tCO₂e / tonne of pulp and paper. Because the production of pulp is part of the company’s activity in the paper sector, TPI favours this latter measure of carbon intensity for the company, and calculates it for the other three years (2013-2015).

Company B has a target to reduce the absolute quantity of its Scope 1 and 2 emissions by 30% below the 2008 level by 2030. This target is said to cover 100% of the company’s Scope 1 and 2 emissions, i.e. it is an operations-wide target.

In order to translate this information into an estimate of emissions intensity in 2030, the following steps are taken:

- The company discloses operations-wide Scope 1 and 2 emissions in 2008: 5,580 thousand tonnes CO₂e. The target is thus to cut those emissions by 30%, resulting in 2030 emissions of 5,580 x (100% – 30%) = 3,906 thousand tonnes CO₂e.

- In order to estimate the 2030 emissions specific to pulp and paper production, we assume that the ratio of pulp and paper to operations-wide emissions is constant between 2013-16 and 2030. In 2013-16, this ratio was 97%, and thus we estimate 2030 Scope 1 and 2 pulp and paper emissions, consistent with the target, at $3,906 \times 0.97 = 3,790$ thousand tonnes CO₂e.
- As the company does not provide an intensity target, its pulp and paper production between 2016 and 2030 is assumed to grow at the same rate as global production for the sector according to the IEA reference technology scenario. In particular, IEA projects that global paper and paperboard production grows by 12.93% between 2016 and 2030. Therefore, the company's pulp, paper, and paperboard production in 2030 is its 2016 value, 12,900 thousand tonnes, multiplied by $(1 + 12.93\%) = 14,568$ thousand tonnes of pulp and paper.
- Dividing the company's estimated 2030 emissions by this estimate of production in 2030 gives an estimated intensity of $3,790 / 14,568 = 0.260$ tCO₂e / t pulp and paper 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 paper producers.

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 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 regularly 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 paper producers

The principal challenge in the paper sector, relative to other sectors whose carbon performance TPI is assessing, is inconsistent reporting of emissions and production, particularly in terms of whether emissions disclosures are paper-making-specific or operations-wide, whether production is measured in tonnes of pulp, paper and paperboard (calculated on a consistent basis), 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 paper-making, so relatively few assumptions are necessary in order to convert companies' stated emissions targets into intensity paths.

Regarding the non-CO₂ greenhouse gas emissions of the paper sector, there is no conclusive evidence as to how large they are and in particular how they will evolve over time and along different emissions reduction scenarios. We here choose to extrapolate from US data to the global level for three reasons:

1. The US is both a large pulp and a large paper producer, so the emissions profile is unlikely to be significantly biased towards the emissions profile of a specific production process.
2. There are multiple sources claiming that non-CO₂ greenhouse gas emissions from the paper sector are small, in line with the result we find for the US (for example [9] [10] [11]).
3. Whilst the share of non-CO₂ greenhouse gas emissions on a company level can be high, it is unlikely to be high on a global level and across all production steps, as absolute non-CO₂ emissions from biomass for energy consumption are still low compared to absolute CO₂ emissions on a global level.

Non-CO₂ gases present a distinct challenge in the paper sector as they increase in share when biomass for energy consumption increases (i.e. CO₂ emissions decrease whilst CH₄ and N₂O emissions increase).

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