Carbon Performance Assessment of International Shipping: Methodology Note

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Transition Pathway Initiative

CONTENTS

1. INTRODUCTION

The purpose of this note is to provide an overview of the methodology being followed by the Transition Pathway Initiative (TPI) in its assessment of the Carbon Performance of international shipping companies.

TPI is a global initiative led by asset owners and supported by asset managers. Established in January 2017, TPI now has over 110 supporters with about $40 trillion of combined Assets Under Management and Advice. [1]

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 international climate targets 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 remainder of this note is structured as follows. Section 2 below provides an overview of the Sectoral Decarbonization Approach (SDA), which forms the basis of TPI's Carbon Performance assessment. Section 3 sets out how TPI applies the SDA to assess the Carbon Performance of companies generically across all sectors, while section 4 explains how it is applied to the shipping sector specifically. A discussion of the issues relating to the Carbon Performance assessment of shipping companies is provided in section 5.

[1] As of October 2021.

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).[2] 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 (UNFCCC)) into appropriate benchmarks, against which the performance of individual companies can be compared.

The SDA is built on the principle of recognising that different sectors of the economy (e.g. oil and gas production, electricity generation and maritime transport) 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.
- 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.

[2] The Sectoral Decarbonization approach (SDA) was created by CDP, WWF and WRI in 2015 (https://sciencebasedtargets.org/wp-content/uploads/2015/05/Sectoral-Decarbonization-Approach-Report.pdf). See also [1].

this assumes companies exactly 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, 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

This section provides an overview of the generic methodology used by TPI to assess the Carbon Performance of companies.

3.1. Deriving benchmark pathways

TPI evaluates companies against benchmark paths, which quantify the implications of the Paris Agreement goals at the sectoral level. For each sector benchmark path, the key inputs are:

- A time path for economy-wide carbon emissions, which 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 path into emissions from key sectors (the numerator of sectoral emissions intensity), including the sector in focus;
- Consistent estimates of the time path of physical production from, or economic activity in, the sector in focus (the denominator of sectoral emissions intensity).

There are various models available that provide sector-specific emissions paths and estimates of sectoral activity, under various scenarios[4]. These emissions paths can be divided by activity to derive sectoral pathways for emissions intensity. In the case of shipping, TPI obtains all the necessary inputs from publications by the International Energy Agency (IEA).

Section 4 describes in more detail how TPI uses IEA data to derive benchmark pathways for shipping.

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. **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 (see below).
2. **Absolute emissions.** 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.

[4] Alternatively, in the absence of sectoral activity data, 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).

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 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 same model that is used to derive the benchmark paths, in order to be consistent. 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 International Pledges Scenario (based on IEA's Stated Policies Scenario) are used.

The length of companies' emissions intensity paths will vary depending on how much information companies provide on their recent emissions, 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 emissions 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 (https://transitionpathwayinitiative.org/sectors). 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. ASSESSMENT OF SHIPPING COMPANIES' CARBON PERFORMANCE

4.1. Introduction

The focus of TPI's Carbon Performance assessment is the ***international shipping sector,*** which is estimated to account for around 90% of total shipping emissions. [3] The balance comes from domestic shipping, which includes coastal shipping between ports in the same country and inland waterway transport. In addition, TPI's analysis focuses on ***freight transport*** only, as passenger transport (e.g. cruise ships and passenger ferries) represents just a small percentage of international shipping. [4]

A key feature of the international shipping sector is the unique way in which its greenhouse gas emissions are governed. Unlike most other sectors, international shipping emissions fall outside the process of setting Nationally Determined Contributions or NDCs to the Paris Agreement. Instead, responsibility for emissions reductions from international shipping lies with the UN's International Maritime Organisation (IMO).[5] In 2018, as part of the *Initial IMO Strategy on Reduction of Greenhouse Gas Emissions from Ships*, targets were agreed to reduce CO_2 emissions by at least 50% by 2050, to reduce carbon intensity by 40% by 2030 and 'to pursue efforts' to reduce carbon intensity by 70% by 2050, all based on 2008 levels.[6] [5]

The measures introduced in 2018 to meet these targets, principally the Energy Efficiency Design Index (or EEDI, an efficiency standard for new ships)[7], were deemed insufficient to meet the IMO targets. [7] In June 2021, the Marine Environment Protection Committee (MEPC 76) of the IMO approved further mandatory measures to cut the carbon intensity of all ships. These measures include a requirement for certain types of ship to calculate an annual Carbon Intensity Indicator (CII) with ship-specific emissions reduction plans, and a requirement to calculate an Energy Efficiency Existing Ship Index (EEXI), which in contrast to the EEDI also covers existing ships. Both measures come into effect on 1 January 2023. Moreover, a prohibition on the use and carriage for use as fuel of heavy fuel oil by ships in Arctic waters will be introduced starting from 1 July 2024 [8]. IMO's Final Strategy is due in 2023.

4.2. Deriving international shipping sector benchmark pathways

4.2.1. Data sources used

In the shipping sector, TPI obtains the data to calculate benchmarks from the IEA, via its *Energy Technology Perspectives 2020* [9], *Net Zero by 2050* [10] and *World Economic Outlook 2021* [11] reports. 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.

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[5] Similarly, greenhouse gas emissions from international aviation are regulated by the International Civil Aviation Organisation (ICAO).

[6] Unlike the ICAO targets for aviation, the IMO shipping targets are based on cutting emissions within the shipping sector and do not include the use of carbon offsetting.

[7] The IMO introduced two additional measures, which apply to ships in operation rather than new vessels: the Ship Energy Efficiency Management Plan (SEEMP) regulation, which aims to improve the monitoring of energy efficiency at an individual vessel level, and the new IMO Data Collection System for Fuel Oil Consumption, which aims to improve reporting of fuel use data across the global fleet from 2020.[6]

The key feature of IEA's modelling is that it 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. Thus, the IEA's low-carbon scenarios are cost-effective, within some limits of economic, political, social and technological feasibility. IEA's model includes a specific module for the transport sector, the Mobility Model (known as 'MoMo'). [9] MoMo provides projections of energy demand and carbon emissions for shipping under various scenarios.[8]

In the shipping sector, IEA's historic emissions figures are consistently lower than those used by other organisations, such as the International Transport Forum (ITF), due to their different methods of accounting for fuel use.[9]

4.2.2. Emissions intensity metric

The calculation of emissions intensity benchmarks for shipping companies requires suitable measures of both marine CO_2 emissions and freight transport activity. A standard metric of transport activity (or 'transport work') used in the shipping industry is ***'tonne-kilometres'***, which is the total number of tonnes transported multiplied by the distance transported.[10] TPI uses this activity measure as the IEA's models provide projected tonne-kilometres for international shipping for several scenarios.[11]

An appropriate measure of carbon emissions varies by sector and depends on where emissions occur in the value chain. In the international shipping sector, the majority of lifecycle emissions arise from fuel combustion. These so-called ***'Tank-to-Wheel'*** (TTW) (or sometimes, in the case of shipping, 'Tank-to-Propeller') emissions currently represent around 87% of total lifecycle (or Well-to-Wheel) fuel emissions, the balance being upstream (Well-to-Tank) emissions occurring during fossil fuel extraction, refining and distribution.[13] This percentage will change in the future as the fuel mix for shipping changes and advanced biofuels, ammonia and hydrogen are introduced. Shipping's fuel mix is not likely to change significantly up to 2030, but evolve rapidly from 2030 to 2050, with a share of low-carbon fuel of over 50% projected by IEA in 2050. [9] TPI uses TTW emissions, as the shipping industry primarily reports emissions on that basis. In addition, our focus on TTW emissions is consistent with the way IEA present international shipping emissions data (that is, excluding upstream fuel emissions, emissions from land-based operations and electricity used in the

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[8] The version of MoMo provided in the IEA's Energy Technology Perspectives 2017 includes emissions for all shipping. [10] More recent IEA publications provide data for ***international*** shipping only. [11]

[9] ITF's historic figures for international shipping emissions are consistent with those produced in other research (for example, ICCT's inventory study [3] and IMO's fourth greenhouse gas report [4]) that use a bottom-up approach to estimating emissions, based on fuel usage of vessels. In contrast, the IEA estimates international shipping combustion emissions based on fuel sales figures submitted by individual countries. Part of the inconsistency between figures from different sources arises because the split between domestic and international shipping emissions is somewhat arbitrary, as one tank of fuel may be used for both international and domestic voyages. [4]

[10] The IMO also uses this metric for transport work in its Energy Efficiency Operational Indicator (EEIO) guidance for shipping companies. [12]

[11] The shipping industry also uses other activity measures based on shipping supply (i.e. vessel capacity), distance travelled, or tonnes carried. These metrics may be used as proxies for transport work, if necessary, but tonne-kilometres are considered to be the most accurate representation of activity. [14]

international shipping sector). We are consistently monitoring developments in company reporting and emission scenarios and will review this issue during the next research cycle.

Emissions from fuel combustion are reported by shipping companies under Scope 1 and are sometimes referred to as 'vessel emissions'. Other emissions reported by shipping companies in Scope 1 relate to land-based operations (e.g. at ports), but these are generally minimal (around 1-2% of total Scope 1 emissions). Shipping companies' Scope 2 emissions, which include emissions from purchased electricity, are also generally small for those companies focused on shipping transport (less than 1% of total Scope 1+2 emissions).[12]

Thus, the measure of emissions intensity that TPI uses to derive benchmark pathways in the international shipping sector is the ***Tank-to-Wheel CO_2 emissions in grams per tonne-kilometre***.

TPI's Carbon Performance assessment of shipping companies does not take account of non-CO_2 emissions. Generally, these are small; greenhouse gases such as Methane and Nitrous Oxide are estimated to represent around 2% of total greenhouse gas emissions from international shipping. [4] However, one non-CO_2 pollutant, black carbon, is estimated to have a bigger impact. ICCT calculates that black carbon, which is short-lived, represents 7% of all CO_2 equivalent greenhouse gas emissions on a 100-year timescale (and 21% on a 20-year timescale).[13] [3] The IMO considered action to address the issue of black carbon separately from its Initial Strategy. [14] The MEPC 76 agreed to prohibit ships from using heavy fuel oil in the Arctic starting from 1 July 2024 [8]. Currently, however, black carbon emissions are not included in company disclosures or in the IEA data, so TPI does not include black carbon in the benchmarks. If the climate impacts of black carbon were to be taken into account, the CO_2 benchmark pathways would be lower to reflect the sector's full contribution to climate change.

4.1.3 Choice of scenarios

The three benchmarks employed for the international shipping sector are:

1. **An International Pledges scenario**, which corresponds with the National Pledges scenario in other TPI sectors and reflects the world's current emissions reduction commitments for international shipping through the IMO. This scenario is directly derived from the IEA's Stated Policies Scenario. It does not reflect the IMO's target to reduce emissions by 50% by 2050 from 2008 but only existing policy commitments, such as the EEDI. Commitments made close to or after the publication of IEA scenarios are not included. When combined with aggregate NDCs and ICAO commitments to reduce international aviation emissions, the included policy commitments are known to be insufficient to put the world on a path to limit warming to 2°C or below, even if

[12] Scope 2 emissions may represent a larger proportion of total Scope 1 and 2 emissions for shipping companies that also have terminal, storage or engineering operations.

[13] Black carbon emissions contribute to climate change in a number of ways: both directly, by absorbing and scattering sunlight, and less directly, by causing cloud formation. In addition, deposits of black carbon on snow and ice reduce reflectivity (i.e. albedo), which affects melting, causing further warming. [15] Thus, black carbon emissions from shipping in the Arctic region are particularly problematic. While black carbon is not strictly a greenhouse gas (but is instead a particulate), for simplicity ICCT includes it as a gas in its analysis.

they will constitute a departure from a business-as-usual trend. The expected global temperature increase is 2.6°C by 2100 with a probability of 50%. [11]

2. **A Below 2 Degrees 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 is directly derived from the IEA's Sustainable Development Scenario and is consistent with IMO's long term 2050 emissions target of reducing shipping emissions by 50% from the 2008 level. It gives a probability of 50% of holding the global temperature increase to 1.65°C. [11]

3. **A 1.5 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". [16] This scenario is directly derived from the IEA's Net Zero Emissions by 2050 Scenario and goes beyond the IMO's long term emissions reduction targets. While the sector does not reach net zero by 2050, absolute emissions decline by 85% between 2020 and 2050. The scenario gives a probability of 50% of holding the global temperature increase to 1.5°C. [11]

A key point to note about the benchmark pathways is that they each represent the ***average*** carbon emissions intensity across the entire international shipping fleet. However, carbon intensities vary significantly across vessel types and sizes. Thus, a shipping company's Carbon Performance, when compared with the benchmarks, will be determined not only by mitigation measures but also by its fleet composition. This issue is likely to be less significant in later years, as emissions intensities of different vessels are expected to eventually converge to meet IMO targets. [17]

Figure 1 shows the benchmark emissions intensity paths for the international shipping sector, while Table 1 provides the underlying data on emissions and marine freight traffic. For example, under the International Pledges scenario in 2030, total global Tank-to-Wheel emissions from the international shipping sector are projected to be 949 million metric tonnes or megatonnes of CO_2. Under the same scenario in 2030, tonne-kilometres are projected to be 141,657 billion. Therefore, the average carbon intensity of a shipping company aligned with the International Pledges path is 949 / 141,657 = 0.0067 megatonnes of CO_2 per billion tonne-kilometres, which is equivalent to 6.7 grams per tonne-kilometres. Where the underlying scenario data from the IEA does not provide specific activity and emission values for all the years, the carbon intensities are estimated by linear interpolation of the carbon intensities for 2019, 2020, 2030, 2040 and 2050.

Figure 1 Benchmark carbon intensity paths for international shipping

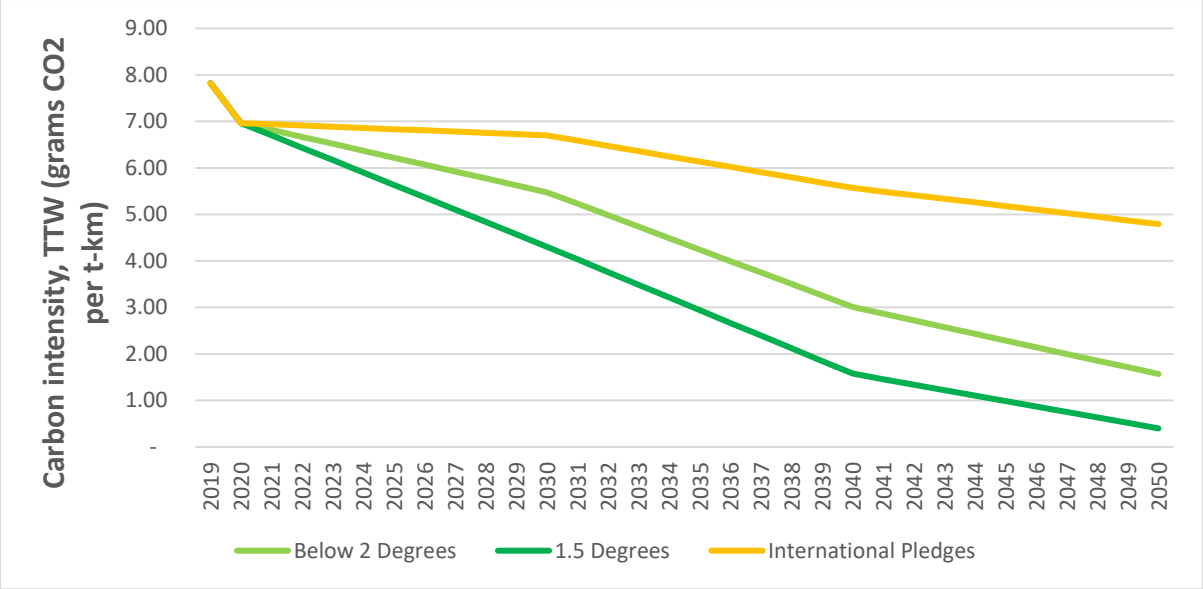


Table 1 Projections of CO_2 emissions and tonne-kilometres used to calculate benchmark intensity paths (Source: IEA)

	2019	2030	2050
International Pledges scenario			
TTW CO2 emissions (Mt)	822	949	1,113
Tonne-kilometres (t-km) (billion)	105,123	141,657	232,121
Carbon intensity (gCO2 / t-km)	7.82	6.7	4.79
Below 2 Degrees scenario			
TTW CO2 emissions (Mt)	822	768	354
Tonne-kilometres (t-km) (billion)	105,123	140,281	225,423
Carbon intensity (gCO2 / t-km)	7.82	5.48	1.57
1.5 Degrees scenario			
TTW CO2 emissions (Mt)	822	670	116
Tonne-kilometres (t-km) (billion)	105,123	155,621	291,032
Carbon intensity (gCO2 / t-km)	7.82	4.31	0.4

4.3. Criteria for inclusion of companies in Carbon Performance assessment

The overall objective of TPI's Carbon Performance assessment is to compare emissions intensity pathways of shipping companies to benchmark pathways. Those benchmarks are based on emissions and activity in the international marine freight sector. To ensure that the companies being assessed are comparable with the benchmarks, TPI uses the following criteria to determine the inclusion of companies:

- The company is publicly listed, with a Primary Industry Classification Benchmark (ICB) of ***Marine Transportation***, under FTSE Russell's standard categorisation system;
- The company is primarily engaged in ***international*** shipping operations. Thus companies engaged solely in domestic operations (e.g. in domestic inland waterway

transportation using barges) are excluded from the assessment. Some companies have a mix of international and domestic shipping operations. TPI includes companies whose CO_2 emissions from international operations represent at least 70% of total vessel CO_2 emissions[14]. (In such cases, TPI uses the company's reported carbon intensity figure across all shipping vessels, if separate intensities are not provided for international and domestic operations. The implicit assumption we are required to make here is that the company's international and domestic operations have similar emissions intensity profiles);

- The company is primarily engaged in ***freight transport***, with only a small percentage of transport activities being non-freight, such as passenger ferries and cruise ships (less than 5% of vessels emissions or vessels).
- The company ***operates*** shipping vessels. Thus logistics companies such as freight forwarders that do not operate their own fleet of vessels are excluded. Similarly, companies that own but do not operates vessels are excluded (e.g. leasing companies). In contrast, companies that do not own the vessels that they operate, but instead charter them, on a time charter basis (a practice that is particularly common in the container shipping sub-sector), are included in the assessment;[15]
- The company has a ***minimum level of absolute vessel emissions*** (at least 0.5Mt per year). This excludes companies engaged in a number of Marine Transportation sub-sectors, whose primary operations are non-freight transport, such as those companies primarily involved in port management, storage, support of offshore installations or engineering. In cases where vessel emissions are greater than 0.5Mt, but they still represent a small proportion of total company emissions, then these are included in our assessment, provided a suitable vessel-only intensity metric can be calculated and we can clearly establish what proportion of Scope 1 emissions are covered by our assessment.

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.

4.4. Calculating shipping companies' recent and current emissions intensities

In other sectors, TPI has sought to verify the carbon intensities reported by companies by using their stand-alone disclosures of emissions and activity. However, this is not possible for many shipping companies as they do not disclose activity metrics, such as tonne-kilometre data. This is due to the fact that such data is often considered to be market sensitive information. [18] Therefore stated intensities for shipping companies are taken at face value,

[14] In the absence of data showing the breakdown of emissions between domestic and international shipping operations, TPI estimates this using other available data, such as revenue by source or fleet composition by domestic and international vessels.

[15] Generally, shipping companies include emissions from charter vessels in Scope 1, with the exception of emissions from 'voyage' (or 'spot') chartered vessels, where a vessel is chartered to transport a given cargo for an agreed fee. In this case, as the ship owner maintains both technical and commercial control of the vessel, the emissions form part of the charterer's Scope 3 emissions as they relate to purchased ocean services.

as long as there is enough confidence that they have been calculated on the same basis as TPI's benchmarks, or can be converted into intensities that are comparable with the benchmarks.[16]

Most shipping companies' reported CO_2 emissions intensities are based on vessel emissions only. A small number include other Scope 1 emissions (e.g. from land operations) or Scope 2 emissions. In these cases, in the absence of further information and given that emissions from ships' fuel combustion generally make up over 98% of all Scope 1 and 2 emissions, TPI takes the reported intensity figure as a proxy for the vessel emissions intensity.

Some shipping companies report emissions intensities that include other greenhouse gases, in addition to CO_2. For shipping companies, non-CO_2 emissions (such as methane and nitrous oxide) are small, typically less than 2% of shipping companies' total greenhouse gas emissions [4], so TPI allows the comparison of emissions intensities, expressed in terms of all greenhouse gases, with the TPI's CO_2-only benchmark intensities. As noted above, black carbon is generally not disclosed by shipping companies and is excluded from TPI's analysis.

The most common intensity metric reported by shipping companies is carbon emissions per tonne-kilometre. This is also the metric used by TPI to derive sector benchmarks. However, many container shipping companies use an alternative intensity metric: carbon emissions per TEU-kilometre (or TEU-nautical mile), that is, emissions per filled Twenty-foot Equivalent Unit container (which is a standard sized shipping container) transported one kilometre (or one nautical mile[17]). As this is a volume rather than a mass metric there is no direct conversion to tonne-kilometres. In the absence of other information, TPI uses an industry rule of thumb, established by the Clean Cargo Working Group initiative, to convert TEUs to tonnes. This assumes that ***one TEU carries cargo with a net mass of ten tonnes***. [19] Clearly, this approach has some limitations, as in practice, the tonnes of cargo per container will depend on the type of goods being transported, which will vary between shipping companies and within the same company, over time, as the cargo mix changes.

Most shipping companies provide an average carbon or greenhouse gas emissions intensity figure across their fleet. However, some companies that operate mixed fleets provide separate intensity data by vessel type. In such cases, to allow comparison with the benchmarks, TPI estimates a weighted average fleet intensity for the company, provided there is sufficient data available about the composition of the fleet and the proportion of the fleet's total transport work performed by each vessel type.

4.5. Estimating shipping companies' future emissions intensities

Many of the shipping companies that provide emissions targets present them as a percentage reduction in vessel emissions intensity for their fleet. This is consistent with the way the IMO expresses the sector's medium term intensity target. A small number of companies set an intensity target that applies to Scope 1 and 2 emissions, or to all Scope 1 emissions (i.e. including vessel and land emissions). In such cases, it is assumed – in the absence of any other

[16] Many shipping companies' emissions data have undergone third party verification, which increases our confidence in the reported carbon intensity figures.

[17] One nautical mile is 1.852 kilometres.

specific information – that the intensity target applies equally across all scopes. This is in line with TPI practice in other sectors.

While most shipping companies that provide targets express these as intensity targets, a small number of companies provide targets based on absolute emissions reductions. In such a case, TPI can estimate the intensity target using the company's current activity data (provided it is available) and the projected growth in shipping activity as assumed in the International Pledges scenario.

4.6. Worked examples[18]

Company A: a simple case

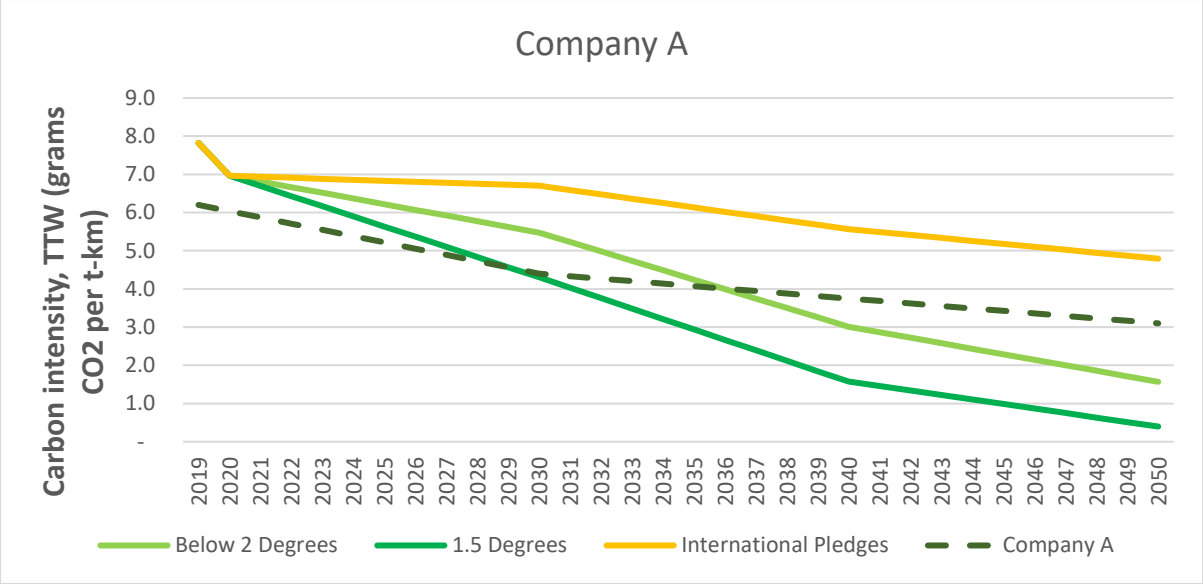
Company A is a global logistics company, primarily engaged in shipping, with 91% of its Scope 1 greenhouse gas emissions derived from shipping and 7% derived from aviation. Company A reports a separate greenhouse gas emissions intensity figure for shipping and we use this figure in our assessment to ensure comparability with the shipping benchmarks. Company A's shipping intensity metric is expressed in terms of CO_2 equivalent emissions from vessels per tonne-kilometre (t-km). While this figure includes other greenhouse gases, TPI estimates from Company A's disclosures that CO_2 represents around 98% of all Scope 1 greenhouse gases. Thus, TPI uses Company A's greenhouse gas intensity figure as an acceptable proxy for CO_2 emissions per t-km.

The vast majority of Company A's shipping operations is freight transportation. It operates only one cruise ship, out of a total number of over 750 vessels. Thus, the inclusion of non-freight emissions will not distort the overall shipping emissions intensity metric.

Company A does not provide separate emissions intensity figures for international and domestic shipping operations, but the intensity target it has set applies to all vessels. Therefore, we use the company's overall shipping intensity figure in our assessment. For 2019, the reported shipping emissions intensity was 6.2 gCO_2e/t-km. Company A also discloses separate emissions and tonne-kilometres figures allowing us to independently verify the reported intensity figure, in this case.

Company A has set a target to reduce the intensity of its vessel emissions per t-km by 30% between 2015 and 2030. The company states that by 2019 5% of this target had been achieved. This implies that the 2019 intensity was (5% x 30%) = 1.5% lower than that in 2015, implying that the 2015 intensity was (6.2/(1 – 1.5%))= 6.3 gCO2e/t-km. Therefore, the 2030 intensity target for Company A is 6.3 x (1 – 30%) = 4.4 gCO_2e/t-km. The company also set a target to reduce its 2050 emissions intensity per t-km by 50% in 2050, with a 2019 baseline. Therefore, Company A has a 2050 emissions intensity target of 6.2 x (1-50%) = 3.1 gCO2e/t-km.

[18] In the following examples various numbers are rounded for ease of presentation.

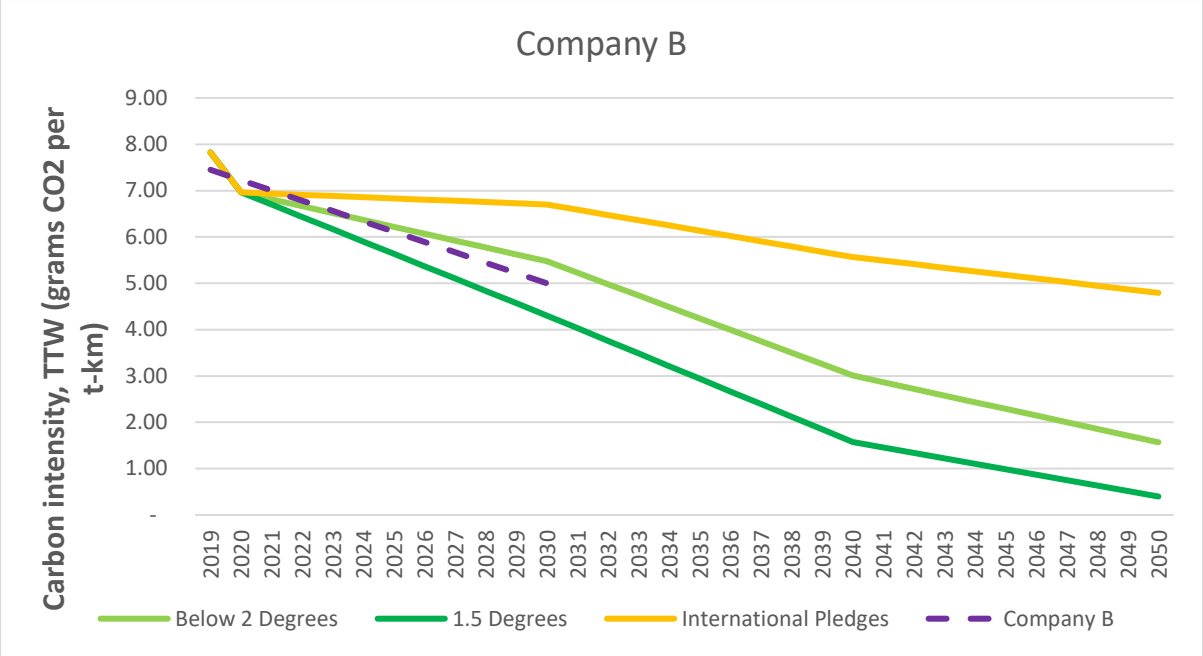


Company B: deriving a carbon intensity target for a container shipping company using fuel efficiency data

Company B is a container shipping company. Around 97% of its Scope 1 emissions come from marine vessels. Company B does not disclose a carbon intensity metric in a suitable form, but it does provide a figure for bunker (i.e. vessel) fuel efficiency expressed in terms of grams of bunker fuel per Twenty Foot Equivalent Unit container (TEU) transported one nautical mile (nm). For 2019 this figure is 44.2g fuel/TEU-nm. This equates to 23.9g fuel/TEU-km (using a conversion factor of 1.852 kms per nm). Company B discloses details of its vessel fuel consumption for 2018. From this TPI calculates that 94% of marine vessel fuel was Heavy Fuel Oil (HFO) and 6% was Marine Fuel Oil (MFO). Using the IMO standard fuel combustion emissions factors[19] for HFO of 3.114 and MFO of 3.206, TPI calculates the weighted average marine fuel combustion emissions factor for Company B of (94% x 3.114) + (6% x 3.206) = 3.119g CO_2 per gram of fuel. Assuming that the fuel mix is unchanged between 2018 and 2019, we calculate that the carbon intensity of Company B's shipping operations in 2019 is (23.9 x 3.119) = 74.5 g CO_2/TEU-km. Company B does not provide suitable activity data so TPI uses the industry rule of thumb to convert TEUs to tonne-kilometres. This assumes that one TEU is approximately equivalent to 10 tonnes of net cargo. Thus, the estimated carbon intensity for 2018 is (74.5/10) = 7.45g CO_2/t-km.

Company B has a target to improve its carbon intensity from all vessels by 60% by 2030, from a 2008 baseline. The company states that the 2019 carbon intensity was 41% lower than in 2008. This implies that the carbon intensity in 2008 was (7.45/(1 – 41%)) = 12.6g CO_2/t-km and that the carbon intensity target for 2030 is (12.6 x (1 – 60%) = 5.0 CO_2/t-km. As company B does not have a carbon intensity target up to 2050, TPI is unable to analyse its carbon performance alignment on that timescale.

[19] Third IMO GHG Study 2014 [4].


Company B
Carbon intensity, TTW (grams CO2 per t-km)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
-
2019
2020
2021
2022
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2048
2049
2050
Below 2 Degrees
1.5 Degrees
International Pledges
Company B

5. DISCUSSION

This note describes the methodology followed by TPI in carrying out its Carbon Performance assessment of companies, with a particular focus on international shipping.

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 climate targets.

TPI uses IEA modelling to calculate the benchmark paths. This modelling has a number of advantages, but it is also subject to limitations, like all other economy-energy or sector-specific 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 update their modelling regularly with the aim of improving the accuracy of their projections and TPI plans to update its benchmark paths accordingly.

TPI uses companies' self-reported 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 international shipping

In addition to the general limitations outlined above, there are several specific issues relating to the benchmarks for international shipping.

There is some uncertainty around the figures available for historic emissions for international shipping. The data vary across different transport modelling groups, such as the IEA and the ITF. This is due, at least in part, to the different methods used to account for vessel fuel. TPI has sought to address this issue by using the same data source, the IEA, for all its scenarios. In the future, the quality of emissions data available for the shipping sector is expected to improve, with the introduction of the IMO Data Collection System for Fuel Oil Consumption in 2020.

Another issue in this sector relates to the way TPI has derived the benchmarks based on the average carbon intensity across the global shipping fleet. However, carbon intensity varies significantly by vessel type and size. Therefore, a company's Carbon Performance, when assessed against the benchmarks, may be distorted if its fleet composition is significantly different from that of the sector as a whole. This is an unavoidable limitation in our

assessment as there is currently insufficient data available to allow separate benchmarks to be calculated for each sub-sector.

A further issue arises when assessing the Carbon Performance of container shipping companies against TPI's benchmarks. For comparison with the benchmarks, TPI uses an industry standard factor to convert carbon intensity expressed in terms of TEU-kilometres to equivalent tonne-kilometres, but the actual conversion factor may vary across different container shipping companies and over time.

As noted in section 4 above, TPI's benchmarks do not take account of the climate impact of black carbon, which has been estimated to represent 7% of all CO_2 equivalent greenhouse gas emissions from shipping, on a 100-year timescale. [3] Black carbon emissions are not currently reported by companies or included in the IEA models and thus the shipping sector's contribution to climate change is likely underestimated to some extent, at present.

One additional source of uncertainty specific to the shipping sector benchmarks relates to the impact on future CO2 emissions of the new measures introduced by MEPC 76 and potentially further measures which could be agreed on during MEPC 77 in November 2021. As their impact on projected CO_2 emissions becomes clearer, this will be reflected in future updates of the IEA models and our benchmarks.

One final point to note relates to the ownership structure of companies within the shipping sector. The focus of TPI's assessment is publicly listed companies but some of the largest shipping companies are privately owned. Therefore, the coverage of emissions achieved by TPI in this sector is lower than in some other sectors that have been assessed.[20]

[20] It is worth noting however that while private shipping companies may be under less pressure from investors than public companies to reduce emissions, there is still pressure from other sources, including lenders (as evident from the recently launched Poseidon Principles initiative) and shipping customers, many of whom are large industrials seeking to reduce emissions in their supply chain.

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