FILLING THE BLANKS: COMPARING CARBON ESTIMATES AGAINST DISCLOSURES

MSCI ESG Research Issue Brief

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EXECUTIVE SUMMARY

In the last couple of years, the drive among institutional investors to measure carbon risk and opportunities and decarbonize their portfolios has gained momentum.[1] The climate deal struck in December 2015 in Paris is likely to provide further impetus to this drive. The growing pressure to take the carbon issue seriously is also putting pressure on companies to disclose their carbon emissions. We have observed an increasing trend in carbon emissions disclosures by companies. In December 2015, we identified 277 companies that were constituents of the MSCI ACWI Investable Market Index (IMI) that had disclosed their 2013 scope 1+2 carbon emissions in 2015 for the first time.

This provided a unique opportunity to test out carbon estimation models on which institutional investors have had to rely. We found that the methods that have been around the longest – which rely on Economic Input Output Life Cycle Analysis (EIO-LCA) models – were not very accurate when compared against company disclosure. In fact, based on our calculations, this approach overstated these 277 companies' carbon footprint by 208% (median value of the estimation range). This could be the result of the use of some dated economic and environmental data by some EIO-LCA models to estimate carbon intensities and thus their failure to account for the latest technological advancements in the areas of carbon mitigation.

The alternative estimation approach, which is based on disclosed carbon emissions data and followed by MSCI ESG Research, aims to address this weakness. Instead of modeling the carbon emissions of non-disclosing companies, this approach relies on the historical data reported by the company or recently reported data by a sample of comparable companies. As a result, this approach may more precisely reflect trends in carbon mitigation and lead to closer estimates. Based on our analysis, we found that this approach results in an estimate that is within 7% (median value of the estimation range) of the figures disclosed by these 277 companies.

With only 20% of MSCI ACWI IMI companies disclosing their emissions, investors continue to rely on estimates to fill in the blanks for the remaining 80% of their portfolios. Unreliable or outdated carbon estimation models may significantly miscalculate or overstate institutional investors' carbon footprints, and lead them astray when used to inform next steps to mitigate that exposure.

In this paper, we present our analysis comparing these approaches in detail, outlining their strengths and limitations. This paper also discusses the current state of disclosed data, highlighting the need for robust quality checks in light of inconsistencies in company disclosures.

[1] The Montreal Pledge was launched on 25 September 2014. Since then, more than 120 investors with over USD 10 trillion in Assets under Management have committed to measure and publicly disclose the carbon footprint of their investment portfolios on an annual basis (as of December 2015). Similarly Portfolio Decarbonization Coalition (PDC), which was launched in September 2014, has attracted 25 investors overseeing the decarbonization of USD 600 billion in Assets under Management (as of December 2015).

KEY TAKEAWAYS

- In December 2015, we identified 277 companies that were constituents of the MSCI ACWI Investable Market Index (IMI) that had disclosed their 2013 scope 1+2 carbon emissions in 2015 for the first time. This provided a unique opportunity to validate our past carbon estimates against subsequently disclosed data.
- Compared with the EIO-LCA data based estimation approach, carbon estimates using the approach based on disclosed data (MSCI ESG Research approach) were over three times more likely to fall within an acceptable range.[2] Using the MSCI ESG Research approach, close to 60% of the companies analyzed fell within this range, compared to only 17% of estimates using the EIO-LCA data based carbon estimation approach (Exhibit 3).
- We also found that the EIO-LCA data based estimates were biased towards over-estimating the carbon emissions, with 75% of estimates "significantly overestimated" (i.e. greater than 50% higher than disclosed data) (Exhibit 3). This could be the result of the use of some dated economic and environmental data by some EIO-LCA models to estimate carbon intensities and thus do not accounting for the latest technological advancements.
- On average, MSCI ESG Research's model overestimated these 277 companies' 2013 carbon emissions by 7% (median value of the estimation range), whereas the EIO-LCA data based model overestimated carbon emissions by 208% (median value of the estimation range) (Exhibit 4).
- The implication is that institutional investors may actually be overstating the carbon output of their portfolios if they rely on the EIO-LCA data based estimation approach, as estimated values are more likely to inflate total portfolio carbon footprint.

[2] Acceptable range is defined as the extent of under/over-estimation which is between 33% below to 50% above the actual disclosed data. For a given company, the extent of under/over-estimation (in %) is computed as:

$$= \left(\frac{2013\ estimated\ scope\ 1+2\ carbon\ emissions - \ 2013\ disclosed\ scope\ 1+2\ carbon\ emissions}{2013\ disclosed\ scope\ 1+2\ carbon\ emissions} \right) X\ 100$$

NEED FOR HIGH-QUALITY CARBON DATA: THE CONTEXT

The climate deal struck in Paris in December 2015 set an ambitious goal of limiting the temperature rise to 2 degrees Celsius, with a stretch goal of 1.5 degrees. Limiting the temperature rise to 2 degrees implies reducing annual energy-related carbon emissions by more than half by 2050 and achieving zero carbon emissions from energy-related activities by 2070.[3] Over the coming decades, efforts to reduce energy-related carbon-emissions may have wide-ranging policy, economic, and technological impacts, potentially creating risks and opportunities for institutional investors. Given this context, understanding the carbon footprint of investment portfolios may become an important step to mitigate potential regulatory and market risks in the transition to a 2-degree world.

Portfolio carbon footprinting sets a baseline to inform future actions, which can range from reporting and engagement, to "decarbonization" and integrated risk management.[4] However, the process hinges on two key factors: data availability and data accuracy. While data reporting mechanisms have existed for more than a decade now through systems like the Carbon Disclosure Project (CDP), even companies with consistent carbon disclosures can provide data that ends up as misleading or inaccurate.

UNDERSTANDING COMPANY-DISCLOSED CARBON DATA

Only 20% of constituents of the MSCI ACWI IMI had disclosed their carbon emissions within the last two years (as of March 31, 2016).

Despite recent improvements, there remain clear limitations in carbon disclosure. While we observed an increase in the disclosure of carbon emissions among the largest public companies, only 20% constituents of the MSCI ACWI IMI had disclosed their carbon emissions within the last two years (as of March 31, 2016). That means that nearly four out of five broad market participants' carbon emissions must be supplemented with estimates.

Further, there are frequent quality-related issues with company-disclosed data. Some of these include:

- Partial disclosure of carbon emissions e.g. disclosed data are related to certain business lines or selected facilities.
- Mismatch between the boundaries of carbon emission data and of sales and other financial data, e.g. subsidiaries or franchisees inconsistently included.
- Large unexplained deviations from prior years' disclosed data.

[3] Fifth assessment report, Intergovernmental Panel on Climate Change (IPCC) – based on RCP 2.6 scenario, http://www.ipcc.ch/report/ar5/wg3/

[4] Source: MSCI ESG Research, Carbon Footprinting 101: A Practical Guide to Understanding and Applying Carbon Metrics (Sep 2015).

- Discrepancies in data disclosed to different sources, e.g. sustainability reports, integrated reports, CDP, etc.

In order to address the quality issues with disclosed data, MSCI ESG Research has built multiple-level data quality checks (see Appendix - Exhibit A2). Through this process, in the first quarter of 2016, we identified and corrected[5] data quality issues in the 2014 carbon emissions data of 76 companies in the MSCI ACWI IMI. Some of these companies belong to carbon intensive sectors and data discrepancies can have a sizeable impact on aggregate portfolio carbon footprints.

The result is a better data set with lower variability year-over-year after making necessary adjustments. However, as we laid out, this approach only covers 20% of MSCI ACWI IMI constituents (see Appendix – Exhibit A1). Estimation models are typically needed to fill in the gaps and provide institutional investors a full picture of their potential carbon risks.

COMPARING CARBON ESTIMATION MODELS:

There are two carbon emissions estimation approaches widely used by carbon data providers. The first is based on Economic Input-Output Life Cycle Analysis (EIO-LCA) models. The second approach, developed by MSCI ESG Research, is based on the disclosed carbon emissions data of a sample of comparable companies. Comparison of these two approaches is presented on the next page (Exhibit 1).

[5] Please refer to Appendix – Exhibit A2 to understand the various steps involved in MSCI ESG Research's quality check procedures for disclosed carbon emissions data.

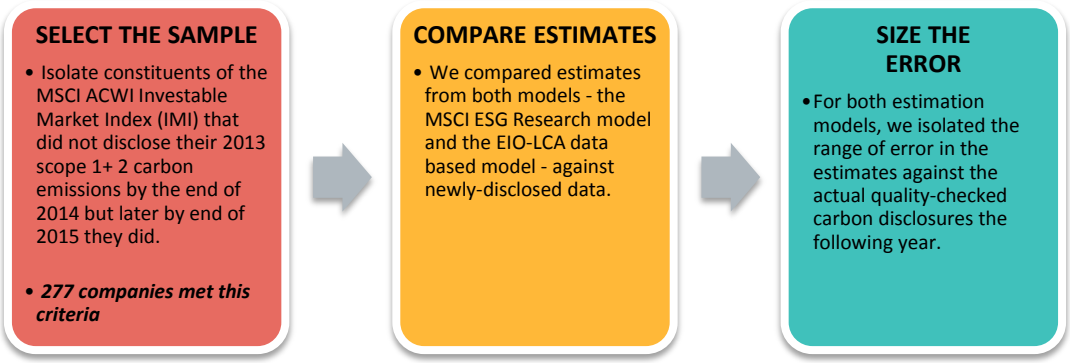
Exhibit 1: Comparison of Two Widely Used Carbon Estimation Approaches

	MSCI ESG Research approach	EIO-LCA data based approach
Approach	• Carbon emissions estimates for a company are based on the current and/or historical data disclosed by the company itself or by other comparable companies[6]. • This approach considers the carbon data in following order of priority: (1) disclosed data, (2) estimate based on the fuel mix, (3) estimate based on company specific intensities and (4) estimate based on industry intensities.	• Carbon emissions estimates are based on the industry specific carbon intensities derived from EIO-LCA models.
Strength	• Based on disclosed data after checking for quality. Carbon intensities thus estimated capture the year-on-year company and/or industry specific trends in the area of carbon mitigation. • Estimates generated using fuel mix and company specific intensities provide more accurate estimates than industry intensity based approach.	• Useful as the best available method when disclosed data is not of high quality. • For example, scope 3 carbon emissions are not consistently calculated and disclosed by the companies. In such cases, EIO-LCA data based estimation model could be the best available method.
Limitations	• Not suitable approach when a sufficient sample of high quality disclosed data is not available.	• Typically use intensities based on energy profile and industry structure of a particular country and thus are not suitable for estimating the carbon emissions for companies from other countries. • Some EIO-LCA data based carbon intensities are based on dated economic and environmental data and thus may not account for the latest advancements in the area of carbon mitigation.

[6] For a more complete review of the methodology of each of the estimation models, please see Appendix.

In 2015, we identified 277 companies on the MSCI ACWI IMI that had disclosed their 2013 scope 1+2 carbon emissions for the first time. This provided a unique opportunity to validate past carbon estimates against subsequently disclosed data, and conduct a comparison of competing estimation models to understand the limitations and potential value of each when conducting carbon footprinting analysis of a portfolio. In order to compare the quality of estimates using these two approaches, we adopted following procedure (Exhibit 2):

Exhibit 2: Approach Used to Compare the Accuracy of Carbon Estimation Models



We defined three buckets for assessing the results – "significantly overestimated" where a company's estimated emissions were over 50% higher than disclosed emissions, "significantly underestimated" where a company's estimated emissions were over 33% lower than disclosed emissions, and "within an acceptable range" where a company's estimated emissions were between 33% below and 50% above disclosed emissions.

The MSCI ESG Research model was more than three times as likely to result in estimates that fell within our acceptable degree of accuracy as measured by the extent of under/over-estimation.

Overall, the results of our review were fairly consistent – the estimates based on the MSCI ESG Research estimation model fell within our acceptable range (i.e. between 33% below to 50% above the actual disclosed data)[7] for a majority of the 277 companies in the sample we reviewed. With estimation models based on the EIO-LCA data, only 17% of companies had estimates that fell within this range in the following year. In contrast, 60% of companies fell in the same range for the MSCI ESG Research's carbon estimation model (Exhibit 3). In order words, the MSCI ESG Research model was more than three times as likely to result in estimates that fell within an our acceptable degree of accuracy as measured by the extent of under/over-estimation.

[7] Estimation range of 33% below to 50% above means that estimated carbon emission data lies between 67% and 150% of the disclosed data.

The results were largely unchanged even as we extended the range of error – more than twice as many companies fell between 50% below and 100% above actual disclosed carbon disclosure for the MSCI ESG Research approach compared to the EIO-LCA data based model (69% vs. 29%). Further, the EIO-LCA data based model significantly overestimated emissions more than three times as often as the MSCI ESG Research's approach (75% vs. 23%) (Exhibit 3).

On average, MSCI ESG Research's model overestimated carbon emissions by 7%, whereas the EIO-LCA model overestimated the carbon emissions by 208%.

Similarly, the range of estimation for these 277 companies' 2013 estimated carbon emissions data, as determined by the extent of over/underestimation for companies at 25th percentile and 75th percentile, is far narrower and well distributed both above and below disclosed estimates when using the MSCI ESG Research model compared to the EIO-LCA data based model (Exhibit 4). On average, MSCI ESG Research's model overestimated carbon emissions by 7% (median value of the range), whereas the EIO-LCA data based model overestimated the carbon emissions by 208%.

Overall, we found the EIO-LCA data have bias towards over-estimating the carbon emissions. This could be the result of the use of some dated economic and environmental data by some EIO-LCA models to estimate carbon intensities and thus do not accounting for the latest technological advancements. The implication is that institutional investors may actually be overestimating the carbon footprint of their portfolios if they rely too heavily on the EIO-LCA data based estimation approach, as estimated values may be more likely to inflate total portfolio carbon footprint.

Exhibit 3: Comparison of MSCI ESG Research's model with EIO-LCA data based model

% of companies by their extent of over/underestimation (Based on 2013 carbon emissions data)

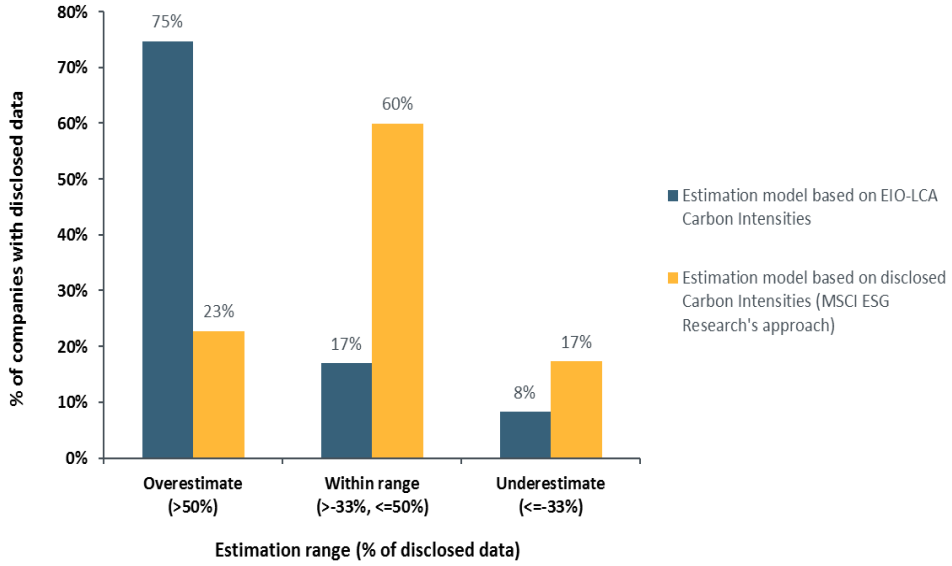
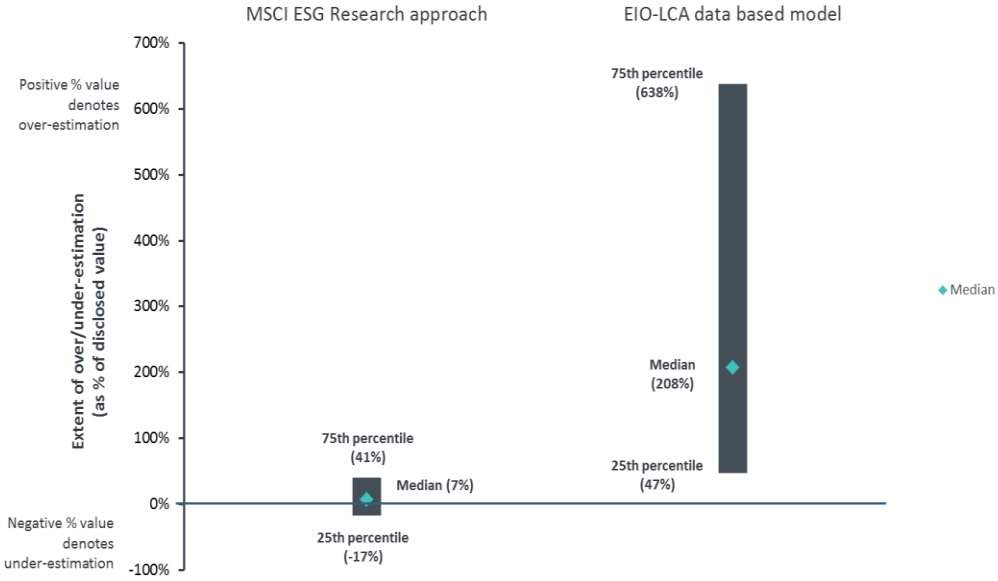


Exhibit 4: Comparison of MSCI ESG Research's model with EIO-LCA data based model

Range of estimation for companies falling in 25th percentile to 75th percentile (Based on 2013 carbon emissions data)



CONCLUSIONS AND NEXT STEPS

While we found results that suggest the MSCI ESG Research approach may provide closer estimates than the EIO-LCA data based estimation model, there is still room for improvement. For instance, none of the existing estimation models take into account individual company carbon targets – a forward indicator of potential performance – but instead rely entirely on historical data. In our paper "***Implications of COP-21: How Do Corporate Carbon Reduction Targets Stack Up?"*** we made a first attempt at addressing how carbon targets might inform estimates of the future emissions of companies. In the paper we found that carbon emissions might be as much as 27% lower in 2030 (against a 2015 baseline) just by using trends and targets alone, a method that could duly inform estimations going forward.

Ultimately, we anticipate the issue of carbon portfolio footprinting and estimation will be a central cog in understanding how portfolios are or can be tilted toward or away from carbon intensive companies and sectors.

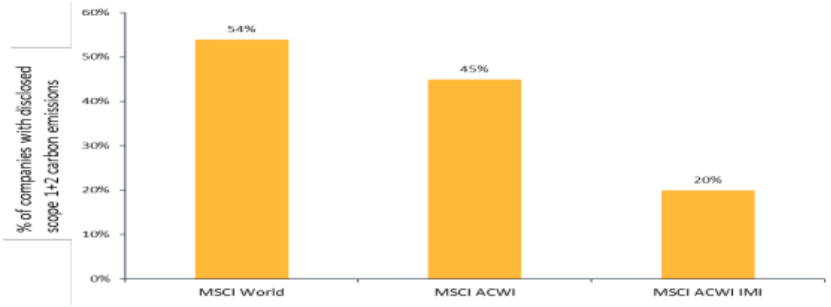
APPENDIX

Exhibit A1: The State of the Carbon Data Disclosure

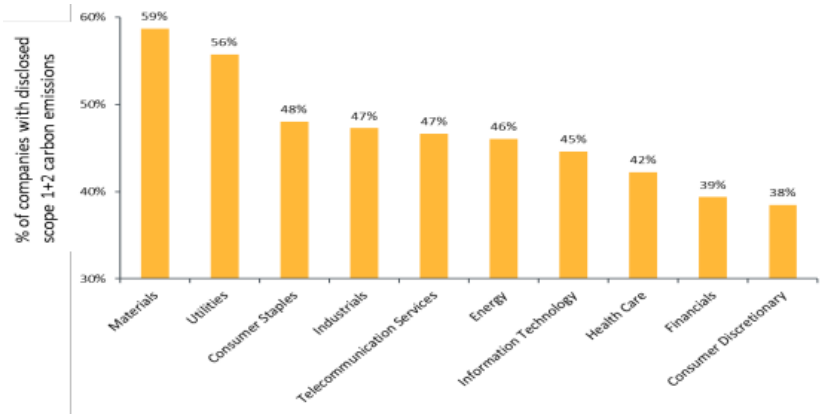
We have observed that carbon data disclosure rates tended to be lower for companies in less carbon intensive sectors, for small- and mid-sized companies, and for companies in emerging markets.

% of companies with disclosed scope 1+2 carbon data (as of 31st March 2016)

By Index



By GICS Sector (MSCI ACWI)



By Country of Domicile (MSCI ACWI)

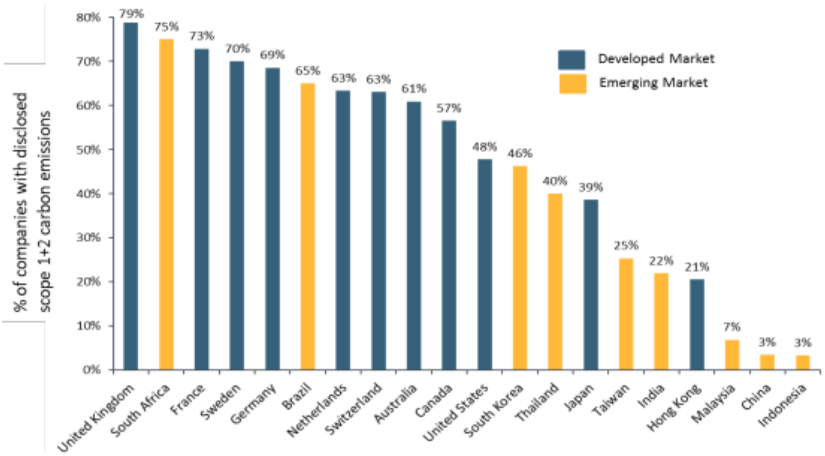
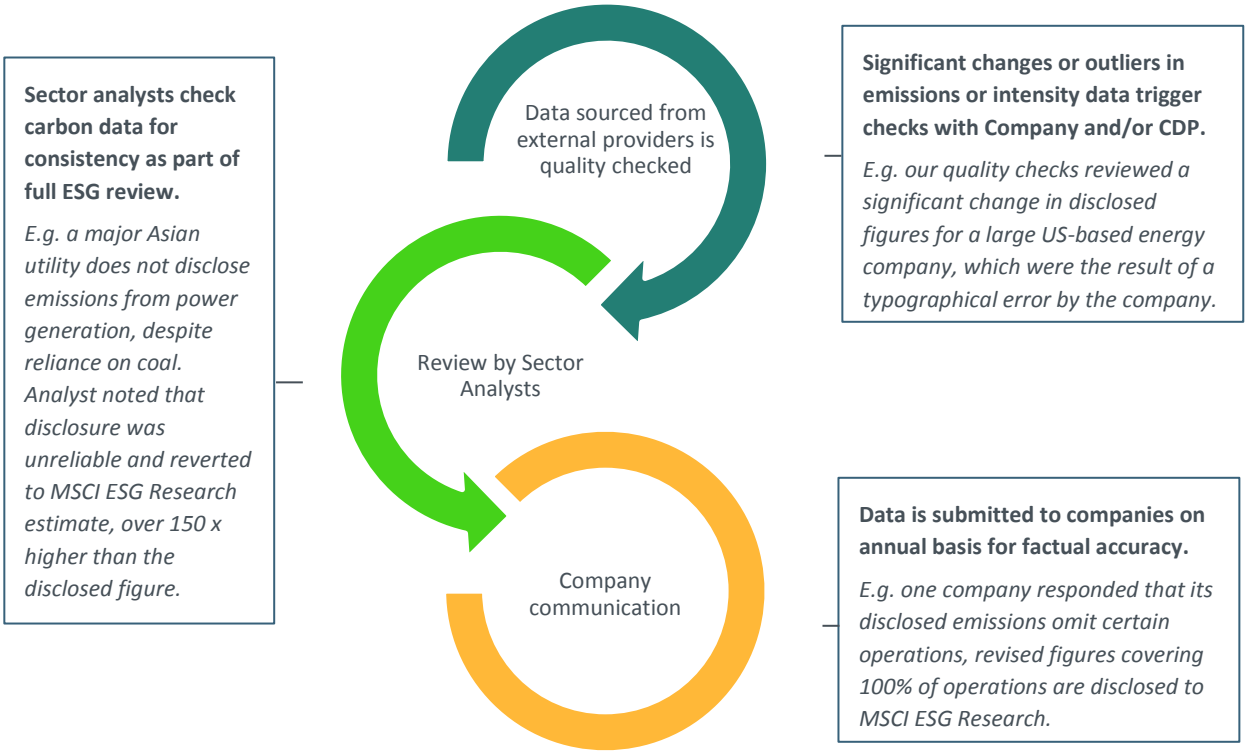


Exhibit A2: MSCI ESG Research – Quality Check Procedures for Disclosed Carbon Emissions Data



A. MSCI ESG RESEARCH'S CARBON ESTIMATION MODEL

Under this estimation approach, disclosed data (current and historical) by the companies is used to estimate carbon intensity at company level and at industry level. MSCI ESG Research pioneered this approach and currently uses it to estimate the emissions in case of no disclosure by the companies. Our estimation model has following three sub-approaches:

1. Production model - For power generating electric utilities, we use fuel-mix (power generation mix) data to estimate the carbon emissions due to its power generation activities. In the first step, we collect total power generation by fuel type under following categories:

   a) Coal

   b) Liquid Fuels

   c) Natural Gas

   d) Nuclear

   e) Renewable Energy

   In the next step, we apply appropriate carbon emissions factors over the fuel-mix data to estimate the Scope 1 emissions for electric utilities.

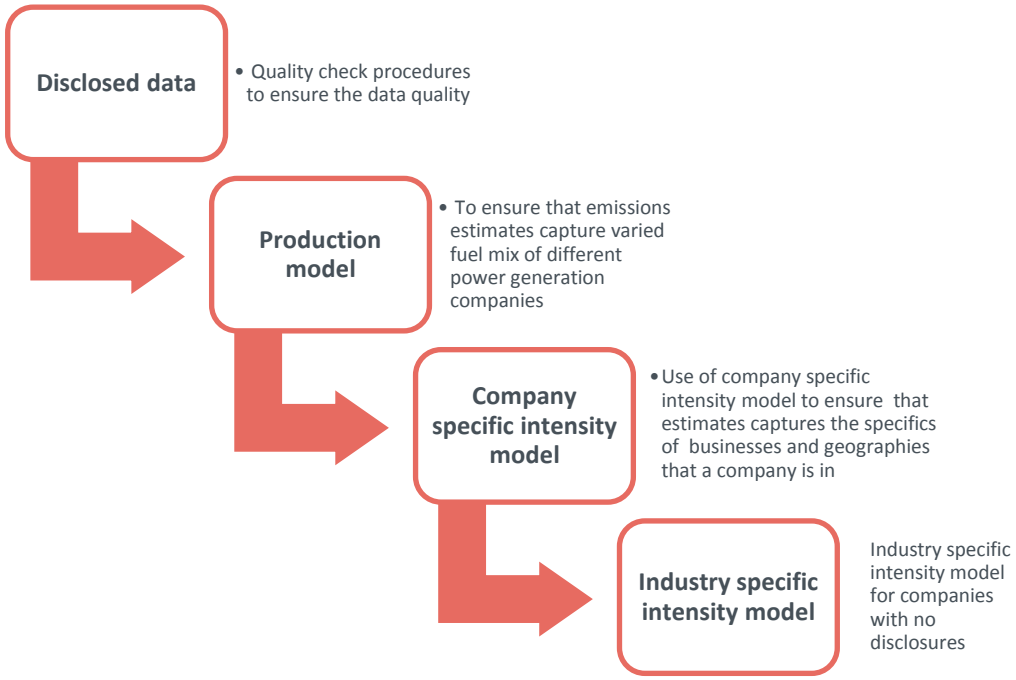
2. Company specific intensity model - For companies with disclosed carbon emissions data in the past, we use company specific intensity model. This model has following steps:

   a) Based on the historical disclosed carbon emissions and revenue data, we first estimate the 'company-specific carbon emission intensity'.

   b) In the next step, we apply revenue of the year with missing carbon emission data to company specific carbon emissions intensity to estimate the carbon emissions for that year.

   It is important to note that since these estimates are based on the data previously disclosed by the company, they already reflects the specifics of the businesses and geographies that the company is in and its own production processes. However, we don't use this model for companies with corporate actions (M&A etc.) even if such companies have disclosed data in the past.

Exhibit A3: MSCI ESG Research's Approach for Estimating Carbon Data



3. Industry specific intensity model - For companies with no disclosed data in the past, we use industry intensity model. In the first step, we estimate carbon emissions intensity for each of 156 GICS[8] sub-industries using company specific carbon emission intensities of companies in a given GICS sub-industry. In the next step, we apply revenue of the year with missing carbon emission data to the corresponding industry specific carbon emissions intensity to estimate the carbon emissions for that year.

[8] The Global Industry Classification Standard (GICS®) was developed by MSCI and Standard & Poor's. For more information, please see http://www.msci.com/products/indices/sector/gics/

B. ESTIMATION MODELS BASED ON ECONOMIC INPUT-OUTPUT LIFE CYCLE ANALYSIS MODELS

Such approaches use carbon intensity at industry level estimated by the Economic Input-Output Life Cycle Analysis (EIO-LCA) models. For a given economy, the EIO-LCA models use aggregate industry level data such as industry GDP, carbon emissions etc. to estimate the carbon intensity at industry level. In the next step, revenue of the year with missing carbon emission data is applied to industry level carbon emissions intensity to estimate the carbon emissions for that year.

With such approach, the quality of carbon emissions estimates depends on the quality of the carbon intensities as estimated by the EIO-LCA models, which itself depends on the availability of updated macro-economic data such as industry-wise GDP and carbon emissions. Some of the EIO-LCA models use dated economic and environmental data to estimate the carbon intensities and thus may not account for the latest technological advancements in the area of carbon mitigation. It adversely affects the quality of estimated carbon intensities. Further, such models are based on economic and environmental data of a country/region and thus represent the structure of its economy, fuel mix and efficiency and technological advancements, which may not be applicable for companies in other countries. For example, industry carbon intensities thus derived do not account for 'outsourced emissions', leading to under-estimate of carbon intensities for some industries.

Despite the aforementioned limitations of this approach, we believe that this approach can be used as the best available method when a sufficient sample of high quality disclosed data is not available. For example, while ensuring the consistency of the disclosed Scope 1 and Scope 2 data is not a major issue due to well defined boundaries and high disclosure rates, we have observed that for Scope 3 emissions the definitions of what emissions should or should not be included are not well defined or consistently calculated by companies. Further, these emissions are not fully within the company's control. As a result, quality of disclosed Scope 3 data for many industries is likely to be poor and inconsistent. In such scenario, for such selected industries, models based on the EIO-LCA data may provide better estimates than the models based on disclosed data.

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