Proposing Constant Currency as a Revenue-Based Denominator to Measure Greenhouse Gas Intensity: A Case Study from the Industrial Gases Sector.

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Abstract

Many investors believe that corporate sustainability offers insight into operational excellence, innovativeness, and long-term shareholder growth. Such investors are looking for a means to separate firms that are making a positive environmental, social, and governance (ESG) contribution from those that are not.

This paper presents observations from employees of one company, Praxair, in a small and fairly homogenous industry subsector, industrial gases (IG). Many ESG investors focus on energy and greenhouse gases (GHG), a material issue for the energy-intensive IG sector. The paper explores challenges for investors who seek to understand and benchmark corporate GHG performance in relation to financial performance.

The paper briefly discusses current ESG investor practices in constructing numerators and denominators for reporting GHG intensity. For the numerator, the authors outline some issues within the emerging practice of summing Scopes 1 & 2 GHG emissions. For the denominator, the authors focus on the preferred investor practice of using revenue to normalize company GHG performance. For multinational firms, a denominator of reported revenue against GHG emissions can produce results that reflect currency fluctuations rather than GHG performance. For Praxair specifically, there is a 22% difference in its reported 2016 GHG intensity depending on the revenue denominator used. The authors argue that reported revenue as a denominator can lead to incorrect conclusions for investors and that constant currency is a more helpful denominator.

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Introduction

Concern over climate change among socially responsible investors makes greenhouse gas emissions an important filter in investment screening. To help develop these filters, environment, social, and governance (ESG) analysts often use the following metric to determine greenhouse gas (GHG) intensity:

$$GHG\ Intensity = \frac{GHG\ Emissions\ (Scope\ 1 + Scope\ 2)}{Total\ Reported\ Sales\ Revenues}$$

Scope 1 emissions refer to those for which the company is directly responsible. Scope 2 emissions are indirect – if a company uses electricity, for instance, then the greenhouse gases emitted in the generation of that electricity are the Scope 1 emissions of the utility company, and the Scope 2 emissions of the user.

This standard assessment of greenhouse gas emissions per unit of revenue can generate misleading conclusions about a company's environmental standing. Using the industrial gases subsector as its case study, this article shows that the denominator of this equation is especially problematic. Using the industrial gases subsector as its case study, this article explores the challenges presented with this calculation. After background on industrial gases (IG), this article briefly outlines concerns with the numerator of this equation and then turns to its principal focus on challenges in using revenues in the denominator.

A note is in order about methodology. This paper presents research and observations from employees of one company, Praxair. Like many companies, Praxair engages in multiple conversations with its investors and ESG investors, who use their own proprietary research or the research of third-party ESG analyst services to which they subscribe.

For the authors, as industry insiders, some investor conclusions about relative company GHG intensity in the chemicals (and IG) sectors did not conform to what we know of business and operational conditions. Several investors made the same observation, and asked us if we could provide an explanation. This paper was produced in response to their questions and presented to various ESG analysts during 2016-2017. It is offered here as a small empirical contribution to an important dialogue.

Industrial Gases

The industrial gases subsector produces both atmospheric and process gases that are used for industrial and commercial applications. Praxair, based in the U.S., is one of four major

firms in this area. The other three are based in the U.S., France, and, Germany.[1] These companies produce two types of gases using two different processes. The business models of all four companies are fairly homogenous.

Atmospheric gases are made by separating air into oxygen, argon, and nitrogen in a process powered by electricity. When that electricity comes from fossil fuels, it generates Scope 2 GHG emissions. *Process gases* are made for the most part through steam methane reforming. This uses natural gas (CH4) and steam (H2O) to make hydrogen; it releases Scope 1 GHGs as a byproduct.

The production of industrial gases is energy intensive. Three of the companies benchmarked in this paper devoted at least 25-30% of their total 2015 operational spend on energy.[2] Industrial gases companies therefore have strong incentives to promote energy efficiency.

At the same time, many industrial gas applications help reduce the environmental footprint of the customer or end-user. For example, Praxair has shown that using oxygen, an atmospheric gas, to improve combustion efficiency in steelmaking avoids more indirect GHG emission than are emitted over the entirety of Praxair's air separation activity. In the case of process gases, hydrogen is used to make ultra-low sulfur diesel fuel, which helps oil refiners meet air quality limits set by the U.S. Clean Air Act. When trucks are fitted with diesel particulate filters, as is now mandated for new trucks in the U.S., the combination of hydrogen and these filters eliminates black carbon emissions from tailpipes. These avoided GHG emissions add up to five times more than the emissions produced by Praxair's hydrogen production. Peer companies make similar claims.[3]

ESG Metrics

Derek Bingham of Goldman Sachs GS SUSTAIN Research points out in a recent report that there are still no broadly accepted standards for ESG data comparable to those that exist for financial reporting. In this context, inconsistent and idiosyncratic metrics proliferate: his team counted 400-800 individual ESG metrics in the databases they reviewed.[4] There

[1] In June 2017, Praxair and Linde, a German peer company, signed a Business Combination Agreement to work towards a merger of equals. See http://praxairlindemerger.praxair.com/

[2] CDP 2016 Climate Change Responses – Question 11.1, responses for all companies available at www.cdproject.net. Though 2016 results were not available at time of writing, they are not likely to change the comments herein.

[3] Avoided GHG emissions are reported in in *Air Liquide 2016 Reference Document* page 89; *Air Products 2016 Sustainability Report* (2015 data) page 6; *Linde Corporate Responsibility Report 2016*, page 2; *Air Products 2016 Sustainability Report* (2015 data) page 6; *Praxair 2016 Sustainable Value Report* page 5

[4] Derek Bingham, of Goldman Sachs Research/ GS SUSTAIN, interview with Jake Siewert, Goldman Sachs Global Head of Corporate Communications, Podcast May 2 Episode 63: "The Metrics that Matter. A

is some progress being made as many in the ESG community use materiality assessments to narrow these metrics to a smaller list of key performance metrics (KPIs) that are material to a specific industry. For example, carbon intensity is a material issue in resource-intensive sectors but may not be in a bank.

Less progress has been made in standardizing key metrics. The Sustainability Accounting Standards Board (SASB) has contributed value in this area, which is discussed below.[5] This paper describes the range of measures used to calculate carbon intensity, and the implications for investors.

Constructing a Numerator

A full corporate GHG emissions statement includes direct emissions (Scope 1), indirect emissions (Scope 2), and other upstream and downstream emissions (Scope 3). Although an understanding of all Scopes is needed to develop a full picture of a company's GHG impacts, most investors simply sum Scopes 1 and 2. This despite the fact that each Scope has a distinctive calculation methodology: Scope 1 GHG emissions can be attributed fairly directly to specific sources and assigned carbon dioxide equivalence values. Scope 2 emissions are measured less precisely.

Take the case of electricity generation, a common source of Scope 2 emissions. This can be calculated from the known fossil/non-fossil fuel mix of the utility provider. This ratio can fluctuate during the year (a utility may be able to draw on wind power more in some seasons than others) and generally changes over time. Sometimes these records can be obtained, although not normally in real-time, so corporate Scope 2 GHG reporting tends to use aggregation: reporting companies infer generalized "emissions factors" (EFs). In the U.S., these EFs are created and published for each state. Some countries create them for sub-national regions. But most countries use a country-level average EF that is periodically updated. This presents an obvious challenge: regional differences in Scope 2 emissions are erased with country-level EFs. For instance, a firm sourcing electricity from Quebec, where hydropower dominates, will overestimate its Scope 2 emissions by using a country-level rather than a provincial-level EF. A reporting firm may disclose this information, but its significance may be lost once it is baked into additional calculations layered on afterward.

In addition to the relative imprecision of Scope 2 measurement, summing Scopes 1 and 2 creates a number of challenges for investors. First, it masks the relative contribution and sources of each. In industrial gases companies, for example, hydrogen production accounts

'Mainstream' Approach to ESG." They asked (1) what matters to operations? (materiality), (2) what data are available, (3) Historical relationships with stock data, LT (3-5 years)

[5] SASB, Sustainability Accounting Standards Board, Standards, see footnote67

for most Scope 1 emissions through steam methane reforming. Atmospheric gas production generates most Scope 2 emissions through the use of electricity. A summed GHG footprint on its own provides investors insight into neither different sources of value and related GHG emissions nor how these change over time in response to business strategies or market conditions. (Incorporating Scope 3 emissions makes this challenge even greater.)[6]

Second, regulators tend to focus on Scope 1 GHG emissions, with Scope 2 not at risk of direct regulatory action. When Scopes 1 and 2 are combined, an investor might inflate the apparent regulatory risk while being unable to pinpoint the sources of that risk. This issue is addressed in the Sustainability Accounting Standards Board (SASB) Standard for the Chemical Sector, RT0101 (Provisional Standard, March 2015). Their GHG Accounting Metric is the annual metric tons of gross CO2 equivalent of global Scope 1 emissions that are covered under a regulatory program.[7] Even though the SASB standards are designed as a basis for SEC filings – and therefore for investor use – this is not the standard metric used among ESG investors to measure corporate carbon emissions in the chemicals and IG sectors.

Third, in terms of national or global accounting, Scope 2 emissions are by definition the Scope 1 emissions of another entity – usually a utility company. In a perfect world where all GHG emissions were properly attributed to their sources, the summing of a company's Scopes 1 and 2 GHG emissions would thus constitute "double counting."

Despite these challenges, many ESG investors use the formula above to construct the numerator in normalizing a company's GHG footprint. Companies in the STOXX Low Carbon family of indices for example, "are selected based on their Carbon Intensity Data (Scope 1 + Scope 2 Greenhouse Gas emissions (GHG) / Revenue ($million))."[8] The STOXX family includes the STOXX Global Climate Change Leaders Index, co-developed with the

[6] See "Exploring the materiality of ESG data," *Environmental Finance.* Winter 2016. Pp 10-17. An important discussion of challenges in establishing product intensity for multiple products and/or activities is provided in Bartley, Jon, Frank Buckless, Y.S. Al Chen, Stephen Harvey, D. Scott Showalter, and Gilroy Zuckerman. "How Widely Used Sustainability Metrics Distort Actual Performance—And a Solution to This All-Too-Common Problem." Environmental Quality Management, Volume 24, Number 4, Summer 2015.

[7] SASB, Sustainability Accounting Standard – Resource Transformation – Chemicals (Provisional Standard, March 2015, page 10. The Standard can be downloaded from: https://www.sasb.org/standards/download/resource-transformation-standards-download/. The Standard requires disclosure of the percentage of an entity's emissions that are covered under a regulatory program, such as the European Union Emissions Trading Scheme (EU ETS), Western Climate Initiative (WCI), California Cap-and-Trade (California Global Warming Solutions Act), or other regulatory programs. It includes regulatory programs like cap-and-trade schemes and carbon tax/fee systems and excludes emissions covered under voluntary trading systems and disclosure-based regulations (e.g., the U.S. Environmental Protection Agency (EPA) mandatory reporting rule).

[8] STOXX® Index Methodology Guide (Portfolio Based Indices), March 2017. Viewed July 21 2017, page 117.

Carbon Disclosure Project (CDP). Other ESG analysts who use a combined Scope 1 & 2 normalized against revenue include Goldman Sachs GS SUSTAIN, MSCI, and Vigeo-EIRIS.[9] Similarly, the Task Force on Climate-related Financial Disclosures (June 2017) weights corporate Scopes 1 and 2 emissions in relation to revenue and/or market capitalization.[10] The Task Force's preferred system is a "weighted average carbon intensity metric," which is calculated as:

$$\sum_{n}^{i}\left(\frac{current\ value\ of\ investment_i}{current\ portfolio\ value} * \frac{issuer's\ Scope\ 1\ and\ Scope\ 2\ GHG\ emissions_i}{issuer's\ \$M\ revenue_i}\right)$$

A variant is offered in the April 2017 report from Goldman Sachs, *The PM's Guide to the ESG Revolution,* which uses two GHG metrics as the basis for their subsequent calculations: total CO2 and CO2 equivalents (CO2-e); and Total Scope 1 GHG emissions. (Both numbers are then normalized by USD revenue.)[11] Having laid out a few of the challenges with the establishment of a numerator that sums Scope 1 and 2 emissions, we will move on to the main focus of this paper: the selection of a denominator, and particularly revenue as a denominator.

Constructing a Denominator

Various denominators have been proposed to measure GHG performance, from sales/revenue to product volumes to employee headcount. Most energy intensive companies, including Praxair, prefer a denominator of product intensity, as this is how operations are managed. (It should be noted that there is no agreed standard to measure or report product intensity.) However, investor criteria – reliable publicly available data that allow for cross-sector comparisons – invariably lead them to use revenue as a denominator in the measurement of GHG performance.

Revenue as a Denominator

ESG investors seek to use extra-financial, non-financial, or, in this case, GHG metrics in the same way that they use financial information. To normalize information and make comparisons, they need a denominator that is easily available in public materials and consistent across industry sectors. Through annual filings and investor presentations, a

[9] MSCI and Vigeo-EIRIS Questionnaires are in the possession of the authors. Goldman Sachs Equity Research April 2017: The PM's Guide to the ESG Revolution: From an article of faith to a mainstream investment tool, downloaded 8.12.17.

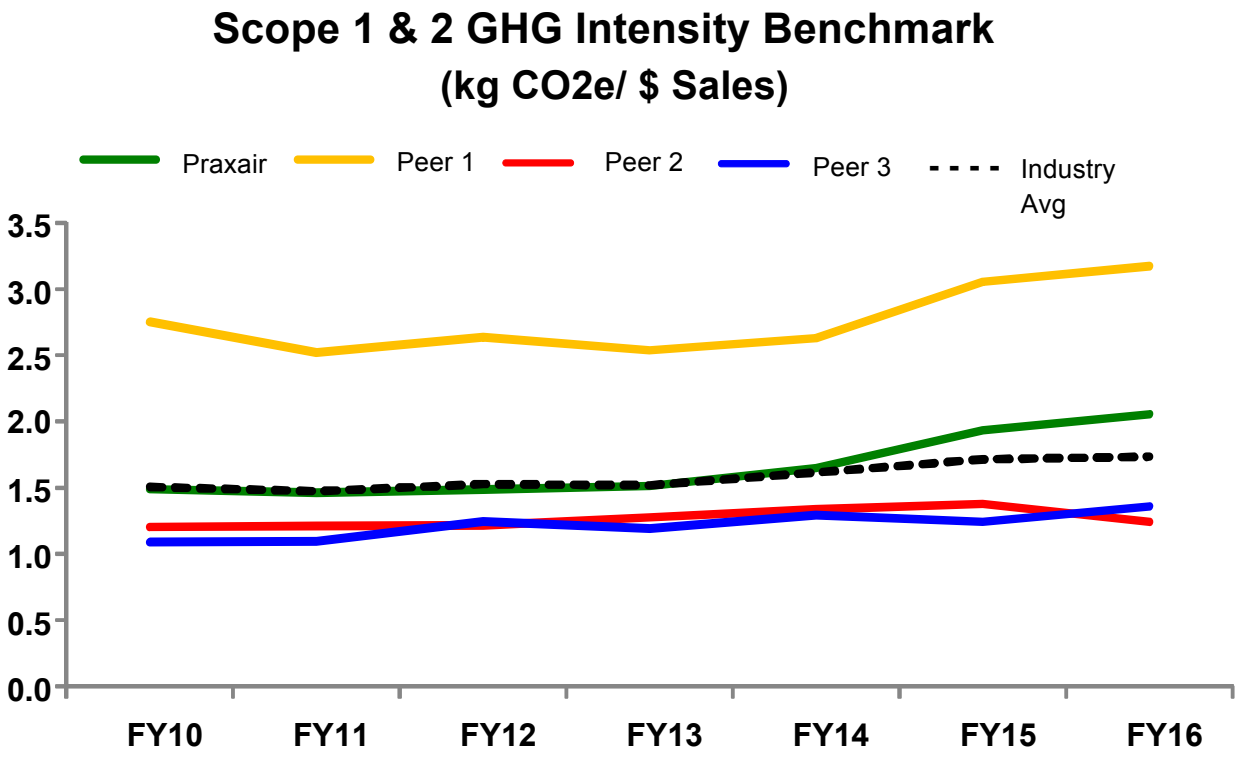
[10] Recommendations of the Task Force on Climate-Related Disclosures 2017, Table 2 page 44. https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf.

[11] Goldman Sachs Equity Research April 2017: *The PM's Guide to the ESG Revolution, op cit.*

range of financial information is disclosed that meets investor requirements for normalizing ESG data; reported revenue is one. By applying the same calculation to the same data from publicly available sources for all four major industrial gases companies, we found that the use of revenue can produce misleading conclusions about GHG intensity.

We started by benchmarking the GHG intensity of the four major global industrial gases companies as the sum of Scopes 1 and 2 against reported revenue. Figure 1 provides the results. The data indicates that "Peer 1" is the most GHG intensive, which is to be expected because it has the largest hydrogen business. It then shows Praxair tracks at industry average and lower than "Peer 2" and "Peer 3" until 2014, after which it shows a significantly higher GHG intensity. Using this methodology, an investor might assume that Praxair's GHG intensity was increasing compared to Peers 2 and 3 and the industry average; and that Peer 2 had taken specific steps to improve its GHG intensity. In fact, this variation was created by non-operational differences.

Figure 1: Industrial Gases Companies Scopes 1 & 2 GHG Intensity Based on Total Reported Sales Revenues, 2010 – 2016



The Importance of Constant Currency

The next adjustment we considered was foreign exchange (FX). We should note here that the RobecoSAM Corporate Sustainability Assessment, which publishes the RobecoSAM Dow Jones Sustainability Indices, invites companies to define a denominator for evaluating eco-efficiency with product volumes, reported revenue, or constant currency. They prefer a denominator of constant currency (foreign exchange adjusted) revenues if possible, as they eliminate the effect of fluctuations in foreign exchange rates and are thus a better indicator of business performance."[12] The argument we present below provides empirical support for this RobecoSAM observation. We do note that investors using the RobecoSAM conclusions for relative company environmental performance, which are available on Bloomberg terminals, may not know which decision a firm made on this issue.

All four industrial gases companies have currency exposure, which has had significant impact on revenues in recent years. Such exposure can significantly increase or decrease reported sales revenues when local currencies are translated to their functional reporting currency. Using reported revenue as a denominator for multinational firms therefore distorts the energy and/or GHG intensity calculations.

A further complication is that different companies usually have different FX exposures. All four industrial gases companies discussed the risk from currency exposure in their 2016 annual filings.[13] Compared with peers, Praxair has a much larger business in Brazil, which has suffered from considerable FX depreciation since FY15. In fact, FX reduced Praxair's reported sales by 10% in FY15 and another 3% in FY16 on year-over-year basis (see Figure 2).

This distortion can be removed by adjusting the FX impact and referring to the sales variance data published in company earnings call presentations and annual reports. This will reveal the extent to which FX contributed to yearly sales variation. To complete this task, we set up a base year to exclude FX impact going forward. In this analysis, our base year is FY10. We started from FY10 sales revenues and extrapolated sales in FY11 to FY16 using the following formula:

[12] This is provided within the RobecoSAM Corporate Sustainability Assessment CSA questionnaire, "Normalization Factors." The citation is from the 2017 questionnaire, in the possession of the authors. A sample questionnaire can be downloaded from: http://www.robecosam.com/en/sustainability-insights/about-sustainability/corporate-sustainability-assessment/sample-questionnaire.jsp. Investors using RobecoSAM CSA results for corporate benchmarking may not have insight into what denominator individual firms selected.

[13] FX exposure was reported as relevant in the 2016 Annual Filings of all four industrial gases companies: Air Liquide 2016 Reference Document page 34; Air Products 2016 Annual Report page 25; Linde 2016 Financial Report page 51; Praxair 2016 Annual Report page 18.

$$Ex\ FX\ Sales\ Yn+1 = Ex\ FX\ Sales\ Yn \times (1 + Ex\ FX\ Growth\ Gn+1)$$

Figure 2: Praxair Adjusted Sales Revenues ex-FX, 2010 - 2016

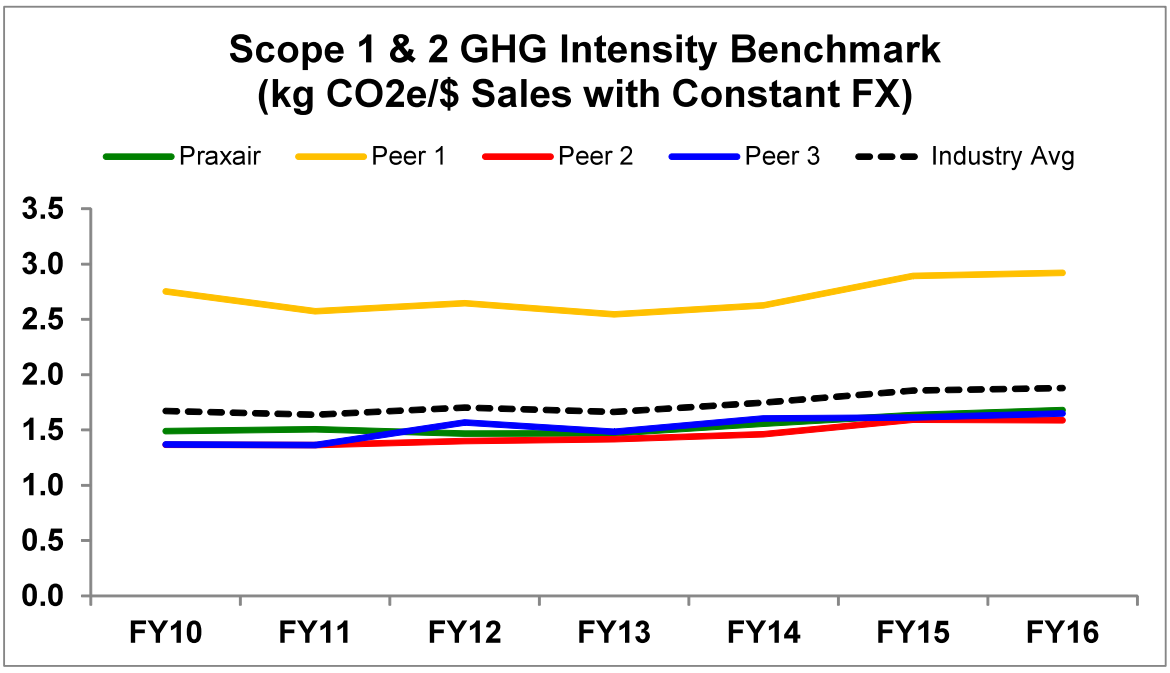
Unit: $ MM	2010	2011	2012	2013	2014	2015	2016
Praxair Sales	**10,116**	**11,252**	**11,224**	**11,925**	**12,273**	**10,776**	**10,534**
Volume	*9%*	*6%*	*2%*	*3%*	*3%*	*-2%*	*0%*
Price	*0%*	*2%*	*2%*	*2%*	*2%*	*1%*	*1%*
Cost Pass-through	*1%*	*1%*	*-1%*	*0%*	*0%*	*-2%*	*-1%*
Currency	*2%*	*3%*	*-4%*	*-2%*	*-3%*	*-10%*	*-3%*
Acquisition/Divestitures	*1%*	*-1%*	*1%*	*3%*	*1%*	*1%*	*1%*
Growth (ex. FX)	***11%***	***8%***	***4%***	***8%***	***6%***	***-2%***	***1%***
Praxair Sales (ex FX, 2010 Base)	**10,116**	**10,925**	**11,362**	**12,271**	**13,008**	**12,747**	**12,875**

If repeated for all the industrial gases companies, we will have constant FX sales (FY10 base) and the revised GHG intensity calculation would look as follows:

$$GHG\ Intensity\ r2 = \frac{GHG\ Emissions\ (Scope\ 1 + Scope\ 2)}{Sales\ Revenues\ Constant\ FX}$$

Figure 3 applies this methodology to all four companies and shows a truer benchmark comparison of GHG intensity between industrial gases companies. This methodology concludes that Praxair's GHG intensity 2010-2016 is on par with European peers, and below the industry average.

Figure 3: Industrial Gases Companies GHG Intensity Based on Adjusted Constant FX Sales Revenues, 2010 - 2016



To double check: if we only look at GHG emissions growth (Figure 4), Praxair has been consistent with the trend observed in the industry. This confirms that the adjusted GHG intensity metric better reflects Praxair's real performance in GHG emissions.

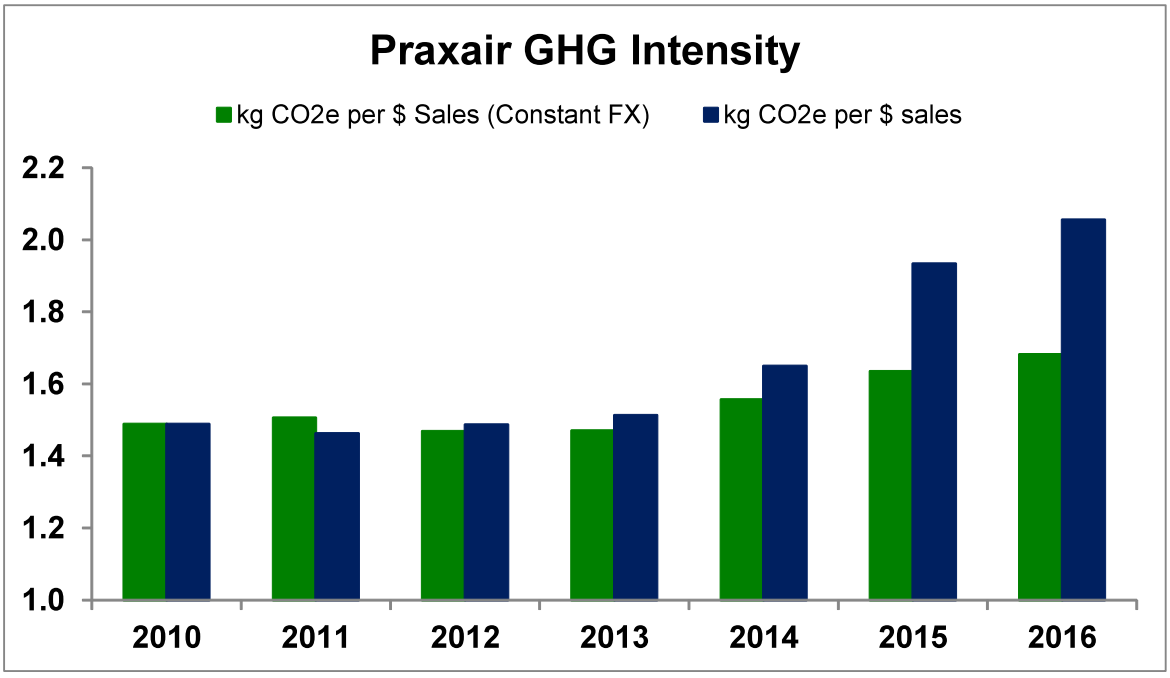
Figure 4: Praxair & IG Industry Scope 1 & 2 GHG Emissions ('000 MT CO2e)

Scope 1 & 2	FY10	FY11	FY12	FY13	FY14	FY15	FY16	CAGR
Praxair	15,060	16,454	16,684	18,035	20,245	20,839	21,649	6%
IG Industry	72,667	77,368	84,132	87,822	95,369	101,331	102,906	6%

Conclusion

Relating GHG intensity and revenue can be done in various ways depending on how revenue is counted in the denominator. Different methodologies can produce materially different conclusions. Figure 5 shows that Praxair's GHG intensity was inflated by significantly lower reported sales in FY15 and FY16 due to currency headwinds, not a change in GHG intensity. All peer company GHG intensity results were affected positively or negatively, and to a greater or lesser extent, by this factor. For Praxair, the difference in GHG intensity between the two methodologies is 22% for 2016.

Figure 5: Praxair GHG Intensity – Comparing Results Reported Against Revenue or Constant Currency, 2010 - 2016



These variations in results derive from different methodologies that relate to business conditions, not underlying GHG performance. Investors are skilled at understanding the complexities of financial accounting and routinely look "beneath" reported revenue at issues such as the business model of each company, its business lines and product mix, the geographies in which it operates, and its current financial challenges and opportunities, including FX. This same attention to detail is needed in order to accurately understand GHG performance.

Like financial information, ESG data and metrics are complex. Moreover, ESG metrics have different accounting methodologies that are not easy to align with the methodologies of financial accounting. Investors seeking to benchmark GHG performance might find it useful to consider how to develop financial denominators that provide more reliable insight into GHG performance.

There is a new level of interest from investors to integrate environmental, social, and governance factors into their investment process. This focus is putting unprecedented pressure on ESG information to reflect corporate performance. However, ESG accounting is an emerging field and protocols are still evolving. This applies to the construction of numerators and denominators to evaluate GHG performance, and likely several other ESG metrics.

It is essential that ESG investors remain sensitive to potential distortions in GHG performance trends when normalizing against reported revenue. Our proposal to consider "constant currency" as a denominator will require agreement between users and investors on methodologies and standards to use. This finding for GHG intensity reporting for four multinational firms in one industry subsector is likely to be true for other environmental – and possibly other ESG– data that is normalized against reported revenue.