Quality or Quantity?
Corporate Environmental Disclosure and Third-party ESG Scores

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ABSTRACT

Climate change is one of the most pressing issues of our society. As some of the largest contributors, companies hold a large responsibility in engaging in more sustainable practices. Sustainability reporting is valuable for companies to track environmental activities through non-financial metrics. This reporting is oftentimes used for Environmental, Social, and Governance (ESG) scores given by third-party agencies that rate a company's socially conscious efforts. However, it can be difficult to navigate these scores since each agency has their own rating methodology. It is unclear how much these scores vary among each other and how the level of corporate disclosure affects the scores companies received. I analyzed sustainability reports of the top 15 US companies by revenue to determine their extent of environmental disclosure and the relationship between number of reported metrics and their third-party ESG score. In my analysis, I found that ESG scores oftentimes differ greatly between rating agencies for companies with up to an 82 point difference out of 100 possible points and thus do not give the public a comprehensive picture of a company's sustainability efforts and progress. Companies also report on a range of environmental metrics, however, far below the amount they could with an average of 18 reported quantitative environmental GRI metrics out of 113 possible ones. Ultimately, there is no clear relationship between ESG score and environmental disclosure with a regression analysis p-value greater than 0.05 for each agency, implying that a score relies more on quality than quantity of metrics.

KEYWORDS

Corporate Social Responsibility, Environmental Social Governance score, Global Reporting Index, sustainability reporting, sustainable business

INTRODUCTION

Climate change and environmental degradation is one of the most pressing issues of our society in the 21st century. The largest contributors to negative environmental impacts are corporations with two thirds of anthropogenic emissions attributing to just 90 companies (AAAS 2016). Therefore, they hold a large responsibility in engaging in more sustainable practices, which they often do through a management concept called Corporate Social Responsibility (CSR) (Halkos and Nomikos 2021). CSR departments oversee a range of company engagements such as working conditions for employees or internal company environmental projects, like carbon offset programs (Halkos and Nomikos 2021). Not only are companies benefiting the environment by improving the eco-friendly practices, but they also increase their financial performance through attaining greater investment sums and attaining higher returns (Naeem et al. 2022). Although the actual environmental impacts and improvements are the most important steps for companies to take, their transparency within helps solidify the stakeholder perception of corporate legitimacy (Nielsen and Thomsen 2018) and steers the public away from companies that engage in damaging practices as external pressure like this can have a significant effect on company practices (Halkos and Nomikos 2021). It is therefore crucial that companies communicate their environmental impacts most accurately to the public.

Sustainability reporting is a valuable tool for companies to track environmental activities and share them with the public and has become a common practice over the recent years (Perello-Marin et al. 2022). The reporting oftentimes takes the form of non-financial metrics listed in the company's annual financial report and is useful to businesses to keep track of their own environmental activities and communicating these to stakeholders. Environmental activities need to be measured to reach reduction targets and to hold companies accountable for their actions. In fact, increased environmental disclosure among corporations is positively correlated with environmental performance (Van Hoang et al. 2021). There are currently a number of third-party reporting standards that provide pre-determined sustainability metrics to track (Perello-Marin et al. 2022). However, only few companies report extensive sustainability metrics thus far and with many different standards options, it can be difficult to compare companies across sectors (Halkos and Nomikos 2021). Thus, there is still a lack of sustainability reporting adoption, transparency, and comparability of standards across companies.

An effort to navigate a company's sustainability disclosure is an "Environmental, Social and Governance (ESG) score", which is a rating given by a third party agency that assesses a company's socially conscious efforts towards being a more responsible business based on reported sustainability metrics by company (Atkins 2020). A range of agencies create ESG scores based on individual rating methodologies that stakeholders or the public will use to gain a general overview of a company's sustainability efforts (Giese et al. 2019). Oftentimes, investors will prefer funding a more ESG-focused business due to their expected higher future payoffs (Cortez et al. 2022).

However, ESG scores don't always convey the full picture of a company's sustainability impacts. One of the biggest issues with the range of scores given is that they are all based on different rating methodologies (Christensen et al. 2021). Although there are some agencies that are the most popular among stakeholders to use as reference points (Berg et al. 2019), there is no singular type of score that is known to be the most telling since each agency rates subjectively, making it difficult to determine which to rely on for the most accurate information. Another factor that affects the credibility of ESG scores is that they are a combination of three correlated, yet separate categories: Environmental, Social and Governance. The result of this combination is a possible skew of the communicated information because, for example, a company that scores well within their governance metrics but poorly within their environmental metrics might receive a score that cancels out these differences and conveys an incomplete image to stakeholders (Christensen et al. 2021). It is therefore unclear what information an ESG score truly conveys and what factors play into its assessment.

In this study, I answered the question: How does an ESG score correlate with the disclosure of a singular sub-category of ESG? My analysis consists of filtering through sustainability reports containing non-financial key performance indicators of the top US companies by revenue to determine the extent of environmental metrics they report on and compare their level of disclosure to their ESG scores given by third-party agencies to test for a correlation between the two. Throughout my research, I addressed: (1) What are the ESG scores of the top US companies by revenue and how do they compare to each other? (2) How extensive is the environmental disclosure of these companies? (3) How do the company ESG scores compare to their level of environmental disclosure? I expected to find that larger companies report on a wider range of environmental categories and ESG scores between different rating

agencies fluctuate greatly. My hypothesis was that there is no clear relationship between ESG scores and environmental disclosure since the other non-financial metrics will skew this correlation and rating agencies put a greater emphasis on quality of metrics.

BACKGROUND

Relationship between business and sustainability

The large-scale impact companies have on the environment derives from sourcing, to production, to transportation, to consumption, across a variety of industries (Clift and Wright 2000). Improvement requires embedding sustainable practices along the whole supply chain. However, a limitation in connecting business with sustainability is that a capitalistic business will inherently be environmentally unsustainable within current societal structures (Hart 2007). Capitalism allows for the exploitation of resources to reach the ultimate goal of maximizing profit (Hart 2007). Economic theory includes the concept of an externality, which is defined as the indirect cost an uninvolved third party is experiencing as a result of another party's activity (Wagner 2002). In the case of long-term environmental degradation, like pollution, the external effects experienced are delayed and can not always be traced back to their original source. And if companies cannot be held responsible for their impacts, they will not internalize the externality they created. Thus, large corporations can take environmental degradation as a tradeoff to reach their business goals, whether intentional or not.

The large-scale change needed to reconstruct the relationship between business and environment is to achieve the same maximum profit even through the use of eco-friendly practices. One realization leaders have made over the recent years is that a financially sustainable business can simultaneously be an environmentally sustainable business; eventually we will have depleted our resources and stricter policies will hold companies accountable for their practices, incurring financial liabilities (Ciulli et al. 2022). Furthermore, consumer demand has shifted to a more eco-friendly lifestyle, which translates to their choices of companies they choose to support (Li et al. 2021). Investors are noticing this value of impact-focused business as well and thus, an increased amount of investments are allotted towards sustainable businesses (Wen et al.2022).

Global efforts towards corporate sustainability improvement

Some countries are currently making efforts towards holding accountability and improving environmental practices. One of the most recent EU policies passed towards company environmental regulation is the EU Taxonomy, which is a classification system for companies to determine which of their activities can be seen as environmentally sustainable (European Commission 2022). This regulation provides a baseline for environmental activity tracking as well as gives investors a more cohesive company sustainability overview. Internal company structure and practices have also made shifts towards conscious decision-making within their CSR departments (Halkos and Nomikos 2021). CSR will encompass actions, such as internal company sustainability projects or supply chain improvements (Halkos and Nomikos 2021).

Empirical evidence proves that sustainability and a profitable business model can go hand-in-hand. One example is Patagonia: They attempt to limit the amount of clothing waste produced yearly at the current level of over 92 million tonnes of waste (Niinimäki et al. 2020). Their supply chain entails sustainable sourcing as well as the usage of recycled materials and clothing repair clinics. Furthermore, the company is working towards carbon neutrality by 2025 and runs their establishments entirely on renewable energy (Patagonia 2022, Guinot 2020). There is an increasing number of companies embedding sustainability in their business models, however, these are in the minority. It is now crucial that the companies that hold the largest market shares and can create an amplified effect on societal change drastically improve their sustainability practices.

RESEARCH FRAMEWORK

ESG Development

Environmental, Social and Governance (ESG) acts as a categorization of an organization's socially conscious activities and plays a role in their success prediction. These three categories are frequently used as a combined metric to measure a company's progress

towards being a more responsible business. The UN was the first to devise this categorization in 2006 (Atkins 2020) in their Principles for Responsible Investment (PRI). Ever since, ESG criteria have been required as a component of a company's financial evaluation (Atkins 2020, Giese 2019). Investors will use these metrics as an aid to screen investments and determine the level of funding to allot to a business, which influences the amount of success and impact a company will have (Giese 2019). A positive correlation exists between environmental and financial performance, which is why ESG investments are so lucrative to investors (Cortez 2022). For transparent communication to investors, companies convey their sustainability progress through accurate ESG reporting and ESG scores, which both have a close relationship (Christensen et al. 2022).

Corporate sustainability reporting in practice

Corporate sustainability reporting helps companies track their environmental activities and convey them to the public. Companies measure their ESG activities by select key performance indicators, just like they would measure any financial metric, but simply with different units. They oftentimes report the measurements in the form of "non-financial metrics" within their annual financial reports or list them in a separate sustainability report (Cardoni et al. 2019). It is important and necessary for businesses to measure environmental activities so they can effectively reach reduction targets and for the public to be able to hold them accountable for their impacts (Cardoni et al. 2019).

To an extent, US policy requires the tracking of non-financial metrics, mainly for CO2 emissions, with the US Greenhouse Gas Reporting Program as part of the Clean Air Act (Davies et al. 2020, EPA 2022). But due to the current lack in reporting regulation and standards in the US, much disclosure relies on a firm's own decision (Davies et al. 2020, Braam et al. 2016). As an aid for companies to voluntarily report on reasonable and accurate environmental activities, there are many third-party reporting standards with sustainability metrics to track (Perello-Marin et al. 2022). The most widely-used agency is the Global Reporting Initiative (GRI) that provides sector-specific metrics that a company can individually choose to follow for ease of reporting and increased transparency to stakeholders (Perello-Marin et al. 2022). However, only a small

percentage report extensive sustainability metrics and with many different standards to choose from, it can be difficult to compare companies cross-sector (Berg et al. 2020).

ESG scoring methodology and rating agencies

ESG scores capture the third-party assessment of a company's sustainable activities, but don't always convey clear information. There are various methods that different rating agencies use to calculate the ESG score, leading to many discrepancies between ESG ratings and leading to a lack of comparability (Berg et al. 2019). Each agency has their own method of scoring companies based on their ESG efforts, for example, MSCI rates companies based on their exposure to ESG risks and company management of these risks (MSCI 2022) of 35 key ESG issues. Meanwhile another top rating agency, Refinitiv, rates companies based on their environmental performance within 10 categories (Reifnitiv 2022). These differences in scoring lead to difficulties for investors to compare companies based on their ESG scores (Christensen et al. 2022).

The scores themselves are also flawed in conveying an accurate picture of the company's impact in each of the ESG categories, as they combine three broad categories – Environmental, Social, Governance – into one score. If, for example, a company shows a lot of initiative in their Governance strategies such as cyber security, company policies, and information disclosure but lacking efforts in their water and waste management, these differences are not highlighted in the final score. The limited information an ESG score presents might convey a false picture of the company to the public and investors (Christensen et al. 2022). A skewed perception could prevent the company from needing to take responsibility for their impacts and could perhaps help them gain investments based on inaccurate information.

Past findings within ESG disclosure and scoring

Past findings on ESG scores and environmental disclosure show existing correlations between the two. More specifically, an increase in ESG disclosure leads to an increase in discrepancies between ESG scores from various agencies (Christensen et al. 2022). This finding proves that the more information a company provides on their ESG activities, the more data

points they provide for agencies to dispute on. Christensen brings to light that the detail of disclosure is one component, but the actual ESG management progress of a company is another. Furthermore, Berg et al. (2019) demonstrate that differences in agency data measurement itself is the largest driver of ESG score divergence for a given company as opposed to the scope or weighting of ESG factors.

As a basis for the appropriate type disclosure evaluation, Perello-Marin et al. (2022) provide a method of numbering the amount of times specific predefined ESG categories are reported within company sustainability reports. This method gives the most direct overview of the topics covered within ESG reports. Thus far, the studies analyzing the relationship between corporate sustainability disclosure and ESG scoring have only examined ESG disclosure as a whole. An expansion of previous research is to analyze the correlation between solely environmental reporting and ESG scores to test if an ESG sub-category can act as an indicator for scoring.

METHODS

In this study, I analyzed company sustainability reports to extract quantitative environmental metrics and compared these to third-party given ESG scores to test the relationship between disclosure and scores. My sample consists of the top 25 Fortune 500 companies. I collected data from each of the companies' publicly available sustainability reports. The ESG scores I used for this research were those of the three most commonly used rating agencies for investment analysis: MSCI, Refinitiv, and Sustainalystics.

ESG score distribution of rating agencies

To begin, I exactred the ESG scores for each sample company from the websites of MSCI, Refinitiv, and Sustainalytics. The rating agencies do not provide publicly available databases with lists of the companies alongside their given ESG score. Therefore, I extracted each score for every one of my sample companies from the rating agencies' websites through their homepage search function and captured these in a spreadsheet.

As previously described, each rating agency has a different method of evaluating companies. Refinitiv scores companies on a scale from 1 to 100. Sustainalytics scores companies on a scale from 1 to 40 for the ESG risk they pose. MSCI scores companies alphabetically from their worst score CCC to their best score AAA. Though Refinitiv and Sustinalytics use different scales for their ratings, they are still comparable because their scores are both in numerical terms. On the other hand, MSCI does not meet the comparability criteria, therefore, I converted the alphabetical MSCI scores to equivalent numerical scores. For the conversion, I used the averages of the conversion factor ranges out of 10 possible points listed on the MSCI "Methodology" page.

I ensured the best comparability among the scoring methods by normalizing the three scoring types to a 0-100 scale, which is the scale Refinitiv uses. I then normalized the converted MSCI scores by multiplying each value on the 1-10 point scale by 10 to receive total scores out of 100. For the Sustainalytics scores, I normalized the scores' 40-1 scale (with 40 being the worst score and 1 being the best) with the following formula to adjust them to a 100 point scale: 100 - (2.5*score) To then compare the scores between the sample companies across one rating agency as well as compare the scores of one company between various agencies, I collected all scores in a joint scatterplot.

Company environmental disclosure

Each company in my sample has a published sustainability report that contains metrics by which they report their environmental activity alongside other environmentally related company updates. The reports range from 15 to 60 pages of content. To find each quantitative environmental metric I manually filtered through the sustainability reports of each company.
I used the Global Reporting Index (GRI) as a guideline for this process for a more focused search as it is not common practice for companies to report on all of their environmental metrics in a concise manner.

GRI consists of disclosure standards for Environmental, Social, and Economic topics a company engages in. I used the Environmental standards for my data collection. The Environmental section consists of 7 overarching topics, each captured in a separate document that contains a list of disclosures for companies to report on. The disclosures define quantitative

and qualitative metrics to use as a concrete measurement. To begin the disclosure segment of the analysis, I extracted all GRI disclosures containing quantitative, measurable metrics listed under the documents of the "Environmental" category and I captured these in a spreadsheet.

Then, I filtered through the text and tables of each company's sustainability report and set a check mark next to each GRI metric mentioned. If there were any metrics mentioned that are not listed in GRI, I took note of these in the Excel sheet as well. At the end of analyzing each report, I counted the number of check marks set as well as the number of additional metrics the company mentioned.

Company environmental disclosure and ESG score relationship

For the analysis of the correlation between the ESG scores and my personal disclosure scores for the companies, I used an Ordinary Least Squares regression. I ran a total of three regressions - one for each scoring agency. My x variable was the company disclosure score and the y variable was the rating agency ESG score.

RESULTS

ESG score distribution of rating agencies

The companies reached a range of scores. For MSCI, they achieved converted average numeric scores between 5 and 9.285; between 67 and 93 for Refinitiv; and between They reached between 38.4 and 12.1 for Sustainalytics (Table 1). The normalized values for MSCI are between 50 and 92.85 and for Sustainalytics between 4 and 69.75 (Table 2).

Table 1. Sample companies and respective absolute ESG scores. Includes scores from MSCI, Refinitiv, and Sustainalytics. MSCI's scores required numerical conversion.

Company	MSCI score	MSCI converted score	Refinitiv score	Sustainalytics score
Walmart	BBB	5	86	24.6
Amazon	BBB	5	83	30.3
Apple	BBB	5	80	16.7
CVS Health	A	6.4285	89	22
UnitedHealth Group	AA	7.857	74	17.4
Exxon Mobil	BBB	5	67	36.5
Alphabet	BBB	5	82	24.6
AmerisourceBergen	A	6.4285	77	12.1
Cigna	AA	7.857	81	14.2
AT&T	BBB	5	76	22.1
Microsoft	AAA	9.285	93	15.2
Cardinal Health	A	6.4285	78	12.6
Chevron	A	6.4285	86	38.4
Walgreens	AA	7.857	88	16.3
Marathon Petroleum	A	6.4285	79	28.7

Table 2. Sample companies and respective normalized ESG scores. Includes scores from MSCI, Refinitiv, and Sustainalytics.

Company	MSCI score (normalized)	Refinitiv score (unchanged)	Sustainalytics score (normalized)
Walmart	50	86	38.5
Amazon	50	83	24.25
Apple	50	80	58.25
CVS Health	64.285	89	45
UnitedHealth Group	78.57	74	56.5
Exxon Mobil	50	67	8.75
Alphabet	50	82	38.5
AmerisourceBergen	64.285	77	69.75
Cigna	78.57	81	64.5
AT&T	50	76	44.75
Microsoft	92.85	93	62
Cardinal Health	64.285	78	68.5
Chevron	64.285	86	4
Walgreens	78.57	88	59.25
Marathon Petroleum	64.285	79	28.25

Each company received varying levels of ESG scores from the rating agencies (Figure 1). There are some alignments for companies like Cardinal Health and AmerisourceBergen, where the companies received scores within a close 13 point (from 64.285 to 77) and 14 point (from 64.285 to 78) range, respectively, from all three rating agencies. There are also instances where companies receive almost identical scores from agencies. For example, Microsoft received a score of approximately 93 from both MSCI and Refinitiv. Cigna also received a 79 from MSCI and 81 from Refinitiv. However, 12 of the 15 analyzed corporations have at least one significant outlier score, with an outlier defined as at least a 17 point deviation from the nearest other score. There are obvious differences in how each agency rates an individual company and how these differences affect the final company ESG score.

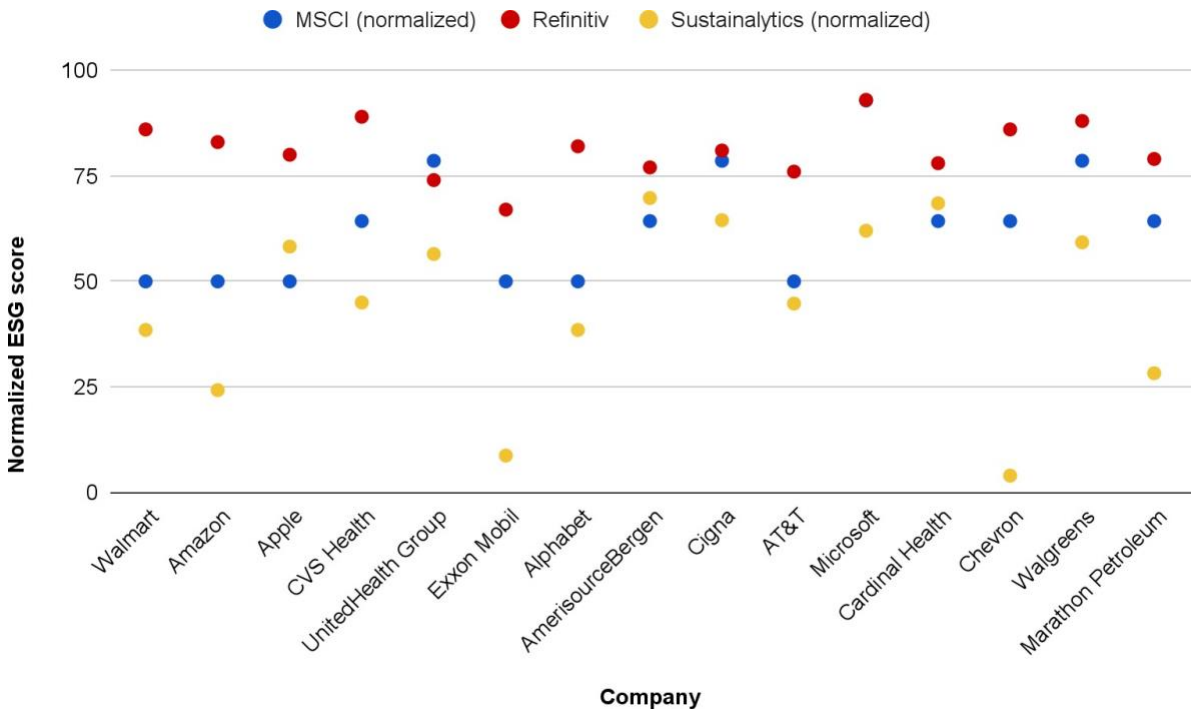

Figure 1. Normalized ESG scores per company. Includes scores from MSCI, Refinitiv, and Sustainalytics. Plotted against each of the 15 sample companies.

Within the companies themselves, there are some that consistently score on the higher end, by each agency definition (Table 3) such as Cigna, Microsoft, and Walgreens with score ranges 64.5 to 81, 62 to 93, 59.25 to 88 respectively. However, such close proximity only applies to those three companies, with the majority of the other companies scoring a much greater range of values between rating agencies. Chevron scores the lowest overall rating of 4 from Sustainalytics on a normalized scale, which is a very low score compared to the two other contenders that gave the company normalized ratings of 64.285 and 86. Among the firms, ExxonMobil consistently scored on the low end of the score ranges for all rating agencies. However, this was the only firm for which this finding was the case – all other companies, apart from the three highest scoring ones – had no consistencies among their scoring patterns.

According to the severity rankings each company provides (Table 3), Sustainalytics appears to be the most sensitive to corporate environmental actions. Their company categorization is more strict compared to the others, as it lists Amazon, ExxonMobil, and Chevron in their highest risk tier that are not scored as strictly among the other rating agencies.

Table 3. Scoring severity assessment as defined by each rating agency. MSCI, Refinitiv, and Sustainalytics each categorize companies by ESG performance on their individual rating scale. There are three tiers for each agency's scale with "Low" for poorest performance, "Medium" for medium performance, and "High" for best performance.

MSCI range	**Low (CCC-B)**	**Medium (BB-A)**	**High (AA-AAA)**
		Walmart	UnitedHealth
		Amazon	Cigna
		Apple	Microsoft
		CVS	Walgreens
		Alphabet	
		AmerisourceBergen	
		Cardinal Health	
		Chevron	
		Marathon Petroleum	
Refinitiv range	**Low (0-50)**	**Medium (51-75)**	**High (76-100)**
		UnitedHealth	Walmart
		Exxon	Amazon
			Apple
			CVS
			Alphabet
			AmerisourceBergen
			Cigna
			AT&T
			Microsoft
			Cardinal
			Chevron
			Walgreens
			Marathon Petroleum
Sustainalytics range	**Low (30-40)**	**Medium (20-30)**	**High (0-20)**
	Amazon	Walmart	Apple
	Exxon	CVS	UniteHealth
	Chevron	Alphabet	AmerisourceBergen
		AT&T	Cigna
		Marathon Petroleum	Microsoft
			Cardinal Health
			Walgreens

Refinitiv provides the most lenient scoring, as almost all of the sample companies are listed under the highest achieving category, with only UnitedHealth and Exxon in their medium-tier, posing a more positive categorization than both MSCI and Sustainalytics. There are no weights for types of industry since each company in the sample, that all represent a range of industries, was rated on the same scale for each rating agency.

Company environmental disclosure

GRI sorts their disclosures into seven sections: Materials, Energy, Water and Effluents, Biodiversity, Emissions, Waste, and Supplier Environmental Assessment. I determined 113 quantitative environmental GRI metrics in total out of 198 total environmental metrics (that include qualitative), among these, seven overarching seven topics. The GRI lists the majority of metrics under topics under Emissions and the least under Biodiversity.

Across the sample companies, I found an average of 55 reported environmental metrics per company (Table 4). The two companies that reported the highest number of metrics were Microsoft with 90 metrics and Chevron with 89 metrics. The two lowest reporting companies were UnitedHealth with 20 metrics and Cigna with 21 metrics. Companies reported on an average of 55 quantitative environmental GRI metrics. They reported on an average of 18 quantitative environmental GRI metrics and an average of 37 company-specific quantitative environmental metrics in addition to the GRI ones. There were no extreme outliers among the sample companies, making the average an accurate representation of the general company reporting behavior.

Table 4. Number of metrics per company. Categorized by total amount of metrics, among of metrics listed under GRI, and amount of metrics the respective company created themselves.

Company	Total metrics	GRI metrics	Individual metrics
Walmart	85	12	73
Amazon	37	9	28
Apple	47	12	35
CVS Health	83	12	71
UnitedHealth	20	11	9
ExxonMobil	58	17	41
Alphabet	51	16	35
AmerisourceBergen	35	15	20
Cigna	21	9	12
AT&T	69	29	40
Microsoft	90	29	61
Cardinal Health	19	16	3
Chevron	89	17	72
Walgreens	35	4	31
Marathon Petroleum	81	57	24
Average	55	18	37

The environmental topic most covered among company reported metrics is Emissions. On average, 42% of a company's quantitative metrics fall under this category (Figure 2). Every company's report has some form of Scope 1, 2, or 3 metrics included in their sustainability report. Waste metrics are the second-most reported in 19.6% of the analyzed sustainability reports. The least reported environmental category was Biodiversity with a 1.7% makeup of the total metrics reported.

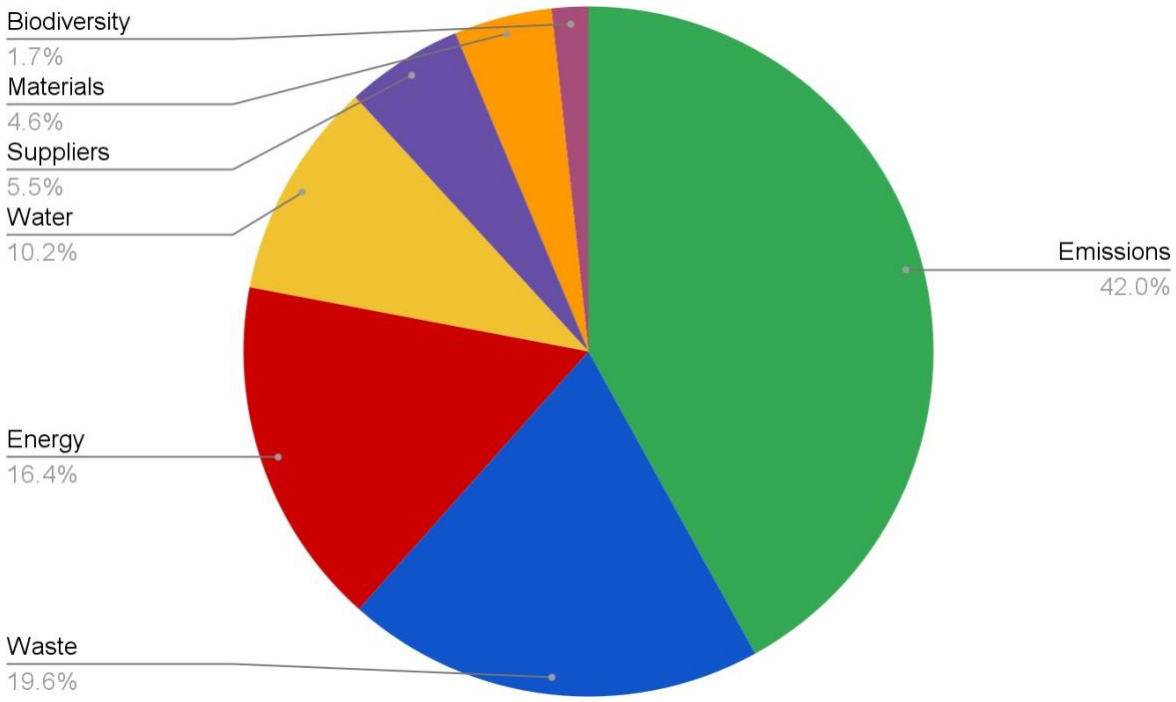

Figure 2. Company disclosure distribution per GRI environmental categories. These percentages illustrate the proportions of total reported quantitative environmental metrics (including both GRI and company-specific metrics) that cover each of the 7 GRI-defined environmental disclosure topics.

Company environmental disclosure and ESG score relationship

The first regression for MSCI does not show any type of relationship between company environmental disclosure and ESG scores with a correlation estimate of -0.005284 (Figure 3). The second regression for Refinitiv shows a slightly more pronounced, yet weak relationship between company disclosure and ESG scores with an estimate of 0.10812. Third, Sustainalytics demonstrates a weak relationship as well with an estimate of 0.16045. With p-values above 0.05 for all correlations, these results are statistically nonsignificant and therefore the null hypothesis that there is no correlation can not be rejected. Among the rating agencies, there is no clear trend of an overall positive or negative correlation between corporate environmental disclosure and ESG scores.

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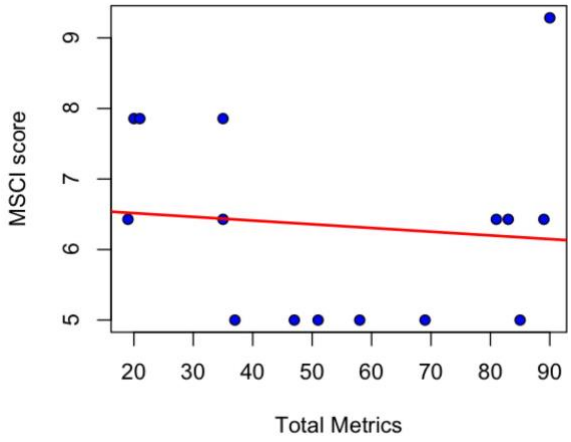

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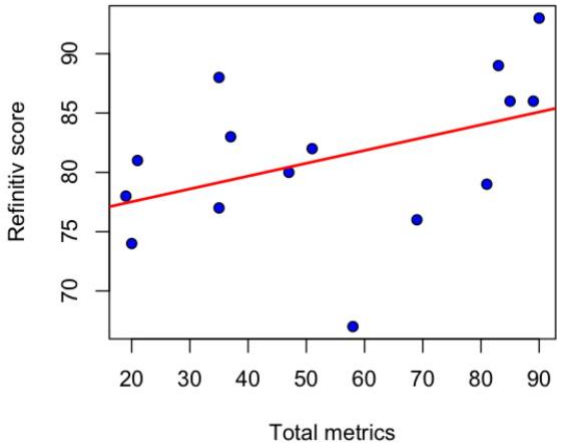

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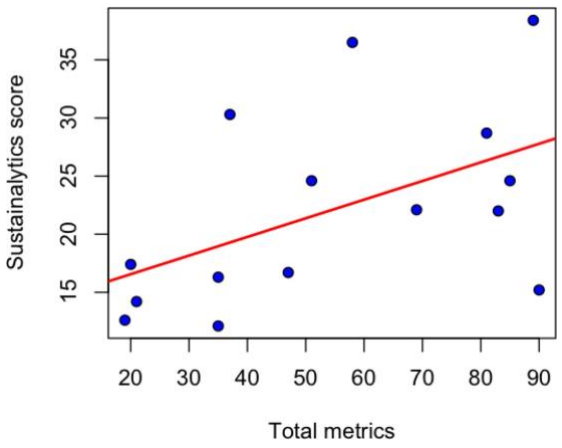
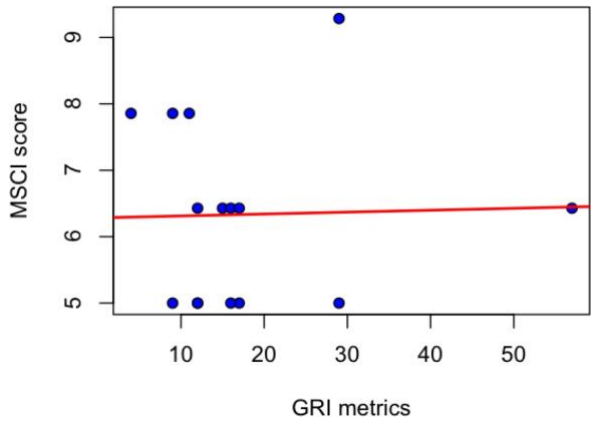


Figure 3. Relationship between total metrics and ESG score. Linear regression to analyze the effect of the number of the total quantitative environmental metrics the sample companies mentioned in the sustainability reports on the respective ESG score they received for by a) MSCI, b) Refinitiv, and c) Sustainalytics.

I found similar inconclusive results when testing for the relationship between company GRI quantitative environmental disclosure and ESG scores (Figure 4). The correlation estimate for the MSCI score was 0.002902, -0.1413 for Refinitiv, and 0.1413 for Sustainalytics – all demonstrating weak correlations. For each of the three regressions, the p-value was greater than 0.05, meaning the results are nonsignificant.

a)



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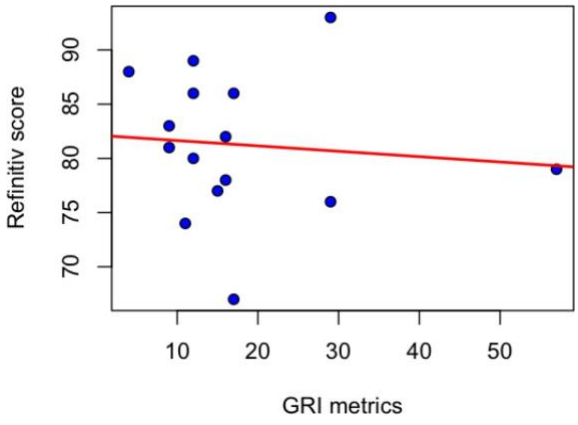

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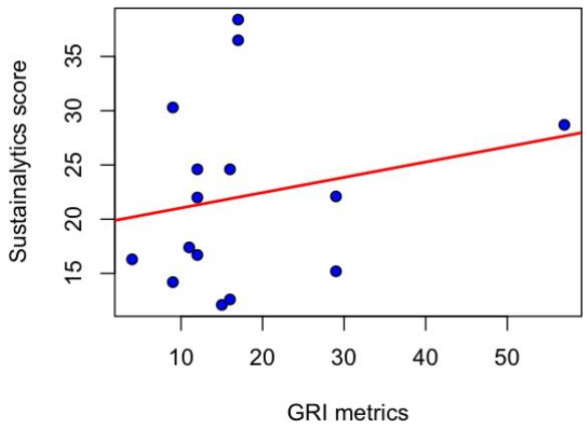

Figure 4. Relationship between GRI metrics and ESG score. Linear regression to analyze the effect of the number of the quantitative environmental GRI metrics the sample companies mentioned in the sustainability reports on the respective ESG score they received for by a) MSCI, b) Refinitiv, and c) Sustainalytics.

DISCUSSION

In my quantitative environmental disclosure analysis of some of the top US companies and three of the most popular ESG rating agencies, I found that given ESG scores varied greatly among companies as well as agencies. A clear trend I saw among companies, though, was that they reported the most quantitative metrics within the categories Emissions and Waste, despite reporting on far fewer metrics than they could, given the available GRI disclosures. Ultimately, my central research question was answered with the result that there is no clear relationship between the amount of quantitative environmental disclosure and ESG scores, meaning companies should focus more on the quality rather than quantity of their quantitative metrics.

ESG score distribution

For the majority of companies, their given third-party ESG scores varied greatly. This finding aligns with previous research by Berg et al. (2019) and Christensen et al. (2022) that reaches the same conclusion. The difference in agency assessment is attributed to each agency's individual rating methodology with differences in measurement approaches acting as the main driver. As Berg et al. (2019) explain, there are three reasons for score divergence: Scope divergence, weight divergence, and measurement divergence. In most cases scope divergence is the reason for the differences in rating agency ESG scores.

Refinitiv consistently gave companies the highest score of the three. An explanation for this reoccurring observation is that this agency uses the most individual indicators for company ESG assessment (Berg et al. 2019, Refinitiv 2022). In addition to Environmental, Social, and Governance, Refinitiv measures economic indicators as well, such as net income growth and capital expenditure, which the other agencies do not include in their evaluation. Given that my sample companies are the highest earning companies in the US, they are very likely to score high within such economic indicators since they have the most resources for economic growth and as well as the funds for increased environmental expenditure (Handayani and Maharani, 2021). This economic consideration is therefore a possible source of Refinitiv's relative higher scoring across the sample companies.

MSCI's scores remained within a range of normalized scores of 50 to 75. In most cases, MSCI appears to be a form of middle ground between the two more extreme ends of scores that Refinitiv and Sustainalytics present. This stable range of scoring can likely be attributed to the fact that MSCI measures specific exposure scores that evaluates how relevant an issue is for the company (Berg et al. 2019, MSCI 2022) – a type of indicator the other two rating agencies do not account for. Thus, MSCI's scores are more stabilized than Sustainalytics', for example, due to an elimination of any industry bias.

Sustainalytics, on the other hand, calculates its risk score as "the sum of unmanaged risk," with "unmanaged risk" defined as the proportion of a company's exposure to ESG risk that remains a risk to the company regardless of its management practices (Sustinalytics 2020). This sum is derived from the following calculation: *Sub-Industry Exposure to ESG Risk - Managed Risk* (the proportion of a company's ESG exposure that *can* be managed through its policies and programs) per each sub-industry material ESG issue. Due to this calculation, Sustainalytics is very sensitive to the industry each company is in, which is reflected in the sample companies' ratings (Berg et al. 2020, Sustainalytics 2020). For example, the companies ExxonMobil and Chevron received significantly lower normalized scores from Sustainalytics (i.e. increased ESG risk) than the other sample companies. As both companies are within petroleum refining and thus engage in the number one contributing sector to climate change (AAAS 2016), it is no surprise that the industry risk influenced the Sustainalytics score. Even if these two firms were to engage in similar levels of ESG management as some of the other sample companies, due to the naturally high-ESG-risk industry Chevron and Exxon are involved in, they have to invest greater efforts in management for a comparatively similar score to some of the higher scoring companies. Perhaps Marathon Petroleum presents such a case. This firm is also an oil refinery, it scores higher than the other two refineries, likely due to its increased managed risk (Marathon Petroleum 2022).

The finding that ESG scores vary greatly for each company raises the question on which agency gives the most accurate rating of a company's sustainability. The discrepancies in scores creates a confusing picture to the public of how a score reflects a company's sustainability (Berg et al. 2019). It is important to know what each agency's scores represent, their weight on different ESG categories, and what type of performance is measured for in order to make any kind of proper assessment of a company's sustainability. Thus, a given ESG score on its own

cannot confidently give an accurate picture of a company's actual sustainability. With sustainability scores only giving a limited degree of insight into a company's efforts, there are other factors to examine in addition when making an informed investment.

Company environmental disclosure

Companies are reporting far fewer environmental metrics than they could and should as an environmentally responsible business. Per Global Reporting Index, there are 7 categories (GRI 2022) that apply to any business of the size of these Fortune 500 companies. Of all quantitative metrics within the GRI environmental disclosures, the sample companies only reported on an average of approximately 16% of all possible metrics with the majority falling into the categories of Emissions and Waste.

This trend in category representation within disclosure aligns with environmental regulations across the US. Regulations on corporate environmental disclosure are currently sparse in the US (Davies et al. 2020). With only one corporate reporting regulation in place, emissions are the most regulated corporate environmental metric (Yang et al. 2021). This emission disclosure requirement is issued under the Greenhouse Gas Reporting Program (GHGRP) implemented by the EPA in 2009 requires companies of a certain industry to report on all greenhouse gas emissions as well (Yang et al. 2021, EPA 2023). Most companies covered in the GHGRP are within sectors involving fossil fuels, which is why Chevron, ExxonMobil, and Marathon Petroleum had the most detailed Emissions metrics (Yang et al. 2021, Chevron 2022, ExxonMobil 2022, Marathon Petroleum 2022). A recent proposal for a further advanced disclosure-focused policy is the 2022 Enhancement and Standardization of Climate-Related Disclosures for Investors. This United States Securities and Exchange Commission (SEC) regulation would require companies to report on Scope 1 and 2 emissions and their respective breakdowns (SEC 2022). However, this regulation has yet to be implemented.

As far as waste goes, there is no current US regulation on waste reporting (Cicchiello et al. 2022). Although regulations on waste recycling and hazardous waste management exist (EPA 2023), corporate reporting on it has yet to develop. Therefore, the relatively high amounts of waste reporting I observed among the sample companies can likely be attributed to the extensive

metrics predetermined in ESG disclosure guidelines (such as the GRI) that companies choose to voluntarily follow.

I observed from the results that Biodiversity and Materials are the least represented. Biodiversity is perhaps one of the most undervalued environmental categories because positive biodiversity impacts are difficult to measure and its effects oftentimes only start to become evident in the long-term future (Skouloudis et al. 2018). Changes in biodiversity are difficult to quantify and thus are lacking in measurement and regulation (Skouloudis et al. 2018). Materials, however, were surprising to see underrepresented. For example, Amazon, the largest ecommerce platform worldwide (Statista 2023) and only reports on 2 material metrics despite their heavy engagement with materials. And not to mention, the sourcing of sold items falls under the Materials category as well.

This raises the question of why companies are not reporting on more than they currently are. The first reason is that there is simply a lack in reporting requirements and standards (Cicchiello et al. 2022, Perrello-Marin et al. 2022, Berg et al. 2020). Most of the environmental categories that appeared in the company sustainability reports have no type of reporting regulation tied to them. As Braam et al. (2016) pointed out, voluntary reporting is significantly less prevalent among corporations, small and large, versus the effect of government-set regulations. Currently, the push of investor expectations initiates the most baseline reporting (Giese et al. 2019) as companies try to display their transparency in efforts towards being more sustainable. However, in order for companies to truly be held accountable for their impacts, actual government regulation is required.

Another reason why companies are not reporting on the more metrics is because they do not have resources to do so. Some environmental metrics are straightforward in their measurement, such as Scope 1 emissions since these are all direct emissions that occur from sources controlled by an organization (EPA 2023). However, there are other metrics, like Scope 3 emissions, that are more difficult to track because they involve the activities of assets that are not controlled by the reporting organization but still count as an indirect effect of the organization on its value chain (EPA 2023). Thus, if companies are not required to report on them, they will not invest an extensive amount of their resources to further assess them. However, if they are held to certain standards, companies will reallocate their resources in order to generate the best tracking of that metric.

Company environmental disclosure and ESG score relationship

The data shows that there is no clear relationship between level of quantitative environmental disclosure and ESG scores for each of the rating agencies. Though at first glance there appears to be a slight correlation between the two variables for Refinitiv and Sustainalytics given the R2 values 0.10812 and 0.16045, respectively, the p-values demonstrate that each of the correlations are statistically insignificant. This finding did not align with my hypothesis since I predicted that though there would be no overall trend in the relationship, the individual correlations between the two variables per rating agency would be strongly oriented – positive or negative – given the findings of Berg et al. (2019, 2020). My research shows that the previously found conclusion that disclosure and ESG scores are related does not apply to quantitative environmental metrics. Thus, quantitative environmental metrics are not a predictor for ESG scores. The possible reason for this difference in findings is that Berg et al. (2019, 2020) took qualitative ESG factors into consideration. Perhaps the amount of qualitative disclosures will influence a stronger correlation between ESG scores since an increase in company policies or rules could directly translate to better management practices – one of the most valued aspects for ESG score evaluation.

What my results demonstrate is that simply reporting on more metrics will not help improve a company's ESG score. Instead, companies should focus on investing resources into the quality of metrics they measure and improving management practices because those factors are what appear to influence ESG scoring the most.

Limitations

Perhaps the largest limitation in this research was my manual data collection process. Though I could target my search towards finding specific GRI metrics and knew the exact wording for them, the majority of quantitative metrics in company reports I ended up extracting were phrased in ways that I was unable to predict. Thus, I could not use a programming software to extract all of the metrics I needed and had to manually filter through company reports instead. This time-consuming process limited the amount of companies I could evaluate. A larger sample size would have given me more data points that would have perhaps led to more significant

results. My data collection process also left room for human error. Due to the length of the sample companies' sustainability reports as well as the degree of embedment of quantitative metrics in text, there is a possibility that I overlooked some of them.

Another limitation is the amount of data I have available for the ESG score evaluation. For a better assessment of why companies received certain scores from agencies, a more detailed breakdown of scoring would have been helpful instead of simply the score itself. Also, I used the GRI standards for my evaluation, however, there are other public standards with a different format of disclosures I could have used as well. Thus, the results I received are biased towards what the voluntary disclosure requirements the GRI provides, and my analysis could have looked slightly different if I had used a different set of standards for evaluation instead.

Future Directions

There are still many nuances of ESG that we could explore. In relation to my study, an expansion of research could involve examining the relationship between ESG scores and the disclosure of Social or Governmental disclosure. An important aspect would be to also look into the effect qualitative metrics have on ESG scores, as well as whether scores are more sensitive to the disclosure of specific environmental categories. Environmental disclosure alone offers many possible future studies, as well: Given the expected changes in requirements, it would be valuable to test for the improvements in reporting behavior among companies, as well as comparing these to influences of disclosure regulations in other countries.

Conclusions

ESG scores can be useful to hold companies accountable for their management decisions within sustainability. However, stakeholders must only use the scores for any company assessment alongside the agency's scoring methodology explaining the exact meaning of a particular score as well as information regarding the company's actual environmental performance, not just management practices. For proper disclosure, government regulation is crucial to ensure complete sustainability transparency among corporations. Only reporting standards that can apply to any sector in addition to instruy-specific ones will help achieve

effective reporting improvements. Lastly, disclosure is only a means to help companies attain better sustainability practices; the actual improvement of environmental impacts a company attains is the most important goal for the sake of saving our planet from further anthropogenic degradation

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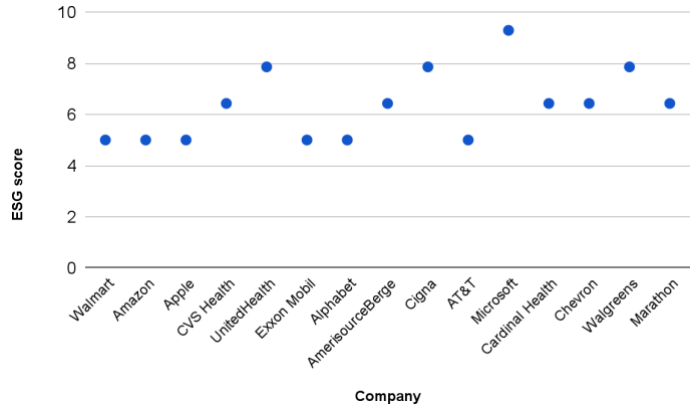
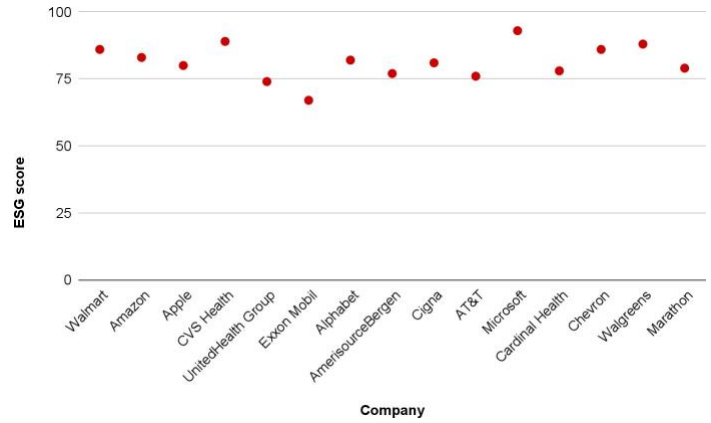
APPENDIX A

a)



b)



c)

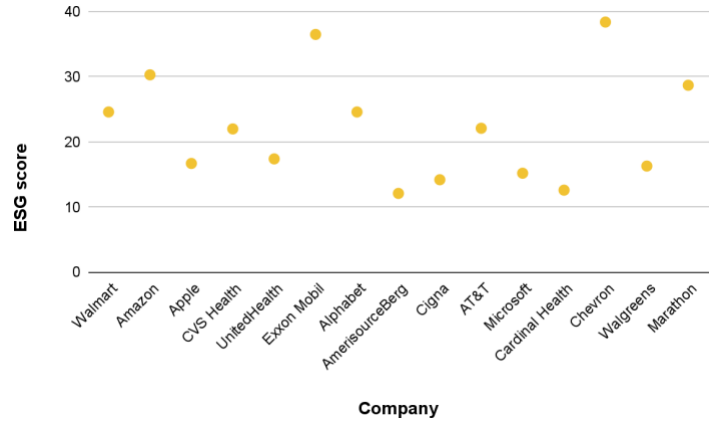


Figure A1. Absolute ESG scores per company. Includes scores from a) MSCI, b) Refinitiv, and c) Sustainalytics. Plotted against each of the 15 sample companies.

Table A1. Number of company metrics per GRI category. Total quantitative environmental metrics listed in the sample companies' sustainability reports categorized by each of the seven GRI-defined environmental topic.

Company	Materials	Energy	Water	Biodiversity	Emissions	Waste	Suppliers
Walmart	8	3	0	2	12	19	41
Amazon	2	8	0	0	16	4	3
Apple	0	18	1	0	16	11	4
CVS Health	0	6	3	0	58	17	0
UnitedHealth	0	5	2	0	10	3	0
ExxonMobil	0	2	8	4	26	12	0
Alphabet	2	13	3	2	22	5	0
AmerisourceBergen	0	10	1	0	8	15	0
Cigna	1	7	3	0	6	4	0
AT&T	0	29	5	1	36	31	0
Microsoft	0	14	7	0	59	14	0
Cardinal Health	0	8	1	0	6	6	0
Chevron	0	10	17	3	52	3	0
Walgreens	27	4	0	0	27	4	0
Marathon Petroleum	0	6	38	3	12	23	0
Total	40	143	89	15	366	171	48

Table A2. GRI quantitative environmental metrics. Extracted from the GRI Disclosures 301, 302, 303, 304, 305, 306, and 308.

Category	Requirement	Sub-requirement
301-1 Materials used by weight or volume	Total weight or volume of materials that are used to produce and package the organization's primary products and services during the reporting period	
301-1 Materials used by weight or volume		by i. non-renewable materials used;
301-1 Materials used by weight or volume		by ii. renewable materials used
301-2 Recycled input materials used	Percentage of recycled input materials used to manufacture the organization's primary products and services	
301-2 Recycled input materials used		total weight or volume of materials used as specified in Disclosure 301-1
301-3 Reclaimed products and their	Percentage of reclaimed products and their packaging materials for each product	

packaging materials	category	
302-1 Energy consumption within the organization	Total fuel consumption within the organization from non-renewable sources, in joules or multiples, and including fuel types used	
302-1 Energy consumption within the organization	Total fuel consumption within the organization from renewable sources, in joules or multiples, and including fuel types used	
302-1 Energy consumption within the organization	Total consumption	electricity
302-1 Energy consumption within the organization		heating
302-1 Energy consumption within the organization		cooling
302-1 Energy consumption within the organization		steam
302-1 Energy consumption within the organization	Total sold	electricity
302-1 Energy consumption within the organization		heating
302-1 Energy consumption within the organization		cooling
302-1 Energy consumption within the organization		steam
302-1 Energy consumption within the organization	Total energy consumption within the organization, in joules or multiples	
302-2 Energy consumption outside of the organization	Energy consumption outside of the organization, in joules or multiples	
302-3 Energy intensity	Energy intensity ratio for the organization	
302-4 Reduction of energy consumption	Amount of reductions in energy consumption achieved as a direct result of conservation and efficiency initiatives, in joules or multiples	
302-4 Reduction of energy consumption	Standards, methodologies, assumptions, and/or calculation tools used	
302-5 Reductions in energy requirements of	Reductions in energy requirements of sold products and services achieved during the	

products and services	reporting period, in joules or multiples	
303-3 Water withdrawal	Total water withdrawal from all areas in megaliters	
303-3 Water withdrawal		Breakdown by surface water
303-3 Water withdrawal		Breakdown by groundwater
303-3 Water withdrawal		Breakdown by seawater
303-3 Water withdrawal		Breakdown by produced water
303-3 Water withdrawal		Breakdown by third-party water
303-3 Water withdrawal	Total water withdrawal from all areas with water stress in megaliters	
303-3 Water withdrawal		Breakdown by surface water
303-3 Water withdrawal		Breakdown by groundwater
303-3 Water withdrawal		Breakdown by seawater
303-3 Water withdrawal		Breakdown by produced water
303-3 Water withdrawal		Breakdown by third-party water
303-3 Water withdrawal	A breakdown of total water withdrawal from each of the sources listed in Disclosures 303-3-a and 303-3-b in megaliters	by freshwater
303-3 Water withdrawal		by other water
303-4 Water discharge	Total water discharge to all areas in megaliters	
303-4 Water discharge		Breakdown by surface water
303-4 Water discharge		Breakdown by groundwater
303-4 Water discharge		Breakdown by seawater
303-4 Water discharge		Breakdown by produced water
303-4 Water discharge		Breakdown by third-party water
303-4 Water discharge	A breakdown of total water discharge to all areas in megaliters	by freshwater
303-4 Water discharge		by other water
303-4 Water discharge	Total water discharge to all areas with water stress in megaliters	
303-4 Water discharge		Breakdown by freshwater
303-4 Water discharge		Breakdown by other water
303-4 Water discharge		Including number of incidents of non-compliance with discharge limits
303-5 Water consumption	Total water consumption from all areas in megaliters	
303-5 Water consumption	Total water consumption from all areas with water stress in megaliters	

303-5 Water consumption	Change in water storage in megaliters, if water storage has been identified as having a significant water-related impact	
304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas		Position in relation to the protected area (in the area, adjacent to, or containing portions of the protected area) or the high biodiversity value area outside protected areas
304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas		Size of operational site
304-1 Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas		Biodiversity value characterized by listing of protected status
304-3 Habitats protected or restored	Size and location of all habitat areas protected or restored, and whether the success of the restoration measure was or is approved by independent external professionals	
304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations	Total number of IUCN Red List species and national conservation list species with habitats in areas affected by the operations of the organization, by level of extinction risk	Critically endangered
304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations		Endangered
304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations		Vulnerable
304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations		Near threatened
304-4 IUCN Red List species and national conservation list species with habitats in areas affected by operations		Least concern

305-1 Direct (Scope 1) GHG emissions	Gross direct (Scope 1) GHG emissions in metric tons of CO2 equivalent	
305-1 Direct (Scope 1) GHG emissions	Biogenic CO2 emissions in metric tons of CO2 equivalent	
305-1 Direct (Scope 1) GHG emissions		Including emissions in the base year
305-2 Energy indirect (Scope 2) GHG emissions	Gross location-based energy indirect (Scope 2) GHG emissions in metric tons of CO2 equivalent	
305-2 Energy indirect (Scope 2) GHG emissions	gross market-based energy indirect (Scope 2) GHG emissions in metric tons of CO2 equivalent	
305-2 Energy indirect (Scope 2) GHG emissions		Including emissions in the base year
305-3 Other indirect (Scope 3) GHG emissions	Gross other indirect (Scope 3) GHG emissions in metric tons of CO2 equivalent	
305-3 Other indirect (Scope 3) GHG emissions	Biogenic CO2 emissions in metric tons of CO2 equivalent	
305-3 Other indirect (Scope 3) GHG emissions	Other indirect (Scope 3) GHG emissions categories and activities included in the calculation	
305-3 Other indirect (Scope 3) GHG emissions		Including emissions in the base year
305-4 GHG emissions intensity	GHG emissions intensity ratio for the organization	
305-4 GHG emissions intensity	Organization-specific metric (the denominator) chosen to calculate the ratio	
305-5 Reduction of GHG emissions	GHG emissions reduced as a direct result of reduction initiatives, in metric tons of CO2 equivalent	
305-5 Reduction of GHG emissions	Gases included in the calculation; whether CO2 , CH4 , N2O, HFCs, PFCs, SF6 , NF3 , or all	
305-6 Emissions of ozone-depleting substances (ODS)	Production, imports, and exports of ODS in metric tons of CFC-11 (trichlorofluoromethane) equivalent	
305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions	Significant air emissions, in kilograms or multiples, for each of the following	N0x
305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions		S0x

305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions		Persistent organic pollutants (POP)
305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions		Volatile organic compounds (VOC)
305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions		Hazardous air pollutants (HAP)
305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions		Particulate matter (PM)
305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions		Other standard categories of air emissions identified in relevant regulations
306-3 Waste generated	Total weight of waste generated in metric tons, and a breakdown of this total by composition of the waste	
306-3 Waste generated	Contextual information necessary to understand the data and how the data has been compiled	
306-4 Waste diverted from disposal	Total weight of waste diverted from disposal in metric tons, and a breakdown of this total by composition of the waste	
306-4 Waste diverted from disposal	Total weight of hazardous waste diverted from disposal in metric tons	
306-4 Waste diverted from disposal		Breakdown by preparation for use
306-4 Waste diverted from disposal		Breakdown by recycling
306-4 Waste diverted from disposal		Breakdown by other recovery operations
306-4 Waste diverted from disposal	Total weight of non-hazardous waste diverted from disposal in metric tons	
306-4 Waste diverted from disposal		Breakdown by preparation for use
306-4 Waste diverted from disposal		Breakdown by recycling
306-4 Waste diverted from disposal		Breakdown by other recovery operations
306-4 Waste diverted from disposal	For each recovery operation listed in Disclosures 306-4-b and 306-4-c, a breakdown of the total weight in metric	onsite

	tons of hazardous waste and of non-hazardous waste diverted from disposal broken down by	
306-4 Waste diverted from disposal		offsite
306-5 Waste directed to disposal	Total weight of waste directed to disposal in metric tons, and a breakdown of this total by composition of the waste	
306-5 Waste directed to disposal	Total weight of hazardous waste directed to disposal in metric tons	
306-5 Waste directed to disposal		Breakdown by Incineration (with energy recovery)
306-5 Waste directed to disposal		Breakdown by Incineration (without energy recovery)
306-5 Waste directed to disposal		Breakdown by landfilling
306-5 Waste directed to disposal		Breakdown by Other disposal operations
306-5 Waste directed to disposal	Total weight of non-hazardous waste directed to disposal in metric tons	
306-5 Waste directed to disposal		Breakdown by Incineration (with energy recovery)
306-5 Waste directed to disposal		Breakdown by Incineration (without energy recovery)
306-5 Waste directed to disposal		Breakdown by landfilling
306-5 Waste directed to disposal		Breakdown by Other disposal operations
306-5 Waste directed to disposal	For each disposal operation listed in Disclosures 306-5-b and 306-5-c, a breakdown of the total weight in metric tons of hazardous waste and of non-hazardous waste directed to disposal:	onsite
306-5 Waste directed to disposal		offsite
308-1 New suppliers that were screened using environmental criteria	Percentage of new suppliers that were screened using environmental criteria	
308-2 Negative environmental impacts in the supply chain and actions taken	Number of suppliers assessed for environmental impacts	
308-2 Negative environmental impacts in the supply chain and actions taken	Number of suppliers identified as having significant actual and potential negative environmental impacts	
308-2 Negative environmental impacts in the supply chain and actions taken	Percentage of suppliers identified as having significant actual and potential negative environmental impacts with which improvements were agreed upon as a result	

	of assessment	

Table A3. Individual company quantitative environmental metrics. Extracted and compiled from each sample company's sustainability report.

Category	**Requirement**	**Sub-requirement**
Waste	Percentage of waste materials diverted from landfill and incineration per country	US
Waste		Canada
Waste		Mexico
Waste	Approximate percentage of waste by destination type (by weight)	Donation to people
Waste		Animal feed
Waste		Composting
Waste		Anaerobic digestion
Waste		Incineration (with and without recovery)
Waste		Landfill
Waste		Biochemical processing
Materials	Percentage private-brand plastic packaging in North America made of post-consumer recycled content	
Materials	Percentage of global private-brand packaging that is recyclable, reusable or industrially compostable	
Materials	Percent reduction in private-brand packaging virgin plastic vs. prior year	
Waste	Pounds of food waste diverted globally from waste stream through composting, animal feed, anaerobic digestion and biochemical processing	
Waste	Pre-consumer food waste prevented in cafes	
Waste	Food donations globally	
Waste	Percent Reduction in packaging used	
Waste	Consumer recycling through customer recycling programs	
Waste	Percentage of private-brand supplier-reported sales with recycle label	
Waste	Percentage of consumption goods labeled with recycling label	
Supplier	Numberof suppliers reporting progress on either or both the waste and packaging pillars of Project Gigaton (waste reduction project)	

Supplier	Number of suppliers reporting through Project Gigaton's nature pillar on their nature goals	
Biodiversity	Total amount invested to help preserve irreplaceable landscapes	
Emissions	Total annual GHG emissions	
Emissions	Percent change in annual emissions vs. previous year	
Emissions	Percent change in emission intensity vs. previous year	
Emissions	Percent change in carbon intensity, per revenue	
Emissions	GHG emissions intensity	
Emissions		Upstream
Emissions		Downstream
Emissions		Chemical
Energy	Energy intensity ratio	
Energy	Percentage of global electricity needs supplied by renewable sources	
Energy	Percentage of renewable electricity	
Energy	Emissions reduced by suppliers since a basline year	
Energy	Global renewable energy projects announced	
Supplier		Number of suppliers reporting
Supplier		Percentage of net sales represeted by these suppliers
Supplier	Reduced or avoided emissions by suppliers in reporting year	
Other	Physical risk assessment	
Supplier	Specific foods sourced sustainably	
Energy	percentage grid electricity used	
Energy	Electric transportation used for devlieries	
Energy	Number of renewable energy products	
Other	Amount of sustainable certified products	
Energy	Percent of sites tracked by the US EPA's ENERGY STAR program	
Energy	Percent ENERGY STAR certified sites	
Other	Number of LEED Certified facilities	
Other	Percent of LEED Certified sites	
Other	Number of LEED Certified offices	
Other		Platinum (cumulative)

Other		Gold (cumulative)
Other		Certified and silver (cumulative)
Emissions	Lifecycle emissions	
Waste	Volume in plastic avoided	
Waste	Volume of cardboard recycled	
Waste	Volume of plastic bags recycled (tons)	
Waste	Volume of pallets recycled	
Waste	Volume of electronic waste recycled	
Waste	Volume of plastic bottles and cans recycled (tons)	
Waste	Volume of paper recycled	
Waste	Percentage of pulp and paper that is recyclable or certified as sustainable	
Waste	Volume of white paper recycled (tons)	
Waste	Volume of mixed paper recycled (tons)	
Waste	Volume of confidential paper recycled (tons)	
Emissions	Scope 1 emissions CO2	mtCO2
Emissions	Scope 1 emissions CH4	mtCO2e
Emissions	Scope 1 emissions other gases (than CO2 and CH4)	mtCO2e
Emissions	Scope 1 emissions N2O	mtCO2e
Emissions	Scope 1 emissions HFCs	mtCO2e
Emissions	Scope 1 emissions SF6	mtCO2e
Emissions	Scope 1 emissions CH4	mt
Emissions	Scope 1 emissions N2O	mt
Emissions	Scope 1 emissions HFCs	mt
Emissions	Scope 1 emissions SF6	mt
Emissions	Scope 1 total emissions (percentage of total emissions)	
Emissions	Scope 1 emissions from gas usage (tCO2e)	
Emissions		Natural gas (tCO2e)
Emissions		Natural gas (% of total emissions)
Emissions		Other fuels (tCO2e)
Emissions		Other fuels (% of total emissions)
Emissions	Scope 1 emissions from fleet vehicles	
Emissions	Scope 1 emissions from air fleets	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 1 process emissions	
Emissions	Scope 1 emissions from corporate fleets	in tCO2e

Emissions		as percentage of total emissions
Emissions	Scope 1 emissions from private delivery fleets	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 1 emissions from fossil fuels	
Emissions	Scope 1 emissions from refrigerants	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 1 emissions from flaring	
Emissions	Scope 1 emissions Asia	
Emissions	Scope 1 emissions Europe, Middle East, Africa	
Emissions	Scope 1 emissions Latin America	
Emissions	Scope 1 emissions North America	
Emissions	Scope 1 emissions Upstream	Total (all GHGs)
Emissions		CO2
Emissions		CH4 in million tonnes
Emissions		CH4 in million tonnes CO2e
Emissions		other GHGs in million tonnes CO2
Emissions	Scope 1 emissions Upstream flaring	Total (all GHGs)
Emissions		CO2
Emissions		CH4 in million tonnes
Emissions		CH4 in million tonnes CO2e
Emissions		other GHGs in million tonnes CO2
Emissions		Volume of flares
Emissions	Scope 1 emissions Midstream	Total (all GHGs)
Emissions		CO2
Emissions		CH4 in million tonnes
Emissions		CH4 in million tonnes CO2e
Emissions		other GHGs in million tonnes CO2
Emissions	Scope 1 emissions Downstream	CO2
Emissions		CH4 and other GHGs in million tonnes CO2e
Emissions	Scope 1 emissions Liquefied Natural Gas	Total (all GHGs)
Emissions		CO2
Emissions		CH4 and other GHGs in million tonnes CO2e
Emissions	Scope 1 emissions Chemicals	CO2
Emissions		CH4 and other GHGs in million tonnes CO2e
Emissions	Scope 1 emissions Other	CO2

Emissions		CH4 and other GHGs in million tonnes CO2e
Emissions	Scope 2 emissions (market-based)	Upstream
Emissions		Midstream
Emissions		Downstream
Emissions		LNG
Emissions		Chemicals
Emissions		Other
Emissions	Percent change in Scope 1 emissions from base year	
Emissions	Scope 2 total emissions from electricity	
Emissions	Scope 2 emissions (percentage of total emissions)	
Emissions	Scope 2 emissions from electricity, steam and chilled water	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 2 emissions CO2 (location-based)	mtCO2e
Emissions	Scope 2 emissions CH4 (location-based)	mtCO2e
Emissions	Scope 2 emissions N2O (location-based)	mtCO2e
Emissions	Scope 2 emissions CO2 (market-based)	mtCO2e
Emissions	Scope 2 emissions CH4 (market-based)	mtCO2e
Emissions	Scope 2 emissions N2O (market-based)	mtCO2e
Emissions	Scope 2 emissions CH4 (location-based)	mtCO2
Emissions	Scope 2 emissions N2O (location-based)	mtCO2
Emissions	Scope 2 emissions CH4 (market-based)	mtCO2
Emissions	Scope 2 emissions N2O (market-based)	mtCO2
Emissions	Scope 2 emissions Asia (location-based)	
Emissions	Scope 2 emissions Europe, Middle East, Africa (location-based)	
Emissions	Scope 2 emissions Latin America (location-based)	
Emissions	Scope 2 emissions North America (location-based)	
Emissions	Scope 2 emissions Asia (market-based)	
Emissions	Scope 2 emissions Europe, Middle East, Africa (market-based)	
Emissions	Scope 2 emissions Latin America (market-based)	
Emissions	Scope 2 emissions North America (market-based)	
Emissions	Percent change in Scope 2 emissions from base year	

Emissions	Total Scope 1 and 2 emissions (market-based)	
Emissions		as percentage of total emissions
Emissions	Total Scope 1 and 2 emissions (location-based)	
Emissions	Scope 3 emissions from corporate purchases	
Emissions	Scope 3 emissions from capital goods	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from Business travel	in tCO2e
Emissions		as percentage of total emissions
Emissions		Business air travel in tCO2e
Emissions		Business air travel as percentage of total emissions
Emissions		Rental cars in tCO2e
Emissions		Rental cars as percentage of total
Emissions		Personal cars in tCO2e
Emissions		Personal cars as percentage of total
Emissions	Scope 3 emissions from upstream leased assets	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from employee commute	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from business travel and employee commuting	
Emissions	Scope 3 emissions for activities other than business travel and employee commuting	
Emissions	Scope 3 emissions from purchased goods and services (i.e. manufacturing)	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from product transportation (upstream and downstream)	
Emissions	Scope 3 emissions from processing of sold products	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from product use (use of sold products)	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from product use (use of sold products) throughput method	
Emissions	Scope 3 emissions from product use (use of sold products) sales method	

Emissions	Scope 3 emissions from product use (use of sold products) refinery yield method	
Emissions	Scope 3 emissions from upstream transportation & distribution losses	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from upstream transportation	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from downstream transportation & distribution	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from downstream leased assets	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from end of life treatment of sold products	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from waste	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from investments	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 emissions from franchises	in tCO2e
Emissions		as percentage of total emissions
Emissions	Scope 3 from fuel- and energy-related activities (location-based)	
Emissions	Scope 3 from fuel- and energy-related activities (market-based)	
Emissions	Scope 3 natural gas production	
Emissions	Scope 3 emissions Upstream production	
Emissions	Scope 3 emissions Refining throughout	
Emissions	Scope 3 emissions petroleum sales	
Emissions	Scope 3 crude production	
Emissions	Scope 3 - other indirect emissions	
Emissions	Percent change in Scope 3 emissions from base year	
Emissions	Total Scope 1 and 2 location-based and 3 emissions	
Emissions	Total Scope 1 and 2 market-based and 3 emissions	
Emissions	Total Scope 1 + 2 market-based + 3 emissions from business travel and employee commuting only	

Emissions	Total Scope 1 + 2 location-based + 3 emissions from business travel and employee commuting only	
Emissions	Percent change in total emissions from base year	
Emissions	Emissions from business travel	United States
Emissions		United States % change from base year
Emissions		International
Emissions		International % change from base year
Emissions	Emissions reduced by renewable energy PPAs	
Energy	Renewable electricity (PPAs and on-site)	
Energy	Renewable electricity (grid)	
Energy	Renewable electricity	
Energy	Total grid-purchased renewable energy	
Emissions	Total operational GHG emissions (after emissions reductions and compensations)	
Energy	Total U.S. corporate electricity consumption (MWh)	
Energy	Total international corporate electricity consumption (MWh)	
Energy	Fuel energy use from natural gas (MWh)	
Energy	Fuel energy use from biogas (MWh)	
Energy	Fuel energy use from propane liquid (MWh)	
Energy	Fuel energy use from gasoline (MWh)	
Energy	Fuel energy use from diesel (other) (MWh)	
Energy	Fuel energy use from diesel (mobile combustion) (MWh)	
Supplier	Supplier facility electricity savings (MWh/year)	
Energy	Corporate facility fuel savings (mmBTU/year)	
Energy	Global renewable energy production capacity of announced projects	
Energy	Equity investment combined renewable energy capacity	
Energy	Supplier facility fuel savings (mmBTU/year)	
Energy	Total on-site renewable energy capacity	kW
Energy	Total on-site renewable energy production	kWh

Energy	Annual energy production of announced projects	
Supplier	Supplier renewable energy capacity (operational) (GW)	
Supplier	Supplier renewable energy capacity (commercial) (GW)	
Supplier	Supplier renewable energy use (MWh)	
Water	Total freshwater consumption (Mgal)	
Water	Total recycled water consumption (Mgal)	
Water	Total alternative source water consumption (Mgal)	
Water	Supply chain freshwater saved (Mgal)	
Waste	Landfill diversion rate (%)	
Waste		by data centers
Waste		by offices
Waste	Total Hazardous waste generated (lbs)	
Waste	Total non-hazardous waste generated	
Waste	Percent domestic nonhazardous waste generated	
Waste	Percent nonhazardous waste recycled	
Waste	Percent nonhazardous waste reused	
Waste	Hazardous waste recycled (Percentage of total waste generated)	
Waste	Percent nonhazardous waste sent to landfill	
Waste	Percent nonhazardous waste incinerated	
Waste	Percent nonhazardous waste composted	
Waste	Other nonhazardous waste	
Waste	Percent other nonhazardous waste	
Waste	Other hazardous waste	
Waste	Percent other hazardous waste	
Waste	Total domestic hazardous waste generated	
Waste	Percent domestic hazardous waste generated	
Waste	Hazardous waste recycled (Percentage of total waste generated)	
Waste	Hazardous waste incinerated (Percentage of total waste generated)	
Waste	Hazardous waste landfilled (Percentage of total waste generated)	
Waste	Total hazardous waste	generated from remediation
Waste		disposed from remediation

Waste		beneficial reuse from remediation
Waste	Total non-hazardous waste	generated from remediation
Waste		disposed from remediation
Waste		beneficial reuse from remediation
Waste	Supply chain waste diverted from landfill (metric tons)	
Waste	Total waste recycled (tons)	
Waste	Total non-hazardous waste recycled or incinerated with energy recovery	
Waste	Percent total waste recycled	
Waste	Total packaging waste generated (metrics tons)	
Waste	Packaging materials used	Recycled fiber (%)
Waste		Responsibly sourced virgin fiber (%)
Waste		Plastic (%)
Energy	Amount of renewable energy generated per country	
Energy	Percent reduction / increase in energy consumption against baseline	
Water	Water use for retail space (Msf)	
Water	Normalized water usage (per sq of retail space in ML)	
Emissions	Percent reduction / increase in emissions (Scope 1 + 2 location-based)	
Emissions	Carbon Offsets	
Water	Municipal water waste (Mm3)	
Emissions	Net GHG emissions	
Emissions	Emissions from exported power and heat	
Emissions		Upstream
Emissions		Midstream
Emissions		Downstream
Emissions		LNG
Emissions		Chemicals
Emissions		Other
Energy	Energy attribute certificates (RECs, GOOs)	
Emissions	Methane (CH4)	
Emissions	Methane (CH4) intensity	
Emissions	Carbon intensity per FTE employee	
Emissions	Carbon intensity per MWh of energy consumed	
Other	Hydrocarbon flaring (worldwide activities)	Africa/Europe/Middle East

Other		Americas
Other		Asia Pacific
Other	Hydrocarbon flaring (worldwide activities) intensity	
Emissions	CO2 captured for storage	
Water	Water intensity reduction	
Water	Water intensity	gal/$ thousand revenue
Water	Water intensity	gal/individual subscriber
Water	Freshwater intensity	
Water		Upstream
Water		Downstream
Water		Chemical
Water	Controlled hydrocarbon discharges to water	Upstream
Water		Downstream
Biodiversity	Spills to the environment	Number of reportable environmental incidents
Water		Number of marine vessel hydrocarbon spills
Biodiversity		Number of hydrocarbon spills (not from marine vessels)
Biodiversity		Volume of hydrocarbon spills (not from marine vessels)
Biodiversity		Number of other spills (not from marine vessels, non-hydrocarbon)
Biodiversity		Volume of other spills (not from marine vessels, non-hydrocarbon)
Biodiversity	Number of hazardous material spills	
Biodiversity	Volume of hazardous material spills	
Biodiversity	Petroleum spills to land and water	Volume
Biodiversity		Total volume recovered
Biodiversity		Number of spills
Other	Environmental expenditures	
Other	Number of environmental health and safety fines paid and settlements	
Other	Total dollars spent on environmental penalties, fines and settlements	
Other	Average annual fleet-wide PUE across data centers	
Energy	Renewable energy contracts	MW
Energy	Percent carbon-free energy across data centers (hourly)	
Energy	EV charging ports at offices in the US and Canada (cumulative)	

Emissions	Emissions avoided due to employee EV commuting in the US and Canada	
Emissions	Employee shuttle commuting trips in the Bay Area	Million trips
Emissions	Employee shuttle commuting trips in the Bay Area (peak daily)	Unique riders
Emissions	Emissions avoided due to employee shuttle trips in the Bay Area	
Biodiversity	Native trees planted on Bay Area campuses (cumulative)	Number of trees
Biodiversity	Native habitat restored and created on Bay Area campuses (cumulative)	Acres
Other	Cities and regions covered by the Environmental Insights Explorer Tool	
Energy	Household energy saved by customers using product. Nest thermostat	
Emissions	Global real estate footprint	Million sqf
Energy	Direct energy consumption	
Energy	Indirect energy consumption	
Energy	Total electricity use	in MWh
Energy	Total energy consumption	in MWh
Energy	Energy intensity	in MWh electricity / 1000 subscribers
Energy	Energy intensity	in MWh electricity / $ billion revenue
Energy	Percent total grid electricity / total energy	
Energy	Percent grid electricity	kWh / total electricity
Energy	Renewable energy certificates purchased and PPAs	
Energy	Renewable energy credits and PPAs	
Energy	Total energy projects implemented	
Energy	Total annualized energy conserved through energy saving projects	
Energy	Total annualized energy cost savings from energy projects	
Emissions	Emission intensity	per 1000 subscribers
Emissions		per $ billion
Waste	Total amount of products reused or recycled through the company	
Waste	Materials from take-back programs reused or sold	
Waste	Materials from take-back programs recycled	

Waste	Materials from take-back programs landfilled	
Waste	Amount of paper used for direct mail and office paper	
Waste	Total domestic waste managed by the company	
Water	Total water consumption	gal
Emissions	Emission intensity - Revenue	mtCO2/Revenue M$
Emissions	Emission intensity - Scope 1	mtCO2/Revenue M$
Emissions	Emission intensity - Scope 2 (location-based)	mtCO2/Revenue M$
Emissions	Emission intensity - Scope 2 (market-based)	mtCO2/Revenue M$
Emissions	Emission intensity - Scope 1 + 2 (location-based)	mtCO2/Revenue M$
Emissions	Emission intensity - Scope 3 (Business Travel)	mtCO2/Revenue M$
Emissions	GHG emissions with carbon neutral boundary	
Emissions	Offsets applied to reporting year	
Emissions	Net GHG emissions within carbon neutral boundary	
Emissions	Total removal offsets contracted	
Energy	Total electricity, heating, cooling, and steam	
Water	Third-party water withdrawal	
Water	Third-party water discharges	
Waste	Total waste directed to disposal for energy recovery	
Other	Oil Intensity	
Other	Gas intensity	
Emissions	Refining carbon intensity	
Energy	Total energy consumption	trillion BTU
Energy	Total energy consumption, operated assets and non operated joint-venture	trillion BTU
Energy	Manufacturing Energy Index	
Energy	Non-manufacturing energy index	
Energy	Energy intensity	Upstream
Energy		Pipeline
Energy		Shipping
Water	Freshwater withdrawn	Upstream
Water		Refining
Water		Other

Water	Non-freshwater withdrawn	Upstream
Water		Refining
Water		Other
Water	Freshwater withdrawn intensity	Upstream
Water		Refining
Water	Average oil concentration in discharges to surface water	Upstream
Water		Refining
Water	Total amount of oil discharged to surface water	Upstream
Water		Refining
Emissions	Total company emissions by source	Energy
Emissions		Product delivery
Emissions		Business travel
Emissions	Percentage change in total company emissions by source (from baseline year)	Energy
Emissions		Product delivery
Emissions		Business travel
Emissions	Emissions from energy, by type	Electricity
Emissions		Gas
Emissions		Other
Emissions		Total
Emissions	Percentage change in emissions from energy, by type	Electricity
Emissions		Gas
Emissions		Other
Emissions		Total
Energy	Energy use by segment	United States
Energy		United States % change from base year
Energy		International
Energy		International % change from base year
Waste	Total waste by method of disposal	Landfill
Waste		Incinerated
Waste		Recycled
Emissions	GHG emission intensity reduction since base year	
Energy	Energy consumption purchased/produced by combined heat and power	

Energy	Energy consumption purchased/produced by combined cycle gas turbine	
Emissions	Total CO emissions	
Water	Surface water withdrawal	by freshwater
Water	Groundwater withdrawal	by freshwater
Water	Seawater withdrawal	by other water
Water	Third-party water withdrawal	by freshwater
Water		by other water
Water	Total refining water consumption	
Water	Surface water discharge	by freshwater
Water		by other water
Water	Groundwater discharge	by freshwater
Water		by other water
Water		by freshwater
Water	Seawater discharge	by other water
Water	Third-party water discharge	by freshwater
Water		by other water
Biodiversity	Land owned, leased, and/or operated within areas of protected conservation status or endangered species habitat	
Supplier	Percentage of sustainably sourced fresh and frozen, wild-caught and farmed, seafood, based on supplier reports	US
Supplier		Sam's Club US
Supplier		Mexico
Supplier		Central America
Supplier	Percentage of wild-caught, fresh and frozen seafood sustainable sourced, based on supplier reports	US
Supplier		Sam's Club US
Supplier		Mexico
Supplier		Central America
Supplier		Canada
Supplier	Percentage of fresh and frozen farmed seafood sustainably sourced, based on supplier reports	US
Supplier		Sam's Club US
Supplier		Canada
Supplier		Mexico
Supplier		Central America

Supplier	Percentage of canned tuna sustainably sourced, based on supplier reports	US
Supplier		Sam's Club
Supplier	Percentage of private-brand coffee net sales that were sourced and certified as sustainable, based on supplier reports	US
Supplier		Sam's Club US
Supplier		Total US and Sam's Club
Supplier	Percentage of private brand black and green tea bags and instant iced teas sourced and certified as sustainable, based on supplier reports	
Supplier	Percentage of bananas and pineapples that were sourced and certified as sustainable, based on supplier reports	US bananas
Supplier		US pineapples
Supplier		Sam's Club bananas
Supplier		Sam's Club pineapples
Supplier	Percentage of net product sales in apparel from suppliers report that at least one facility that has completed the Sustainable Apparel Coalition's Higg FEM assessment for Walmart US	
Supplier	Percentage of cotton volume for US private brand apparel and home textile products sourced as "more sustainable" cotton, based on supplier reports	
Supplier	Percentage sustainably sourced cellulosic fiber	US
Supplier		Sam's Club
Supplier		Canada
Materials	Percentage recycled polyester	US
Materials		Canada
Materials		Sam's Club
Supplier	Percentage certified RSPO segregated or equivalent standards	10% certified segregated/higher
Supplier		80% certified mass balance / equivalent
Supplier	Number of acres involved in fertilizer optimization or soil health practice programs, based on supplier reports	
Supplier	Number of suppliers participating in fertilizer optimization or soil health plans	
Emissions	Packages delivered to customers' doorsteps using zero-emission vehicles	

Emissions	Delivery stations across North America and Europe equipped for electric vehicle use	
Materials	Percentage reduction in per-shipment packaging weight since base year	
Materials	Volume of packaging of packaging eliminated since base year	
Other	Products in Climate Pledge Friendly program	
Other	Climate Pledge friendly units shipped to Amazon customers	
Supplier	Supplier assessment hazardous substances	
Supplier	Supplier assessment Pollution Management and Prevention	
Energy	Vehicle fuel	
Energy	Non-renewable electricity	
Energy	Reduction in total stationary and vehicle fuel consumption	
Energy	Percent increase in renewable electricity	
Energy	Percent reduction in non-renewable electricity	