Corporate Greenhouse Gas Disclosures

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On March 21, 2022, the SEC proposed a rule that would make corporate greenhouse gas ("GHG") emissions reporting mandatory. That decision may break the impasse over whether corporate social responsibility reporting should be designed solely for the benefit of investors — single materiality — or for the benefit of investors and the public — double materiality. In corporate greenhouse gas disclosure, the materiality debate pitted the double-materiality Corporate Greenhouse Gas Protocol ("GHG Protocol") against the single-materiality Sustainability Accounting Standards Board ("SASB") standards. SASB capitulated in November 2021 by joining a single-materiality alliance that accepts the GHG Protocol. The SEC's proposed rule tracks the GHG Protocol. Mandatory reporting to some version of the GHG Protocol now appears inevitable in the United States.

The GHG Protocol is the dominant reporting standard, but dozens of other protocols, standards, and frameworks, including SASB's, authorize deviations. This Article presents the first comprehensive study of voluntary corporate GHG reporting. The study consists of two parts: (1) a review of the complex array of protocols, standards, and frameworks that govern voluntary GHG reporting and (2) an empirical analysis of the 2020 GHG disclosures of two hundred randomly selected S&P 500 companies. The review reveals several loopholes in the GHG Protocol, including options for converting other gases to CO_2 equivalents, options for setting firm boundaries, the ability to exclude categories of emissions, and the omission of biogenic CO_2 emissions from the reports. The empirical analysis, however, reveals little evidence of companies exploiting the loopholes. The

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empirical analysis shows an eighty-one percent reporting rate for Scope 1 and Scope 2 emissions.

Public use of the GHG data will be possible only through rankings by trusted intermediaries. This Article proposes methods for ranking S&P 500 companies based on corporate GHG emissions reports. It demonstrates those methods by ranking the studied companies.

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Corporate Social Responsibility ("CSR") is an idea whose time has come. In the past eleven years, voluntary CSR reporting has jumped from about 20% of large public companies to about 93%.[1] The data in most of those reports are not sufficiently standardized to provide the basis for credible company comparisons. Nevertheless, hundreds of for-profit and not-for-profit intermediaries are processing data from the reports, together with data transmitted privately by the companies, into CSR ratings, rankings, and recommendations. The most sophisticated are sold to investors at prices that neither small investors nor the public can afford to pay.

On March 21, 2022, the SEC released a proposed a rule that would impose mandatory, standardized greenhouse gas ("GHG") emissions reporting on U.S. public companies.[2] Standardization would make credible comparison and ranking of companies based solely on the public data possible. But standardization will also force the resolution of a crucial issue that is now the subject of worldwide debate.[3] Should governments impose standards designed solely for the benefit of investors (single materiality) or standards designed for the benefit of investors and the public (double materiality)?[4] Under double

[1] *See infra* Appendix (showing one hundred eighty-six of two hundred randomly selected S&P 500 companies (93%) published a CSR report covering 2020); Catherine Cote, *What Is a CSR Report & Why Is It Important?*, HARVARD BUSINESS SCHOOL ONLINE (Apr. 20, 2021), https://online.hbs.edu/blog/post/what-is-a-csr-report [https://perma.cc/82RP-SJGS].

[2] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21,334 (proposed Apr. 11, 2022) (to be codified at 17 C.F.R. pts. 210, 229, 232, 239, and 249).

[3] *E.g.*, Lynn M. LoPucki, *Repurposing the Corporation Through Stakeholder Markets*, 55 UC DAVIS L. REV. 1445, 1466-69 (2022) [hereinafter *Repurposing the Corporation*] (discussing the failed effort to align SASB's single materiality standards with GRI's double materiality standards).

[4] *E.g.*, Yoon-Ho Alex Lee, *The Efficiency Criterion for Securities Regulation: Investor Welfare or Total Surplus?*, 57 ARIZ. L. REV. 85, 85 (2015).

> The current debates therefore raise an urgent policy question for the SEC with regard to the proper criterion of efficiency for its rules: whether it should continue to consider the costs and benefits of its rules from the perspective of investors only, or whether it should instead consider them from the perspective of total surplus.

Id.; Matthias Täger, *'Double Materiality': What Is It and Why Does It Matter?*, LONDON SCH. OF ECON. AND POL. SCI. (Apr. 21, 2021), https://www.lse.ac.uk/granthaminstitute/news/double-materiality-what-is-it-and-why-does-it-matter/ [https://perma.cc/B4BD-QFCP]

materiality, "a firm not only reports how it is affected by ESG issues, but also the firm's impact on the environment and society, including the externalities it causes."[5]

The SEC titled its proposal as "for investors."[6] But it also determined that "disclosure of information about climate-related risks and metrics would be in the public interest."[7] Even more importantly, in the context of the debate over single or double materiality, the substance of the SEC Proposed Rule is double materiality. In particular, it would require the reporting of GHG emissions by companies whose emissions are too small to be material to to the reporting company's investors.[8]

GHG emissions are the most important, the most complex, and probably the most frequently reported category of CSR data. This Article reports the first comprehensive empirical study of voluntary corporate GHG disclosures. The study includes a detailed analysis of the GHG emissions disclosures of two hundred randomly selected S&P 500 companies. The data describe the GHG voluntary disclosure system as it currently operates and highlight deficiencies in the Corporate Greenhouse Gas Protocol ("GHG Protocol")[9] that the SEC should address.

The main elements of the GHG emissions reporting system are first, the published data, and second, the protocols, standards, and frameworks that define the data. This Article explains how GHG emissions are measured and calculated, catalogues the applicable protocols, and explains the complex relationships among them.

("[I]t is not just climate-related impacts on the company that can be material but also impacts of a company on the climate . . . .").

[5] Hans B. Christensen, Luzi Hail & Christian Leuz, *Mandatory CSR and Sustainability Reporting: Economic Analysis and Literature Review*, 26 REV. ACCT. STUD. 1176, 1178 (2021); *see also* EUR. FIN. REPORTING ADVISORY GRP., FINAL REPORT: PROPOSALS FOR A RELEVANT AND DYNAMIC EU SUSTAINABILITY REPORTING STANDARD-SETTING 34 (2021) ("[T]he double materiality approach [is] intended to address the so-called 'outside-in' perspective (risks and opportunities for the entity . . .) as well as the so-called 'inside-out' perspective (positive and negative impacts of the entity . . .).").

[6] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334.

[7] *Id.* at 21335.

[8] *See infra* Part I.C.4.

[9] References in this Article and elsewhere to the Corporate Greenhouse Gas Protocol may be to the foundational document or the foundational document and various amendments. The foundational document is WORLD BUS. COUNCIL FOR SUSTAINABLE DEV. & WORLD RES. INST., THE GREENHOUSE GAS PROTOCOL: A CORPORATE ACCOUNTING AND REPORTING STANDARD (rev. ed. 2004), https://files.wri.org/d8/s3fs-public/pdf/ghg_protocol_2004.pdf [https://perma.cc/QP2V-ZYK6] [hereinafter GREENHOUSE GAS PROTOCOL].

Hundreds of nongovernmental organizations ("NGOs") and thousands of companies, working through about two dozen promulgators of protocols, standards, and frameworks, compete and cooperate strategically in their efforts to shape the voluntary corporate GHG emissions reporting system to their preferences.[10]

CSR and GHG reporting are generally thought to serve three purposes. First, imposing a reporting procedure on companies may cause them to address issues they might not otherwise, leading to improvements in CSR and GHG performance.[11] Second, comparison of comparable GHG data from successive years enables companies to set goals and chart their progress over time. Third, comparability of GHG data across companies facilitates the comparison, rating, and ranking of the companies. Effective comparison, rating, and ranking might enable the companies' stakeholders and potential stakeholders to evaluate, respond to, and ultimately control the companies' GHG emissions.[12]

This Article ignores the first two purposes to focus on the third. It compares GHG performances — the amounts of GHG companies emit or induce others to emit — because GHG performance provides the most credible basis on which to rank companies. Elsewhere, I have explained the tremendous potential for CSR performance ranking to improve CSR performance.[13]

The empirical study reported here makes seven principal findings. First, the GHG Protocol is the dominant reporting standard. However, dozens of other protocols, standards, and frameworks authorize deviations, and some companies report to multiple protocols.

Second, Scope 1 and Scope 2 GHG emissions, as defined in the GHG Protocol, are the key fields reported. One hundred sixty-two of the two hundred companies studied (81%) reported Scope 1 and Scope 2 emissions essentially in accord with the GHG Protocol.[14]

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[10] *See infra* Part I.

[11] On the other hand, ranking companies based on their procedures may cause the raters, rankers, and ranked to lose track of their substantive goals. For example, Ranking Digital Rights' exclusive focus on "disclosed policies and practices" resulted in that organization ranking Twitter first in "freedom of expression" in the same year Twitter cancelled the Twitter account of the President of the United States, thereby preventing him from expressing his views. *The 2020 RDR Index*, RANKING DIGIT. RIGHTS, https://rankingdigitalrights.org/index2020/ (last visited Dec. 23, 2021) [https://perma.cc/FLX9-ABK7].

[12] *See* LoPucki, *Repurposing the Corporation*, *supra* note 3, at 1496-97 (describing how effective ranking might enable potential stakeholders to control corporations).

[13] *Id.* at 1483-96.

[14] *See infra* Table 2.

Third, the single-materiality standards promulgated by the Sustainability Accounting Standards Board ("SASB") for the reporting of GHG emissions are fundamentally in conflict with the double-materiality standards of the GHG Protocol. The GHG Protocol requires that companies in all industries report Scope 1 and Scope 2 emissions.[15] SASB standards require companies in only twenty-two of SASB's seventy-seven industries (29%) to report Scope 1 emissions and do not require the reporting of Scope 2 emissions at all.[16] By committing to "consolidate" into a new standards board[17] that is committed to single-materiality[18] but has also accepted the GHG Protocol,[19] SASB has effectively abandoned its challenge to the GHG Protocol.[20]

Fourth, the GHG Protocol gives companies three options as to how they define their boundaries for GHG reporting — equity share, financial control, or operational control. Although that flexibility has

[15] GREENHOUSE GAS PROTOCOL, *supra* note 9, at 25 ("Companies shall separately account for and report on scopes 1 and 2 at a minimum.").

[16] *Why Aren't Direct (Scope 1) GHG Emissions Included in Every Industry Standard? How Do the SASB Standards Account for Indirect (Scope 2 and Scope 3) Emissions?*, SASB STANDARDS, https://help.sasb.org/hc/en-us/articles/360060352271-Why-aren-t-direct-Scope-1-GHG-emissions- (last visited July 1, 2022) [https://perma.cc/YGU8-WWDX] [hereinafter *SASB Industry Standards*] ("[SASB's] process has identified a GHG emissions metric (i.e., Scope 1) in the 22 industries that involve significant direct emissions.").

[17] *See IFRS Foundation Announces International Sustainability Standards Board*, VALUE REPORTING FOUND., (Nov. 3, 2021), https://www.valuereportingfoundation.org/news/ifrs-foundation-announcement/ [https://perma.cc/ZS2T-GQUD] (referring to "[a] commitment . . . to consolidate into the new board . . . by . . . Value Reporting Foundation (VRF — which houses . . . the SASB Standards) by June 2022").

[18] *See id.* ("The [new] standards will enable companies to provide comprehensive sustainability information for the global financial markets.").

[19] *Compare* TECH. READINESS WORKING GRP, CLIMATE-RELATED DISCLOSURES PROTOTYPE ¶ 13(a) (2021), https://www.ifrs.org/content/dam/ifrs/groups/trwg/trwg-climate-related-disclosures-prototype.pdf [https://perma.cc/HY5X-HLWQ] ("An entity shall disclose the following cross-industry metrics: (a) greenhouse gas emissions — in terms of absolute gross Scope 1, Scope 2 and Scope 3, expressed as metric tonnes of CO_2 equivalent, in accordance with the Greenhouse Gas Protocol, and emissions intensity."), *with* TECH. READINESS WORKING GRP., GENERAL REQUIREMENTS FOR DISCLOSURE OF SUSTAINABILITY-RELATED FINANCIAL INFORMATION PROTOTYPE ¶ 1 (2021), https://www.ifrs.org/content/dam/ifrs/groups/trwg/trwg-general-requirements-prototype.pdf [https://perma.cc/DV4G-ZCCG] ("The objective of sustainability-related financial disclosures is to provide information . . . useful . . . [to] decisions about buying, selling or holding equity and debt instruments . . . providing or settling loans and other forms of credit . . . or . . . exercising rights to vote.").

[20] *See IFRS Foundation Announces International Sustainability Standards Board*, *supra* note 17 (announcing "the formation of a new International Sustainability Standards Board (ISSB) to develop — in the public interest — a comprehensive global baseline of high-quality sustainability disclosure standards to meet investors' information needs").

the potential to reduce GHG emissions data comparability, that potential has probably not yet been realized. Of the one hundred twenty companies that reported their boundary methods, one hundred six (88%) defined them as "operational control."[21] Thus, the large bulk of all companies are reporting to the same boundaries. However, some evidence of strategic response does exist. Electric utilities are high GHG emitters. Five of the six electric utilities in the sample that reported boundaries, reported "equity share." No non-electric utility in the study reported "equity share."[22]

Fifth, biogenic emissions remain a problem, both in theory and in reporting. Biogenic emissions are GHG emissions from the combustion or decomposition of biomass other than fossil fuels, peat, and carbon minerals.[23] They are a source of energy and carbon emissions that are not included in the scopes, little-reported, and hence a potential source of noncomparability.

Sixth, because reporting is voluntary, companies need not report their emissions strictly in accord with the protocols. Thirty-three of the one hundred sixty-two companies that reported Scope 1 and Scope 2 emissions (20%) expressly excluded categories of emissions without estimating the amounts excluded.[24] Such exclusions may alone prevent credible ratings and rankings based on voluntary reporting.

Lastly, to integrate GHG data into the companies' financial reports — as would be required by the SEC Proposed Rule — companies would have to generate GHG data much faster than they currently do. Although one hundred fifty-five of the one hundred sixty-two GHG reporting companies (96%) used the same reporting period for financial and GHG reporting, the median time from the end of the reporting period until the release of financial reports was fifty days, while the corresponding time for GHG reports was one hundred eighty days.[25]

The public can use GHG and other CSR information only through rankings. Ranking is comparison, and comparison requires comparable

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[21] *Infra* Table 4.

[22] *Infra* Part II.C.4.

[23] U.S. ENV'T PROT. AGENCY OFF. OF ATMOSPHERIC PROGRAMS, ACCOUNTING FRAMEWORK FOR BIOGENIC CO_2 EMISSIONS FROM STATIONARY SOURCES iv (2011), https://www.epa.gov/sites/default/files/2016-08/documents/biogenic-co2-accounting-framework-report-sept-2011.pdf [https://perma.cc/Y3DR-WJUB] ("[B]iogenic CO_2 emissions are defined as CO_2 emissions directly resulting from the combustion, decomposition, or processing of biologically based materials other than fossil fuels, peat, and mineral sources of carbon through combustion, digestion, fermentation, or decomposition processes.").

[24] *See infra* Appendix (down arrow (🡻) indicates an exclusion).

[25] *See infra* Table 7.

data. To be comparable, data must be about similar items — here, S&P 500 companies. The data must also be similar in another sense: the characteristics of the companies must have been measured in the same or a similar way. Earlier academic studies seeking to assess the comparability of voluntarily reported corporate GHG emissions have found low levels of comparability.[26] Mandatory, double-materiality reporting could fix those problems. Once comparable data are made public, anyone will be able to extract them from the reports, publish them in matrices, and construct rankings from them.

To demonstrate that, I ranked the two hundred companies studied based on their reported GHG emissions for 2020.[27] Five prior public rankings of companies based on GHG emissions have been published.[28] Two used data mandatorily reported to the U.S. Environmental Protection Agency ("EPA").[29] The EPA data are less comprehensive than the voluntarily reported data studied here[30] and not comparable across companies. One study used the extensively researched, eclectic data of the Carbon Majors Database.[31] That database provides rich historical data ranking 224 companies.[32] But the companies are scattered throughout the world, so most are not vulnerable to pressures from U.S. stakeholders or potential stakeholders. By contrast, S&P 500 companies are, by definition, all U.S.-based. In addition, the Carbon Majors Database does not include Scope 2 (energy usage) emissions.

[26] *See, e.g.*, Andrea Cardoni, Evgeniia Kiseleva & Simone Terzani, *Evaluating the Intra-Industry Comparability of Sustainability Reports: The Case of the Oil and Gas Industry*, 11 SUSTAINABILITY 1093, 1104 (2019) (studying the correlations between the data reported and the standards to which they were reported in the oil and gas industry); Andrea Liesen, Andreas G. Hoepner, Dennis M. Patten & Frank Figge, *Does Stakeholder Pressure Influence Corporate GHG Emissions Reporting? Empirical Evidence from Europe*, 28 ACCT. AUDITING & ACCOUNTABILITY J. 1047, 1049 (2015) (finding from 2005-2009 data that only 23% of GHG emissions disclosures are complete where completeness required (1) reporting Scope 1 and 2 emissions, (2) including both CO_2 and other greenhouse gases, and (3) reporting the firm boundary).

[27] These rankings are in the Appendix. *Greenhouse Gas Emissions Ranking*, STAKEHOLDER TAKEOVER PROJECT, https://www.stakeholdertakeover.org/rankings.html (last visited Sept. 16, 2022) [https://perma.cc/GM3N-7J6W] (interactive version).

[28] *Infra* Part IV.A.

[29] *Id.*

[30] Three hundred sixty-eight of the S&P 500 companies reported zero GHG emissions to the EPA.

[31] For a description of the Carbon Majors Database see PAUL GRIFFIN, CDP, THE CARBON MAJORS DATABASE: CDP CARBON MAJORS REPORT 2017, at 5 (2017), https://cdn.cdp.net/cdp-production/cms/reports/documents/000/002/327/original/Carbon-Majors-Report-2017.pdf?1501833772 [https://perma.cc/4SKR-U3LH].

[32] *Id.*

Another study generated data apparently adequate to rank the S&P 100 companies based on corporate voluntary reports but did not actually rank them.[33]

The rankings from this study appear in the Appendix, and an interactive version that ranks all five hundred companies appears on the Stakeholder Takeover Project website.[34] My purposes for ranking the companies studied were (1) to demonstrate the feasibility and ease of ranking, and (2) to discover issues that might surface only in the ranking process. The ranking of all S&P 500 companies is sufficient to enable potential stakeholders to begin repurposing companies.

Part I of this Article explains what GHG emissions are and the complex array of protocols, standards, and frameworks to which companies report them. Part I also explores the subsystem in which hundreds of mostly non-profit organizations attempt to influence the protocols, standards, and frameworks that govern GHG emissions reporting. Part II describes the empirical study, the methodological problems encountered, and the study's findings. Part III explores the concept of data comparability, which is central to ranking. Part IV explains how the data were converted into the single metric on which the rankings are based, compares the resulting rankings with other GHG rankings, and explores the vulnerability of the ranking system to companies' reporting strategies. Part V concludes that the corporate GHG emissions data currently available are adequate for ranking but probably would not remain so once GHG emissions rankings become influential and the companies respond strategically. Part V concludes by recommending that the SEC make the reporting of Scope 1 and Scope 2 emissions mandatory and identifying the changes to the GHG Protocol that would be necessary to maintain the validity and credibility of the GHG emissions disclosure system against the ranked companies' strategic responses.

I. THE GHG EMISSIONS REPORTING SYSTEM

Corporate GHG emissions reporting is voluntary in the sense that corporations are not legally required to measure their GHG emissions or report them publicly. However, EPA regulations require that the "owners and operators" of major GHG emitting facilities located in the

[33] *See* Pete Edmunds, Daniela Chona & Lesley Meng, *Net Zero: The Next Frontier for Corporate Sustainability*, YALE CTR. FOR BUS. & ENV'T, https://cbey.yale.edu/research/net-zero-the-next-frontier-for-corporate-sustainability [https://perma.cc/STQ9-VUT3].

[34] *Greenhouse Gas Emissions Ranking*, *supra* note 27.

United States measure and report publicly the GHG emissions of those facilities.[35]

The relationship between corporate voluntary and EPA mandatory reporting is frequently misunderstood. In a hastily issued comment letter to the SEC on the Proposed Rule, a group of twenty-two leading corporate law scholars claimed that the EPA reporting system "currently measures and reports on almost all [greenhouse gas emissions] in the United States from all sources."[36] To the contrary, data from the instant study suggests that GHG emissions reported to the EPA by S&P 500 companies are only about half of the GHG emissions that would be reported by S&P 500 companies under the SEC Proposed Rule.[37]

Although the facilities data can, with some difficulty, be linked to corporations, (1) the facilities data include only Scope 1 emissions,[38] and (2) are only for facilities emitting at least 25,000 metric tons of CO_2-e annually.[39] As a result, only 132 of the S&P 500 companies (26%) reported any GHG emissions at all to the EPA for 2020[40] — as compared with an estimated 405 (81%) that voluntarily reported GHG emission data directly to the public. The EPA reporting system does not provide an alternative means for investors to assess the GHG emissions of the

[35] EPA Mandatory Greenhouse Gas Reporting Rule, 40 C.F.R. § 98.2(a) (2018).

[36] Letter from Lawrence A. Cunningham, Stephen M. Bainbridge, Jonathan B. Berk, Sanjai Bhagat, Bernard S. Black, William J. Carney, Lawrence A. Cunningham, David J. Denis, Diane Denis & Charles M. Elson, et al., to Sec. & Exch. Comm'n 13 (Apr. 25, 2022).

[37] Two hundred randomly selected S&P 500 companies reported a total of 452,066,760 metric tons of CO_2-e to the EPA. Those same companies voluntarily reported a total of 677,242,370 metric tons of CO_2-e to the public. Mandatory corporate reporting will add an estimated 19% to the latter figure because 19% of S&P 500 companies did not voluntarily report in 2020. The resulting estimate is 836,101,691 metric tons of CO_2-e. The 452,066,760 reported to the EPA is only 54% of that number. The data are available on the Stakeholder Takeover website. *Greenhouse Gas Emissions Ranking*, *supra* note 27 (columns Scope 1+2 and Scope 1).

[38] The U.S. Environmental Protection Agency ("EPA") estimates that its data cover "85-90 percent of the total U.S. GHG emissions." U.S. ENV'T PROT. AGENCY, FACT SHEET: GREENHOUSE GASES REPORTING PROGRAM IMPLEMENTATION 1 (2013), https://www.epa.gov/sites/default/files/2014-09/documents/ghgfactsheet.pdf [https://perma.cc/T8VB-VYQL]. But that estimate includes only direct emissions, because that is all the EPA reporting system covers. *Id.* ("CFR part 98 applies to direct greenhouse gas emitters.").

[39] *Id.*

[40] LYNN M. LOPUCKI, RANK OF S&P 500 COMPANIES BY GREENHOUSE GAS EMISSIONS REPORTED TO THE EPA: SEPTEMBER 2020 DATA, EMISSIONS IN CO_2 EQUIVALENT TONNES, https://www.stakeholdertakeover.org/pdf/Rankings.pdf [https://perma.cc/68H4-KWJ7] [hereinafter RANK OF S&P 500].

largest public companies, let alone the GHG emissions of all public companies.

The instant study addresses the internal comparability of data voluntarily reported by corporations in CSR reports. Data from the EPA reporting system is outside its scope.

Companies that measured and reported their 2020 Scope 1 and Scope 2 GHG emissions did so in accord with the requirements of one or more of over a dozen reporting protocols, standards, or frameworks established by NGOs. This Article sometimes uses "reporting instructions" as a generic reference to the applicable protocols, standards, or frameworks.

Promulgators of reporting instructions "require" particular practices by permitting a corporation that has complied with the mandatory portion of the promulgator's instructions to use the promulgator's name in stating its compliance.[41] For example, the Global Reporting Initiative ("GRI") standard 305-1 states that "[t]he reporting organizations shall report . . . [g]ross direct (Scope 1) GHG emissions in metric tons of CO_2 equivalent."[42] No law requires corporations to comply with that standard. But if a corporation does not comply with GRI 305, GRI does not authorize the corporation to claim that it reported to GRI 305.[43]

The structure of the corporate reporting system is conceptual in the sense that each of the reporting instructions contribute concepts to the reporting system for voluntary adoption or require the use of concepts in reporting. Seeking dominance for their own instructions, promulgators negotiate with one another to "align" their instructions to those of other promulgators or to form alliances with them.[44]

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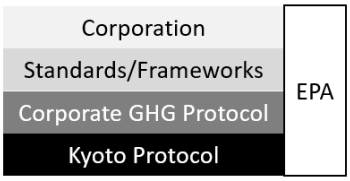
[41] *See, e.g.*, GLOB. REP. INITIATIVE, GRI 1: FOUNDATION 11 (2021), https://www.globalreporting.org/how-to-use-the-gri-standards/gri-standards-english-language/ [https://perma.cc/G57R-B3JQ] [hereinafter GRI 1] ("The organization must comply with all nine requirements in this section to report in accordance with the GRI Standards.").

[42] GLOB. REPORTING INITIATIVE, GRI 305: EMISSIONS 2016, at 7 (2016), https://www.globalreporting.org/standards/media/1012/gri-305-emissions-2016.pdf [https://perma.cc/57FG-P69X] [hereinafter GRI 305].

[43] GRI 1, *supra* note 41, at 11; *see also* SUSTAINABILITY ACCT. STANDARDS BD., SASB STANDARDS APPLICATION GUIDANCE: VERSION 2018-10 1 (2018), https://www.sasb.org/wp-content/uploads/2018/11/SASB-Standards-Application-Guidance-2018-10.pdf [https://perma.cc/S59E-AUUJ] [hereinafter SASB STANDARDS APPLICATION GUIDANCE] ("Because the use of the SASB standards is voluntary, requirements of a standard (as indicated by "shall" clauses), along with the guidance contained herein, refer to those conditions that must be followed in order for disclosure to be in conformance with the applicable industry standard(s).").

[44] *See, e.g.*, CORP. REPORTING DIALOGUE, DRIVING ALIGNMENT IN CLIMATE-RELATED REPORTING, (2019), https://corporatereportingdialogue.com/better-alignment-project/

Figure 1. The Conceptual Structure of Corporate Greenhouse Gas Reporting



The reporting instructions stack in roughly the manner shown in Figure 1. The Kyoto Protocol defines "greenhouse gas" but does not require corporate emissions reporting. The Corporate GHG Protocol accepts the Kyoto definition and specifies comprehensively how corporations should calculate and report their Kyoto greenhouse gas emissions. Other standards and frameworks generally accept the Corporate GHG Protocol specifications as a base, but may add to, or subtract from them. Ultimately, corporations choose the reporting instructions they apply. Corporations may report to none, one, or more than one of the protocols. The EPA ignores this conceptual hierarchy. By regulation, the EPA defines and requires use of its own concepts in facilities' GHG reporting. The SEC "based [its] proposed GHG emissions disclosure requirement primarily on the GHG Protocol's concept of scopes and related methodology," but did not adopt the GHG protocols by reference.[45]

A. The Kyoto Protocol

The Kyoto Protocol's definition of greenhouse gases is at the root of the conceptual structure. That Protocol identifies five greenhouse gases — carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, and nitrogen trifluoride — and two categories of greenhouse gases — hydrofluorocarbons and perfluorocarbons.[46] (In accord with the general practice, this Article refers to them as "the seven greenhouse gases.")

In the Kyoto Protocol, the signatory countries agree to meet specified limitation and reduction commitments with respect to those seven

[https://perma.cc/W6CF-VVHA] (principally comparing CDP, CDSB, GRI, and SASB standards to the TCFD recommended disclosures).

[45] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334, 21345 (proposed Apr. 11, 2022) (to be codified at 17 C.F.R. §§ 210, 229, 232, 239, and 249).

[46] Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 11, 1997, 2303 U.N.T.S. 162, Annex A [hereinafter Kyoto Protocol]; Doha Amendment to the Kyoto Protocol art. 1B, Dec. 8, 2012, UNFCCC Doc. FCCC/KP/CMP/2012/13/Add.1, Decision 1/CMP.8 [hereinafter Doha Amendment] (adding Nitrogen trifluoride to Annex A of the Kyoto Protocol).

gases.[47] In most countries, including the United States,[48] the systems for calculating country emissions are separate from the systems for calculating corporate emissions. That is, corporate emissions are calculated by different methods than country emissions, and corporate emissions are not a component of country emissions.[49]

B. The Greenhouse Gas Protocol

The one-hundred-sixteen-page *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard* ("GHG Protocol") provides "standards and guidance" for companies reporting GHG emissions.[50] The GHG Protocol is a product of the Greenhouse Gas Protocol Initiative, which is "a multi-stakeholder partnership of businesses, non-governmental organizations (NGOs), governments, and others convened by the World Resources Institute (WRI), a U.S.-based environmental NGO, and the World Business Council for Sustainable Development (WBCSD), a Geneva-based coalition of 170 international companies."[51] As shown in Figure 1, the GHG Protocol sits atop the Kyoto Protocol in that it accepts and incorporates the Kyoto Protocol's definition of greenhouse gases.

1. Scopes

GHG emissions are principally emissions from combustion, but they are also produced by some other chemical reactions.[52] "Direct GHG emissions are emissions from sources that are owned or controlled by the company."[53] Examples are "emissions from combustion in owned

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[47] Kyoto Protocol, *supra* note 46, at Annex B.

[48] *See*, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS 1990-2020, U.S. ENV'T PROT. AGENCY 1-13 to 1-22 (2022), https://www.epa.gov/system/files/documents/2022-04/us-ghg-inventory-2022-main-text.pdf [https://perma.cc/CM3U-AREN] (describing how the U.S. compiles its national inventory).

[49] GREENHOUSE GAS PROTOCOL, *supra* note 9, at 32 ("[Country emissions] are usually compiled via a top-down exercise using national economic data, rather than aggregation of bottom-up company data.").

[50] *Id.* at 3.

[51] *Id.* at 2.

[52] *Sources of Greenhouse Gas Emissions*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions (last updated Aug. 5, 2022) [https://perma.cc/48LY-LH8L] ("Greenhouse gas emissions from industry primarily come from burning fossil fuels for energy, as well as greenhouse gas emissions from certain chemical reactions necessary to produce goods from raw materials.").

[53] GREENHOUSE GAS PROTOCOL, *supra* note 9, at 25.

or controlled boilers, furnaces, vehicles, etc." and "emissions from chemical production in owned or controlled process equipment."[54]

"Indirect GHG emissions are emissions that are a consequence of the activities of the company but occur at sources owned or controlled by another company."[55] For example, if Company A emits GHG in the process of generating electricity, Company A sells the electricity to Company B, and Company B uses it without emitting GHG, the emissions are direct emissions of Company A and indirect emissions of Company B.

The GHG Protocol's main contribution to the corporate reporting system is to define Scope 1, 2, and 3 emissions and to specify how they should be measured. Scope 1 emissions are direct emissions. Scope 2 and 3 emissions are indirect emissions.

The company's Scope 1 emissions are emissions from the company's generation of "electricity, heat, or steam," "physical or chemical processing," "transportation of materials, products, waste, or employees," or from directly releasing greenhouse gases.[56] The company's Scope 2 emissions are emissions "from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company."[57] In a footnote, the GHG Protocol adds that the term "electricity" is used here "as shorthand for electricity, steam, and heating/cooling."[58] The SEC Proposed Rule has adopted essentially this terminology.[59]

To illustrate, if Utility emits a metric ton of greenhouse gases to produce electricity and sells that electricity to Customer, and Customer uses the electricity to produce heat and light without emitting any greenhouse gases, Utility reports a metric ton of Scope 1 emissions, and Customer reports a metric ton of Scope 2 emissions.[60] The emissions have been double-counted in the sense that only a metric ton of GHG has been added to the atmosphere, but two metric tons of GHG emissions have been reported. The GHG Protocol is concerned with

[54] *Id.*

[55] *Id.*

[56] *Id.* at 27. The Scope 1 emissions from leaks are referred to as "fugitive emissions." *Id.*

[57] *Id.* at 25.

[58] *Id.* at 33 n.2.

[59] *See, e.g.*, The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334, 21466 (proposed Apr. 11, 2022) (to be codified at 17 C.F.R. §§ 210, 229, 232, 239, and 249) (defining Scope 2 emissions).

[60] *See* GREENHOUSE GAS PROTOCOL, *supra* note 9, at 33.

double counting but does not consider this double counting.[61] The Protocol views Scope 1 and Scope 2 emissions as different responsibilities for the same emissions — one for emitting the gases, the other for inducing the emissions by using the resulting energy.[62]

The user of a given amount of electricity generated from a high emissions source, such as coal, oil, or natural gas, must report higher Scope 2 emissions than the user of that same amount of electricity from a low emissions source, such as solar, nuclear, or wind.[63] Thus, by purchasing electricity from a low emissions source, a company can reduce its Scope 2 emissions without reducing its electricity consumption.

Most electricity users have no real choice about where to purchase their electricity. They are served by the electrical grid in their location. The grid operators may obtain electricity from a mix of sources, each with different Scope 1 emissions per megawatt-hour ("MWh") of electricity. The grid operators post their average emissions per MWh.[64] The buyer of electricity from the grid can use the appropriate average to calculate its Scope 2 emissions — a method referred to as "location-based" reporting.

To enable buyers from the grid to choose the kind of electricity they buy, a 2015 amendment to the GHG Protocol authorizes a second, "market-based" reporting method.[65] The buyer of electricity buys along with it the electricity's Scope 1 attributes. The attributes are tracked by contracts:

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[61] *See id.* ("The GHG Protocol Corporate Standard is designed to prevent double counting of emissions between different companies within Scope 1 and 2. For example, the Scope 1 emissions of company A (generator of electricity) can be counted as the Scope 2 emissions of company B (end-user of electricity).").

[62] *Id.*

[63] MARY SOTOS, WORLD RES. INST., GHG PROTOCOL SCOPE 2 GUIDANCE: AN AMENDMENT TO THE GHG PROTOCOL CORPORATE STANDARD 6 (2015), https://ghgprotocol.org/sites/default/files/standards/Scope%202%20Guidance_Final_Sept26.pdf [https://perma.cc/XU75-GY9E] ("To calculate scope 2 emissions, the *Corporate Standard* recommends multiplying activity data (MWhs of electricity consumption) by source and supplier-specific emission factors to arrive at the total GHG emissions impact of electricity use.").

[64] The Emissions & Generation Resource Integrated Database (eGRID) shows plant level, balancing authority level, and regional level emissions per megawatt-hour of electricity. *eGRID Questions and Answers*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/egrid/egrid-questions-and-answers#egrid1 (last updated July 25, 2022) [https://perma.cc/L46R-EYL3] (offering download of the eGRID2019 Data File at https://www.epa.gov/sites/default/files/2021-02/egrid2019_data.xlsx).

[65] SOTOS, *supra* note 63, at 8.

> [N]ew instruments have been developed to track energy production information (or its "attributes") separately from actual energy delivery. These instruments — termed here "energy attribute certificates" — typically flow from energy generation facilities to energy suppliers and ultimately energy consumers in order to support consumer claims about the type of energy used and its related attributes — such as GHG emissions — produced at the point of generation.[66]

Under the market-based method, a seller who owns electricity with differing attributes can specify by contract with the buyer which electricity is sold.[67] Buyers of fungible electricity from a grid can buy solar-generated, fossil fuel-generated, or other types of electricity.

The 2015 amendment requires that companies report Scope 2 emissions by the location-based method and the market-based method if the two are different. As the GHG Protocol guidance put it in announcing the new, market-based method, "[f]or most companies, Scope 2 is no longer one number — it is two."[68] The SEC Proposed Rule does not distinguish location-based from market-based emissions. The likely effect will be to allow companies to report the lower of the two numbers, thus concealing the fact that they achieved lower emissions by making a payment rather than reducing their energy usage.

"Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company."[69] For example, if a steel company buys iron ore from a mining company, the mining company's emissions in extracting and refining the ore are Scope 3 emissions of the steel company, and the steel company's emissions in steel making would be Scope 3 emissions of the mining company.[70]

Companies can comply with the GHG Protocol with respect to Scope 3 emissions by reporting selected categories of Scope 3 emissions or not reporting Scope 3 emissions at all. Scope 3 emissions are not reported

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[66] *Id.* at 6.

[67] *Id.* at 8 ("A *market-based method* reflects emissions from electricity that companies have purposefully chosen . . . . It derives emission factors from contractual instruments . . . .").

[68] GREENHOUSE GAS PROTOCOL & WORLD RES. INST., GHG PROTOCOL SCOPE 2 GUIDANCE EXECUTIVE SUMMARY: AN AMENDMENT TO THE GHG PROTOCOL CORPORATE STANDARD 3 (2015), https://ghgprotocol.org/sites/default/files/Scope2_ExecSum_Final.pdf [https://perma.cc/FN6B-GJEU].

[69] GREENHOUSE GAS PROTOCOL, *supra* note 9, at 25.

[70] *See id.* The emissions are not Scope 2 because no energy was sold.

with sufficient frequency or consistency to provide a basis for ranking companies.

The SEC Proposed Rule requires that companies report their Scope 3 emissions "if material." That is not a change from prior law.[71] Accordingly, Scope 3 emissions are outside the Scope of this Article.

2. Greenhouse Gas Equivalencies

Companies report their emissions in equivalent metric tons of carbon dioxide. An equivalent metric ton of a GHG other than carbon dioxide is the amount of the other gas that has the same global warming potential ("GWP") as a metric ton of carbon dioxide.[72] The Intergovernmental Panel on Climate Change ("IPCC") periodically determines the equivalencies based on scientific research and publishes "assessments." The equivalencies in the assessments enable companies to convert their emissions into carbon dioxide equivalencies (abbreviated "CO_2-e"), add them up, and disclose single Scope 1 numbers that account for each company's emissions of all seven greenhouse gases.

The IPCC has published five "assessments" of the equivalencies over time, each based on the scientific understanding of the time. The second assessment was in 1995. The fifth was in 2014. A 2013 amendment to the Corporate GHG Protocol requires that companies "use GWP values from the most recent Assessment Report" but allows companies "to use assessments from other IPCC Assessment Reports."[73] The GWP values

[71] Commission Guidance Regarding Disclosure Related to Climate Change, 75 Fed. Reg. 6290, 6293 (Feb. 8, 2010) (to be codified at 17 C.F.R pts. 211, 231, 241) ("[I]nformation is material if there is a substantial likelihood that a reasonable investor would consider it important in deciding how to vote or make an investment decision, or, put another way, if the information would alter the total mix of available information.").

[72] *See, e.g.*, Dep't for Env't, Food & Rural Affs. & Env't Agency, *Calculate the Carbon Dioxide Equivalent Quantity of an F Gas,* GOV.UK (Dec. 31, 2014), https://www.gov.uk/guidance/calculate-the-carbon-dioxide-equivalent-quantity-of-an-f-gas [https://perma.cc/DV5M-TEKU] (providing global warming potential values for greenhouse gases); GREENHOUSE GAS PROTOCOL, GLOBAL WARMING POTENTIAL VALUES (2016), https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf [https://perma.cc/AN9A-K4S3] (showing the global warming potentials of other greenhouse gases using ratios from the second, fourth, and fifth IPCC assessments).

[73] GREENHOUSE GAS PROTOCOL & WORLD RES. INST., REQUIRED GREENHOUSE GASES IN INVENTORIES: ACCOUNTING AND REPORTING STANDARD AMENDMENT 1 (2013), https://ghgprotocol.org/sites/default/files/standards_supporting/Required%20gases%20and%20GWP%20values_0.pdf [https://perma.cc/C647-65DV] [hereinafter 2013 AMENDMENTS].

used must be from a single Assessment Report, except that "[i]f GWPs for a particular gas are not provided in the chosen Assessment Report, companies shall select the most recent GWPs for that gas."[74]

Table 1: Difference in Global Warming Potential ("GWP") by IPCC Assessment (100 years)

(1) Greenhouse Gas	(2) GWP by IPCC 2nd assessment	(3) GWP by IPCC 5th assessment	(4) Increase or (decrease)	(5) Percent of equivalent emissions	(6) Difference by IPCC assessment	(7) GWP by EPA CO_2-e
Carbon Dioxide	1	1	0	76%	0.0%	1
Methane	21	28	33%	16%	5.3%	25
Nitrous Oxide	310	265	(15%)	6%	-0.9%	298
Chlorofluorocarbon-12 ("CFC-12")	8,100	10,200	26%			No data
Hydrofluorocarbon-23 ("HFC-23")	11,700	12,400	6%	2%	0.5%*	14,800
Sulfur Hexafluoride	23,900	23,500	(2%)			22,800
Nitrogen Trifluoride	no report	16,100	None			17,200
Total				100%	2.9%	

* Maximum difference, calculated by assuming all F-gas emissions are from Chlorofluorocarbon-12.

Source of data: GREENHOUSE GAS PROTOCOL INITIATIVE, GLOBAL WARMING POTENTIAL VALUES (Feb. 16, 2016), https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf [https://perma.cc/8DQV-FYAA] and IPCC, CLIMATE CHANGE 2014: SYNTHESIS REPORT 46 (Core Writing Team, Rajendra. K. Pachauri & Leo Meyer eds. 2015), https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf [https://perma.cc/ SL27-Z4UU].

Companies can increase or reduce their GHG emissions by their choices of IPCC assessments. Table 1 shows, however, that the increases or reductions will ordinarily be small. Columns (2) and (3) show the IPCC conversion ratios for the second and fifth assessments and column (4) shows the change from the second to the fifth assessments as a percentage of the second assessment. Some of those percentages are substantial. Column (5), however, shows the contributions of the gases to total GHG emissions. Seventy-six percent of the total GHG equivalent emissions are carbon dioxide; 16% are methane, 6% are nitrous oxide, and only 2% are other gases. The 2% includes the three gases shown on Table 1. Even if all the other gases increased at the highest rate shown for any of them — the 26% for CFC-12 — GHG total emissions would increase by only one half of one

[74] *Id.*

percent.[75] Only carbon dioxide, methane, and nitrous oxide contribute large enough portions of total emissions that differences in the assessments used to convert them matter.

Column (6) shows how IPCC's change in assessments from the second to the fifth affects the total GHG emissions reported.[76] The increase is less than 2.9%, nearly all of it from methane. Even though the GHG Protocol allows companies to choose the IPCC assessment to which they report, the differences in those assessments are immaterial. Column (7) shows the conversion ratios mandated by the EPA.

The SEC Proposed Rule defines "global warming potential (GWP)" and requires the reporting of CO_2 equivalencies for the six other greenhouse gases.[77] The Rule does not provide conversion ratios or address assessments, putting the burden on each company to decide what ratios are correct.

3. Firm Boundaries

To attribute emissions appropriately, one must know whether they occurred inside or outside the firm. Ambiguity arises in situations where the company shares ownership or control of subsidiaries or facilities with other companies. The GHG Protocol offers companies three options to define their boundaries.[78]

Under the *equity share approach*, "a company accounts for GHG emissions from operations according to its share of equity in the operation."[79] For example, if Companies A, B, and C each owned a third of the shares of an emitting corporation ("Company E") and received a third of the profits, a third of the emissions would be attributed to each of A, B, and C. Under this approach, "the economic substance of the relationship the company has with the operation always overrides the legal ownership form to ensure that equity share reflects the percentage of economic interest."[80] Thus, if Company A owned a third of the shares but received 40% of the profits, 40% of the emissions would be attributed to Company A.

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[75] For CFC-12, 26% of 2% is half of 1%.

[76] Column (6) is equal to column (4) multiplied by column (5).

[77] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334, 21375 (proposed Apr. 11, 2022) (to be codified at 17 C.F.R. §§ 210, 229, 232, 239, and 249).

[78] GREENHOUSE GAS PROTOCOL, *supra* note 9, at 17-18.

[79] *Id.* at 17.

[80] *Id.*

Under the *control approach*, "a company accounts for [one hundred] percent of the GHG emissions from operations over which it has control."[81] The control can be *financial control* or *operational control*. The control is *financial* "if the [company] has the ability to direct the financial and operating policies of the [emitter] with a view to gaining economic benefits from its activities."[82] A shareholder that owned stock in the company with sufficient voting power to elect the directors would have such control. The control is *operational* "if the [company] or one of its subsidiaries . . . has the full authority to introduce and implement its operating policies at the [emitter]."[83] A management company that did not own shares in the company but had the contractual right to direct its operations would have operating control.

If Companies A, B, and C each owned a third of the shares of an emitting corporation ("Company E"), each received a third of the profits, and each elected the control approach, none of the three would report E's emissions because none of the three controls C's operations or had the ability to direct E's financial and operating policies. Company E would report Company E's emissions.[84]

If Companies A, B, and C entered into a shareholder agreement that gave Company C operational control over Company E, and Company C elected the operational control method of reporting, Company C would report all of Company E's emissions. If instead, Company C held 51% of the equity and voting control of Company E, elected the financial control approach, but bound itself by contract to allow Company E to "introduce and implement its own operating policies," Company C would not have financial control of Company E and Company E's emissions would not be attributable to Company C.

When companies are engaged in GHG-emitting joint ventures, the firm boundary rules make it easy for them to avoid responsibility for the emissions. Companies can accomplish that in a variety of ways.[85]

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[81] *Id.*

[82] *Id.*

[83] *Id.* at 18; *see, e.g.*, United States v. Bestfoods, 524 U.S. 51, 52 (1998) (distinguishing the ownership of an entity that operates a facility from the operation of a facility).

[84] *See* GREENHOUSE GAS PROTOCOL, *supra* note 9, at 18 ("If the operation itself will introduce and implement its own operating policies, the partners with joint financial control over the operation will not report any emissions under operational control.").

[85] *See infra* Part II.C.4.

C. Frameworks and Standards

This Section describes the complex relationships among the frameworks and standards that purport to govern GHG reporting. Although the terms are not used consistently in the literature, "standards" usually refers to specific instructions that say what to report. "Frameworks" are usually general principles regarding the manner of reporting.[86] Several reporting frameworks and standards are attempts to influence the corporate reporting of GHG emissions. Those frameworks and standards generally sit atop the GHG protocol in that they accept and incorporate the GHG Protocol's definitions of Scope 1 and Scope 2 emissions as their starting points.[87]

1. Task Force on Climate-Related Financial Disclosure

The Task Force on Climate-Related Financial Disclosure ("TCFD") was established by the Financial Stability Board[88] at the request of the G20 Finance Ministers and Central Bank Governors. In its 2017 Final Report, the TCFD recommended, among other things, that "[o]rganizations should provide their Scope 1 and Scope 2 GHG emissions and, if appropriate, Scope 3 GHG emissions and the related risks. GHG emissions should be calculated in line with the GHG Protocol."[89] The TCFD report added that "the GHG Protocol methodology is the most widely recognized and used international standard for calculating GHG emissions. Organizations may use national reporting methodologies if they are consistent with the GHG Protocol methodology."[90]

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[86] *E.g.*, VALUE REPORTING FOUND., COMPLEMENTARY TOOLS: USING THE <IR> FRAMEWORK AND SASB STANDARDS TOGETHER 4 (2021), https://www.sasb.org/knowledge-hub/complementary-tools-using-the-framework-and-sasb-standards-together/ [https://perma.cc/X9EN-JGBA] (defining "disclosure frameworks" and "disclosure standards").

[87] Using a similar metaphor, the GHG Protocol formally recognizes "Guidance Built on GHG Protocol." *Guidance Built on GHG Protocol*, GREENHOUSE GAS PROTOCOL, https://ghgprotocol.org/Guidance-Built-on-GHG-Protocol (last visited Dec. 23, 2021) [https://perma.cc/7LDV-29A] (listing tools that the GHG Protocol has determined are "in conformance with the GHG Protocol standards.").

[88] The Financial Stability Board is an international body that monitors and makes recommendations about the global financial system.

[89] TASK FORCE ON CLIMATE-RELATED FIN. DISCLOSURES, FINAL REPORT: RECOMMENDATIONS OF THE TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES 22 (2017), https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf [https://perma.cc/V8JL-LH7D] [hereinafter TCFD FINAL REPORT].

[90] *Id.* at 22 n.40.

The promulgators of other reporting systems are particularly deferential to the TCFD framework because of its government connection.[91] Although the TCFD has not sought to change GHG emissions reporting, its endorsement of the GHG Protocol has solidified the GHG Protocol's place in the reporting structure.

2. Global Reporting Initiative

The Global Reporting Initiative ("GRI") is a nonprofit organization that promulgates a comprehensive set of corporate social responsibility reporting standards.[92] GRI 305 is the standard that governs GHG emissions.[93] GRI 305 acknowledges that greenhouse gases "are governed by the United Nations (UN) 'Framework Convention on Climate Change' and the subsequent UN 'Kyoto Protocol'" and identifies the seven greenhouse gases.[94] GRI 305-1 and GRI 305-2 require the reporting of Scope 1 and Scope 2 emissions respectively, using the same terms of art as the GHG Protocol. Those terms include "direct (Scope 1) emissions," "biogenic CO_2 emission," "base year," "global warming potential (GWP) rates," "equity share," "financial control," and "operational control." The only clear difference between the GHG Protocol and GRI 305-1 is that GRI 305-1 allows the use of GWP values from only the second and most recent IPCC Assessment Reports,[95] while the GHG Protocol states that companies "should use GWP values from the most recent Assessment Report but may choose to use other IPCC Assessment Reports."[96] Thus, the GRI GHG reporting standards are almost identical to the GHG Protocol and sit atop the GHG Protocol.

[91] The SEC states that "[o]ur proposed climate-related disclosure framework is modeled in part on the TCFD's recommendations." The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334, 21343 (proposed Apr. 11, 2022) (to be codified at 17 C.F.R. §§ 210, 229, 232, 239, and 249).

[92] Global Reporting Initiative, *Setting the Agenda for the Future*, GRI, https://www.globalreporting.org (last visited Sept. 17, 2022) [https://perma.cc/FA6Z-S43W].

[93] GRI 305, *supra* note 42, at 4.

[94] *Id.*

[95] *Id.* at 8 ("GWP rates from the Second Assessment Report of the . . . IPCC . . . can be used for disclosing GHG emissions where it does not conflict with national or regional reporting requirements. The organization can also use the latest GWP rates from the most recent IPCC assessment report.").

[96] 2013 AMENDMENTS, *supra* note 73, at 1.

3. Sustainability Accounting Standards Board

SASB is another nonprofit organization that promulgates a comprehensive set of CSR reporting standards.[97] SASB standards with codes ending in "110a" require the reporting of total Scope 1 GHG emissions.[98] They also require the reporting of Scope 1 emissions of each of the seven greenhouse gases in metric tons of CO_2-e in accord with the GHG Protocol. The IPCC's fifth assessment is the "preferred" source for conversion factors,[99] but the Protocol places no other limit on the source. As to the firm boundary, SASB directs that "GHG emission data shall be consolidated according to the approach with which the entity consolidates its financial reporting data, which is generally aligned with the 'financial control' approach defined by the GHG Protocol."[100]

SASB does not require the reporting of Scope 2 emissions.[101] Instead, SASB standards that end in "130a" require companies in designated industries to disclose "the total amount of energy [the company] consumed as an aggregate figure, in gigajoules (GJ)."[102]

> The scope of energy consumption includes energy from all sources, including energy purchased from sources external to the entity and energy produced by the entity itself (self-generated). For example, direct fuel usage, purchased

[97] IFRS FOUND.: SASB STANDARDS, https://www.sasb.org/ (last visited Sept. 17, 2022) [https://perma.cc/643E-P22W].

[98] SUSTAINABILITY ACCT. STANDARDS BD., OIL & GAS — EXPLORATION & PRODUCTION: SUSTAINABILITY ACCOUNTING STANDARD 9 (2018), https://www.sasb.org/wp-content/uploads/2018/11/Oil_Gas_Exploration_Production_Standard_2018.pdf [https://perma.cc/XS8A-8TTY] [hereinafter SASB EM-EP-110a].

[99] *E.g.*, *id.* ("Emissions of all GHGs shall be . . . in metric tons of carbon dioxide equivalent (CO_2-e), and calculated in accordance with published 100-year time horizon global warming potential (GWP) values. To date, the preferred source for GWP values is the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (2014).").

[100] *Id.* at 10.

[101] *See* SUSTAINABILITY ACCT. STANDARDS BD., SASB IMPLEMENTATION SUPPLEMENT: GREENHOUSE GAS EMISSIONS AND SASB STANDARDS 1 (2020), https://www.sasb.org/wp-content/uploads/2020/10/GHG-Emmissions-100520.pdf [https://perma.cc/BE84-X582].

[102] SUSTAINABILITY ACCT. STANDARDS BD., IRON & STEEL PRODUCERS: SUSTAINABILITY ACCOUNTING STANDARD 14 (2018), https://www.sasb.org/wp-content/uploads/2018/11/Iron_Steel_Producers_Standard_2018.pdf [https://perma.cc/VWY3-5WEF] [hereinafter SASB EM-IS-110a].

> electricity, and heating, cooling, and steam energy are all included within the scope of energy consumption.[103]

On its face, SASB 130a seems to be sharply different from the GHG Protocol's Scope 2 emissions. SASB requires a measure of energy consumption in GJ;[104] the GHG Protocol requires a measure of GHG emissions in metric tons.[105]

The difference is less than it at first appears. The calculation of Scope 2 GHG emissions begins with a calculation of the company's energy consumption.

The energy included in the two measures is similar. But SASB energy consumption includes biogenic/biomass usage, while GHG Protocol Scope 2 includes only non-CO_2 emissions from biogenic/biomass.[106] SASB includes "energy from all sources, including . . . self-generated."[107] The GHG Protocol may include Scope 2 emissions from self-generated electricity, but that is not clear.[108] SASB requires disclosure of only the total amount of energy consumed, the percentage from the grid, and the percentage from renewable sources.[109] The GHG

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[103] SUSTAINABILITY ACCT. STANDARDS BD., E-COMMERCE: SUSTAINABILITY ACCOUNTING STANDARD 8 (2018), https://www.sasb.org/wp-content/uploads/2018/11/E_Commerce_Standard_2018.pdf [https://perma.cc/ AS9L-ZGS2].

[104] SASB EM-IS-110a, *supra* note 102, at 14.

[105] GRI 305, *supra* note 42, at 9 ("The reporting organization shall report . . . : Gross location-based energy indirect (Scope 2) GHG emissions in metric tons of CO_2 equivalent."); *see* GREENHOUSE GAS PROTOCOL, *supra* note 9, at 25 ("Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company.").

[106] SOTOS, *supra* note 63, at 57 ("Based on the Corporate Standard, any CH_4 or N_2O emissions from biogenic energy sources use shall be reported in scope 2, while the CO_2 portion of the biofuel combustion shall be reported outside the scopes.").

[107] SASB EM-IS-110a, *supra* note 102, at 14.

[108] SOTOS, *supra* note 63, at 37-38:

> Some companies own, operate, or host energy generation sources such as solar panels or fuel cells on the premises of their building or in close proximity to where the energy is consumed. This arrangement is often termed "distributed generation" or "on-site" consumption . . . . The owners/operator of a distributed generation facility may therefore have both scope 1 emissions from energy generation, as well as scope 2 emissions from any energy purchased from the grid, or consumed from on-site generation.

[109] *See* Cam Simpson, Akshat Rathi & Saijel Kishan, *The ESG Mirage*, BLOOMBERG (Dec. 9, 2021), https://www.bloomberg.com/graphics/2021-what-is-esg-investing-msci-ratings-focus-on-corporate-bottom-line/?cmpid=BBD121021_OUS&utm_medi% E2%80% [https://perma.cc/5MPY-DMM7] (noting that MSCI dropped "carbon emissions from any consideration in the calculation of McDonald's rating" because

Protocol also considers differences in the electricity consumed, but it calculates those differences differently.[110] The differences are large enough to render SASB energy consumption and GHG Protocol Scope 2 emissions non-comparable even if the user is willing to make the complex conversions.

CSR reporting standards are of two basic types. Single-materiality standards — such as SASB's — require only the reporting of information relevant to the company's profitability and hence material to investors. Double materiality standards — such as GRI's — require the reporting of information material to the investors and information material to other stakeholders and the public.[111]

To illustrate the difference, single-materiality reporting of "water stress" might measure "whether communities have enough water to sustain [the company's] factories," while double materiality would also measure "the company's impact on the water supplies of the communities."[112] Single materiality might regard GHG emissions as immaterial if the company is unlikely to be the subject of emissions regulation,[113] while double materiality would require GHG emissions reporting if the public needed the information to address climate change. Single materiality is sometimes described as measuring "the potential impact of the world on the company," while double materiality is described as also measuring "the impact of company on the world."[114]

Consistent with its single-materiality approach, SASB distinguishes seventy-seven industries and provides separate reporting requirements for each. In industries where GHG emissions are low, SASB considers emissions immaterial and does not require the company to report them. SASB provides a "materiality map" to show which standards apply in

"MSCI determined that climate change neither poses a risk nor offers 'opportunities' to the company's bottom line").

110 *See supra* Part I.B.1.

111 *See* Christensen et al., *supra* note 5, at 1178 ("The broad approach applies double materiality as the key criterion; that is, a firm not only reports how it is affected by ESG issues, but also the firm's impacts on the environment and society, including the externalities it causes.").

112 *See, e.g.*, Simpson et al., *supra* note 109 ("[MSCI's] ratings don't measure a company's impact on the Earth and society. In fact, they gauge the opposite: the potential impact of the world on the company and its shareholders.").

113 *See id.*

114 *Id.*

each industry.[115] Disclosure of Scope 1 emissions is required in only twenty-two of SASB's seventy-seven industries. In fifty-five other industries, disclosure of Scope 1 GHG emissions is not required. Strict adherence to SASB's GHG standards would limit comparability of Scope 1 emissions to companies in twenty-two industries. Only companies in those industries could be ranked on Scope 1 emissions.

SASB's substitute for Scope 2 emissions, "energy management" disclosure, is required in only thirty-five of SASB's seventy-seven industries.[116] Those disclosures are not comparable to Scope 2 emissions disclosures. Fortunately, nearly all companies that report to SASB standards also report Scope 1 and Scope 2 emissions.[117] The SEC Proposed Rule rejects SASB's concept of materiality by requiring that all companies report their Scope 1 and Scope 2 emissions.

4. Climate Disclosure Standards Board

The Climate Disclosure Standards Board ("CDSB") is a non-profit "consortium of business and environmental NGOs" that offers companies a "framework for reporting environmental information."[118] CDSB's framework consists almost entirely of broad principles. However, CDSB does require the reporting of GHG emissions "in CO_2 equivalent metric tonnes, absolute and normalised Scope 1 and 2 GHG emissions, calculated by reference to a recognised . . . GHG emissions measurement methodology."[119] The recognized methodologies referred to include "Global standards," "national and regional legislation," "national guidance," or provisions issued by any of a group of organizations that include GRI, SASB, and TCFD.[120] The CDSB Framework makes no mention of the GHG Protocol's firm boundaries or global warming potential calculations.

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[115] *Exploring Materiality*, VALUE REPORTING FOUND.: SASB STANDARDS, https://materiality.sasb.org/ (last visited Sept. 17, 2022) [https://perma.cc/U6G5-ZBVD] (text of EM-EP-110a.1).

[116] *SASB Industry Standards*, *supra* note 16 ("For the 35 industries that indirectly contribute to greenhouse gas emissions through significant use of purchased electricity . . . SASB Standards recommend metrics related to understanding the amount, type . . . and source.").

[117] GHG Reporting Study (on file with author).

[118] CLIMATE DISCLOSURE STANDARDS BD., CDSB FRAMEWORK FOR REPORTING ENVIRONMENTAL & CLIMATE CHANGE INFORMATION 1 (2019), https://s3.amazonaws.com/assets.wemeanbusinesscoalition.org/wp-content/uploads/2021/12/15102926/cdsb_framework_2019_v2.2.pdf [https://perma.cc/R2BM-B2FD] [hereinafter CDSB FRAMEWORK].

[119] *Id.* at 22.

[120] *Id.* at 9, 23 (naming GRI, SASB, TCFD, and others).

However, CDSB does specify that "[f]or the purposes of the CDSB Framework GHG emissions shall be treated as material in all cases."[121] That puts the CDSB framework in conflict with SASB. SASB regards GHG emissions as immaterial in most industries.

5. The Climate Registry

The Climate Registry was established in 2007 as a nonprofit NGO "to continue the work of the California Climate Action Registry (CCAR)."[122] CCAR separated from the Climate Registry in 2010.[123]

The Climate Registry promulgates a set of GHG reporting protocols that it says "embodies GHG accounting best practices drawn from the following existing GHG standards and guidance." [124] It then lists the GHG Protocol, the International Organization for Standardization GHG guidance, and the EPA GHG guidance.[125]

The Climate Registry's protocols differ from the GHG Protocol in important respects. Comparability across companies is not an express principle.[126] Accordingly, the Climate Registry protocols expressly permit companies to limit their reports to some countries while excluding others[127] and to some facilities while excluding others, provided that the companies identify the facilities omitted.[128] If substantial numbers of companies exercise their freedom to exclude unquantified portions of their emissions, the Climate Registry Protocols will no longer provide a credible basis for comparison or ranking.

The SEC Proposed Rule requires companies to disclose their "total Scope 1 emissions and total Scope 2 emissions separately after

[121] *Id.* at 11.

[122] *About Us*, THE CLIMATE REGISTRY, https://www.theclimateregistry.org/who-we-are/about-us/ (last visited Aug. 14, 2022) [https://perma.cc/ZYD5-YR8W].

[123] *Id.*; *Board & Council of Jurisdictions*, CLIMATE REGISTRY, https://www.theclimateregistry.org/who-we-are-board-of-directors-jurisdictions/ (last visited Dec. 23, 2021) [https://perma.cc/D5HX-TLT3].

[124] CLIMATE REGISTRY, GENERAL REPORTING PROTOCOL: VERSION 3.0 A-2 (2019), https://www.theclimateregistry.org/protocols/General-Reporting-ProtocolV3.pdf [https://perma.cc/2V8H-PSRF] [hereinafter CLIMATE REGISTRY PROTOCOL].

[125] *Id.*

[126] *Id.* (listing relevance, completeness, consistency, transparency, and accuracy as its principles).

[127] *Id.* at B-3 ("Organizations may use geography as a parameter in defining their reporting boundary. For example, organizations can choose to include specific countries, states, provinces or territories in their reporting boundary.").

[128] *Id.* ("When organizations are defining their reporting boundary to include a subset of facilities in their operational boundary, they must disclose any facilities that are excluded from the reporting boundary.").

calculating them from all sources that are included in the registrant's organizational and operational boundaries."[129] When calculating those emissions "a registrant may exclude emissions from investments that are not consolidated, are not proportionately consolidated, or that do not qualify for the equity method of accounting in the registrant's consolidated financial statements."[130] The vagueness of these exclusions suggests that companies will be able to manipulate their boundaries under the Rule, but not nearly to the degree they now can under voluntary reporting.

6. Other Protocols, Standards and Frameworks

CSR Reports sometimes purport to comply with two other frameworks. The Sustainable Development Goals ("SDGs") were adopted by the United Nations in 2015.[131] As their name implies, they are a set of goals, not reporting instructions. "Climate action" is one of the SDGs, but the climate action goal states no reporting requirements.[132]

The International Integrated Reporting Council ("IIRC") adopted its International <IR> Framework in 2013.[133] The framework's principles promote the integration of financial and non-financial reporting but say nothing about greenhouse gases. Nothing in either of these frameworks appears to contravene anything in the GHG Protocol.

The GHG Protocol gained hegemony in GHG reporting by partnering with industry groups:

> Industry groups, such as the International Aluminum Institute, the International Council of Forest and Paper Associations, and the WBCSD Cement Sustainability Initiative, partnered with the GHG Protocol Initiative to develop complementary industry-specific calculation tools. Widespread adoption of the [GHG

[129] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334, 21468 (proposed Apr. 11, 2022) (to be codified at 17 C.F.R. §§ 210, 229, 232, 239, and 249).

[130] *Id.*

[131] *What are the Sustainable Development Goals?*, UNITED NATIONS DEV. PROGRAMME, https://www.undp.org/sustainable-development-goals (last visited Dec. 23, 2021) [https://perma.cc/P4R4-GQXX].

[132] *Id.*

[133] *International <IR> Framework*, IFRS FOUND. (Jan. 2021), https://www.integratedreporting.org/international-framework-downloads [https://perma.cc/7SVP-M3ZS].

> Protocol] can be attributed to the inclusion of many stakeholders in its development.[134]

The partnering resulted in several industry organizations developing their own, industry-specific, GHG-Protocol-compatible standards for reporting GHG emissions. Those industries include oil and gas,[135] aluminum,[136] iron and steel,[137] cement,[138] waste removal,[139] pulp and paper mill,[140] real estate,[141] and office-based organizations.[142] The partnering also resulted in a revision of the GHG Protocol in 2004.[143] The revised version recommends that "[i]ndustrial companies . . . should seek guidance from the sector-specific guidelines on the GHG Protocol website (if available) or from their industry associations."[144]

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134 GREENHOUSE GAS PROTOCOL, *supra* note 9, at 3.

135 For the oil and gas industry standards, see generally AM. PETROLEUM INST., COMPENDIUM OF GREENHOUSE GAS EMISSIONS METHODOLOGIES FOR THE OIL AND NATURAL GAS INDUSTRY (2009), https://www.api.org/~/media/files/ehs/climate-change/2009_ghg_compendium.ashx [https://perma.cc/LEC9-WXDB].

136 INT'L ALUMINIUM INST., THE ALUMINIUM SECTOR GREENHOUSE GAS PROTOCOL (2006), https://ghgprotocol.org/sites/default/files/aluminium_1.pdf [https://perma.cc/WA7W-QN6M] (calling itself an "[a]ddendum to the WRI/WBCSD Greenhouse Gas Protocol").

137 WORLDSTEEL ASS'N, CALCULATING GREENHOUSE GAS EMISSIONS FROM IRON AND STEEL PRODUCTION (2008), https://ghgprotocol.org/sites/default/files/Iron%20and%20Steel%20Version%202.0%20Guidance.doc [https://perma.cc/XL4S-VWSG].

138 WORLD BUS. COUNCIL FOR SUSTAINABLE DEV., THE CEMENT CO_2 PROTOCOL: CO_2 ACCOUNTING AND REPORTING STANDARD FOR THE CEMENT INDUSTRY, VERSION 2.0 (2005), https://ghgprotocol.org/sites/default/files/co2_CSI_Cement_Protocol-V2.0_0.pdf [https://perma.cc/Z5M9-8KN3].

139 For the waste industry standards, see generally ENTERS. POUR L'ENVIRONNEMENT WORKING GRP., PROTOCOL FOR THE QUANTIFICATION OF GREENHOUSE GAS EMISSIONS FROM WASTE MANAGEMENT ACTIVITIES: VERSION 5.0 (2013), https://ghgprotocol.org/sites/default/files/Waste%20Sector%20GHG%20Protocol_Version%205_October%202013_1_0.pdf [https://perma.cc/CW5Z-M8LG].

140 For the pulp and paper mill industry standards, see generally INT'L COUNCIL OF FOREST & PAPER ASS'NS, CALCULATION TOOLS FOR ESTIMATING GREENHOUSE GAS EMISSIONS FROM PULP AND PAPER MILLS: VERSION 1.1 (2005), https://www.ncasi.org/wp-content/uploads/2019/02/GHG_Calc_Tools_PandP_report.pdf [https://perma.cc/MR8P-396H].

141 GRESB REAL EST., 2021 REAL ESTATE REFERENCE GUIDE, https://documents.gresb.com/generated_files/real_estate/2021/real_estate/reference_guide/complete.html (last visited Dec. 23, 2021) [https://perma.cc/A35H-KA99].

142 CTR. FOR CORP. CLIMATE LEADERSHIP, U.S. ENV'T PROT. AGENCY, GUIDE TO GREENHOUSE GAS MANAGEMENT FOR SMALL BUSINESS & LOW EMITTERS (2020), https://www.epa.gov/sites/default/files/2017-01/documents/guide_to_greenhouse_gas_management_for_small_business_low_emitters.pdf [https://perma.cc/4UHV-HCU5].

143 *See* GREENHOUSE GAS PROTOCOL, *supra* note 9, at 3.

144 *Id.* at 42.

The industry protocols track the GHG Protocol in most respects. But, as intended, they also describe industry-specific methods of collecting data and making calculations. Those methods and calculations may reduce the comparability of data across industries.

II. THE EMPIRICAL STUDY

To determine the degree to which the GHG emissions data reported for 2020 provide an adequate basis for company rankings, I collected and analyzed GHG emissions data on two hundred randomly selected S&P 500 companies. I choose the S&P 500 because it consists of large, U.S.-based, public companies. Large, public companies are the companies most likely to report CSR information.[145] S&P 500 companies are thus a relatively easy context in which to rank companies based on GHG emissions.

A. Sample Selection

The sample is randomly selected from the S&P 500. The S&P 500 is an index compiled by Standard & Poor's to "measure[] . . . the performance of the large-cap segment of the market."[146] To be included, companies must have a market capitalization of at least $13.1 billion,[147] file 10-K annual reports, have a plurality of their fixed assets and revenues in the United States, and have their primary listing on one of ten U.S. stock exchanges.[148]

We downloaded the list of the S&P 500 companies from Cap IQ on June 29, 2021. We randomized the list by adding a field containing 500 copies of the Excel RAND formula. We sorted the list by those random numbers, putting the companies in random order. We permanently numbered them from one to five hundred. The first two hundred are the subject of this study.

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[145] *See* Enrique Nunez & Rosita Nunez, *Comparison of CSR Reporting Using the GRI Framework for Small and Large Companies*, 23 J. BUS. & ECON. STUD. 42, 47 (2019) (reviewing the literature).

[146] S&P DOW JONES INDICES, S&P U.S. INDICES: METHODOLOGY 3 (2022), https://www.spglobal.com/spdji/en/documents/methodologies/methodology-sp-us-indices.pdf [https://perma.cc/9M5C-H77J].

[147] *Id.* at 7, 24.

[148] *Id.* at 6.

B. Reporting Comprehensiveness

This Section considers two aspects of GHG emissions reporting comprehensiveness: (1) What proportion of S&P 500 companies report GHG emissions? and (2) How complete are those reports? The wider a ranking system's coverage, the more valuable the rankings. That is because users of rankings are usually interested in the ranking of particular items, and a ranking system with greater coverage is more likely to include the particular items.

Table 2 shows the frequency with which the studied companies reported (1) Scope 1 and 2 emissions in accord with the GHG Protocol, (2) biogenic emissions, and (3) energy use or consumption in accord with the applicable SASB protocols. One hundred sixty-two of the two hundred companies (81%) reported Scope 1 emissions. The same one hundred sixty-two companies reported Scope 2 emissions. Of the one hundred sixty-two Scope 2-reporting companies, one hundred five (65%) reported a location-based number and ninety-five (59%) reported a market-based number. Forty-five of the one hundred sixty-two (28%) reported a Scope 2 number without differentiating between location-based and market-based reporting.

Table 2: Numbers of Companies Reporting 2020 GHG Emissions

	Scope 1 number	Scope 2 number	Scope 2 location number	Scope 2 market number	Scope 2 un-differentiated number	Biogenic emissions number	SASB energy use number
Reported	162 (81%)	162 (81%)	105 (53%)	95 (48%)	45 (23%)	28 (14%)	77 (39%)
Did not report	38 (19%)	38 (19%)	95 (48%)	105 (53%)	155 (78%)	172 (86%)	123 (62%)
Total	200 (100%)	200 (100%)	200 (100%)	200 (100%)	200 (100%)	200 (100%)	200 (100%)

Of the thirty-eight companies that did not report 2020 Scope 1 or Scope 2 GHG emissions, Hologic reported what appears to be a total of Scope 1 and Scope 2 emissions. Four non-reporting companies — Tesla, Fox, Global Payments, and Quanta Services — say they are planning to report GHG emissions in the near future. Of the two hundred companies studied, only 14 (7%) did not publish a CSR report for 2020.[149]

[149] The protocols for this study defined a "CSR report" as:

> [A] pdf or a website that reports data on at least one of the subjects of reporting under the GRI or SASB protocols. The report must contain numeric

The 81% reporting levels for Scope 1 and Scope 2 GHG emissions are adequate to support rankings based solely on GHG emissions. They are not adequate, however, to support rankings based on multiple measures of CSR. For example, if the reporting rate were 81% for each of ten factors used to calculate a CSR measure, and the missing data were randomly distributed among the ten factors, the CSR measure could be calculated for only 12% of the companies.[150] For each other company, one or more of the ten data points would be missing, making the calculation impossible. Thus, mandatory reporting is probably necessary to support a multi-factor measure of CSR without the questionable practice of estimating data.

Instead of Scope 2 emissions, SASB requires the reporting of energy use or energy consumption for thirty-five of SASB's seventy-seven industries. That includes the industries of one hundred nineteen of the two hundred companies studied (60%). Only seventy-seven of those one hundred nineteen companies (65%) complied with SASB's requirement by reporting an amount for energy use or consumption.

SASB requires reporting energy use and consumption in GJ, but thirty-one of the seventy-seven reporting companies (40%) reported in other metrics. Seventy-one of the seventy-seven reporting companies that reported SASB energy use or consumption (92%) also reported Scope 1 and Scope 2 emissions.[151] Thus far, SASB's rejection of Scope 1 and Scope 2 reporting has not interfered substantially with GHG Protocol emissions reporting.

C. The Reporting Pattern

This Section describes the pattern of GHG emissions reporting in greater detail. The pattern reveals several weaknesses in the reporting system. If the voluntary reporting system becomes sufficiently important, companies can be expected to exploit these weaknesses.

> data. "We are reducing our GHG emissions" is not a report. The report must be for some fixed period of time. "We've reduced our emissions by more than 32%" is not a CSR Report if it states no period of coverage. A CDP questionnaire that is available free on the internet is a CSR report.

Lynn M. LoPucki, 2020 Study Design and Protocols: GHG Emissions Ranking Project 4 (Aug. 9, 2022) (on file with author).

[150] One hundred multiplied by .81 ten times is 12.15.

[151] Advance Auto Parts, Brown-Forman, Electronic Arts, Generac, Huntington Ingalls, and Snap-on were the exceptions.

1. Third-Party Assurances

Third party assurance is a check of a company's data, financial or nonfinancial, by an accredited auditor.[152] The auditor provides an approximately three-page "verification certificate" that summarizes the engagement, states the auditor's conclusions, and states the level of assurance provided.[153] That level will be "limited" or "reasonable" if the ISAE 3000 standard is applied[154] and "moderate" or "high" if the AA1000 Assurance Standard v3 is applied.[155] The AA1000 standard was adopted in August 2020, so only a few assurors applied it to certifications of 2020 reports.

Ninety-six of the one hundred sixty-two companies that reported GHG emissions (59%) obtained third-party assurances of their GHG emissions reporting. Seventy-one of the ninety-six assurances (74%) are "limited," ten (10%) are "reasonable," eleven (11%) are "moderate," two are "high" (2%), and two are of unknown type (2%). Of the ninety-six companies that obtained assurances, we were able to obtain the certificates for seventy-six (79%) from public sources.

Assurance coverage was heavily focused on GHG emissions; all ninety-six certificates for which we have coverage data included them. Thirty-six of the seventy-six certificates in our possession (47%) covered only GHG emissions. Twenty-two of the seventy-six (29%) covered GHG emissions in addition to other environmental data such as energy usage or measures of water and air pollution. Only eighteen of the seventy-six (24%) covered other aspects of corporate social responsibility, such as health, safety, diversity, or legal compliance.

Three assurors, Apex, ERM, and Lloyd's Register, issued forty-four of the eighty-three assurances (53%) for which we could identify the assurors. Certified public accounting firms can provide assurances, but only seven of the eighty-three assurances (8%) were provided by CPAs.

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[152] In the U.S., the term "auditor" is generally used to refer only to financial auditors, but worldwide the term is also used to refer to firms that provide assurances.

[153] *E.g.*, BUREAU VERITAS, INDEPENDENT LIMITED ASSURANCE STATEMENT (2021), https://www.ibm.com/ibm/environment/annual/IBM_GHG_AssuranceStatement_2020.pdf [https://perma.cc/ER8T-G54G] (assurance certificate issued to IBM Corporation).

[154] INT'L AUDITING & ASSURANCE STANDARDS BD., ISAE 3000 (REVISED), ASSURANCE ENGAGEMENTS OTHER THAN AUDITS OR REVIEWS OF HISTORICAL FINANCIAL INFORMATION: FINAL PRONOUNCEMENT 7 (2013), https://www.ifac.org/system/files/publications/files/ISAE%203000%20Revised%20-%20for%20IAASB.pdf [https://perma.cc/EY5R-4CPA] (defining "reasonable assurance engagement" and "limited assurance engagement").

[155] ACCOUNTABILITY, AA1000: ASSURANCE STANDARD V3 18 (2020), https://www.accountability.org/static/3ff15429033873cdc775212ca63572fb/aa1000as_v3_final.pdf [https://perma.cc/P44L-E2UM].

Four were by Deloitte & Touche. Ernst & Young, PricewaterhouseCoopers, and KPMG each had one.

In collecting the data for this study, we discovered that assurance certificates were a better data source than CSR or GHG reports. Nearly all certificates identified the standards to which the company reported, reported specific GHG numbers, and clearly described what each number measured. The underlying reports were sometimes ambiguous as to the protocols followed, presented data in graphic forms that required the user to estimate the height of a bar on the graph and translate it into a number, or failed to say what some of the numbers measured. The clarity of presentation in certificates is an important benefit of the assurance process.

The SEC Proposed Rule would require each accelerated filer to obtain an "attestation report" from an independent "GHG emissions attestation provider" with respect to its Scope 1 and Scope 2 emissions disclosures.[156] Accelerated filers are companies with more than $75 million of equity outstanding.[157] In the second and third years after the Rule's effective date, the attestation could provide limited assurances. In the fourth and subsequent years, the attestation would have to provide reasonable assurances.[158]

2. Reporting Standards

As part of the assurance process, the company chooses one or more protocols, standards, or frameworks and calculates its emissions by them. The assuror checks the calculations and reports, among other things, the standards used. We were able to identify the protocols applied by eighty-three companies that obtained assurances. Table 3 shows the number and percent of companies applying each standard set.

156 The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334, 21398 (Apr. 11, 2022) (to be codified at 17 C.F.R. pts. 210, 229, 232, 239, and 249).

157 *See* 17 C.F.R. § 240.12b-2 (2022) (defining "accelerated filer" and "large accelerated filer").

158 The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21392.

Table 3. Standards Applied by Companies Providing Assurances (from eighty-three reports of one or more)

Standards applied	Number of applications	Percent of reports
GHG Protocol	68	82%
GRI	14	17%
Climate Registry	5	6%
U.S. EPA	4	5%
GRESB	2	2%
Petroleum Institute	2	2%
Mining Metals Council	1	1%
CDP Guidance	1	1%
TCFD	1	1%
SASB	1	1%
Total	99	134%
The number of applications (99) exceeds the number of companies (83) because some companies applied more than one set of standards.		

Table 3 shows that the GHG Protocol is the dominant reporting standard. The 82% rate shown understates that dominance because the other standards — except SASB and the EPA — are based on the GHG Protocol and highly similar to it.

3. Biogenic Emissions

Biogenic emissions are emissions from the combustion or decomposition of biomass other than fossil fuels, peat, or carbon minerals.[159] "Biomass is renewable organic material that comes from plants and animals."[160] Biogenic CO_2 emissions are regarded as less harmful than emissions from fossil fuels because under natural conditions, biomass would degrade and the carbon would return to the atmosphere anyway.[161] Accordingly, the GHG Protocol instructs:

[159] ENV'T PROT. AGENCY OFF. OF ATMOSPHERIC PROGRAMS, *supra* note 23, at iv ("[B]iogenic CO_2 emissions are defined as CO_2 emissions directly resulting from the combustion, decomposition, or processing of biologically based materials other than fossil fuels, peat, and mineral sources of carbon through combustion, digestion, fermentation, or decomposition processes.").

[160] *Biomass Explained*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/energyexplained/biomass/ (last updated June 2, 2022) [https://perma.cc/GT6C-BNA2].

[161] *See Biogenic Emissions*, SUSTAINABILITY INDICATOR MGMT. & ANALYSIS PLATFORM, https://unhsimap.org/cmap/resources/biogenic (last visited Dec. 23, 2021) [https://perma.cc/ JM8V-BP4M] ("Biogenic CO_2 refers to carbon in wood, paper, grass trimmings, and other biofuels that was originally removed from the atmosphere by photosynthesis and, under natural conditions, would eventually cycle back to the atmosphere as CO_2 due to degradation processes."). The Climate Registry provides a similar explanation:

> While biomass can produce fewer GHG emissions than fossil fuels and may be grown and used on a shorter time horizon, it still produces GHG emissions and should not be treated with a "zero" emission factor. Based on the *Corporate Standard,* any CH_4 or N_2O emissions from biogenic energy sources use shall be reported in Scope 2, while the CO_2 portion of the biofuel combustion shall be reported outside the scopes. In practice, this means that any market-based method data that includes biofuels should report the CO_2 portion of the biofuel combustion separately from the scopes.[162]

Separately reporting biogenic CO_2 emissions was probably intended to allow users of the data to decide how much weight to give to them. But it may also have discouraged companies from reporting biogenic CO_2 emissions at all. As shown in Table 2, only twenty-eight of the two hundred companies studied (14%) reported a number for biogenic emissions. Some companies stated on CDP questionnaires that biogenic emissions were "not relevant" to their business. The low response rates prevent the use of biogenic emissions in ranking the companies. But the omission of biogenic emissions from ranking when the GHG Protocol requires their reporting reduces the comparability of GHG emissions.

Even if all companies reported biogenic emissions data, a comparability problem would remain. The GHG Protocol specifies no equivalency between GHG emissions and biogenic emissions, thus providing no basis for combining them into a single number that could be used for ranking. Under current reporting practices, the best solution to this problem is to ignore biogenic emissions in ranking the companies.

The SEC Proposed Rule makes no reference to biogenic emissions. In doing so, it implicitly adopts the GHG's exclusion of most biogenic emissions from Scope 1 and Scope 2.

> Organizations must track and report biogenic CO_2 emissions separately from other emissions because the carbon in biomass was recently contained in living organic matter. This sets it apart from the carbon in fossil fuels that has been trapped in geologic formations for millennia, the release of which can be attributed directly to human activities.

CLIMATE REGISTRY PROTOCOL, *supra* note 124, at B-6.

[162] SOTOS, *supra* note 63, at 57.

4. Firm Boundary

As previously noted, the GHG Protocol allows companies to define the boundaries of their firms — and hence the boundaries of their responsibility for emissions — in any of three ways: (1) equity share, (2) financial control, and (3) operating control. That flexibility created a theoretical risk that companies might each choose the boundaries most favorable to themselves, rendering the resulting data not comparable. Table 4 shows the boundaries reported by the one hundred twenty companies (60%) that reported boundaries.

Table 4. Firm Boundaries

Boundary method	Number	Percent
Operational control	106	88%
Financial control	6	5%
Equity share	5	4%
Other	3	3%
Total	120	100%
GHG Protocol boundary not reported	80	

Of the one hundred twenty companies that reported how they determined their firm boundaries, one-hundred six (88%) defined their boundaries as "operating control," six (5%) defined their boundaries as "financial control," five (4%) defined their boundaries as "equity share," and three (3%) did not define their boundaries as matching any of those three GHG Protocol categories.

Five of the six electric utilities that reported their boundary method used the equity share method.The data suggest that utilities may be more likely to use the equity share method than they were in the past. Working from 2014 data, Stanny found that only eight of eighteen electric utilities (44%) used the equity share approach.[163] The difference between Stanny's findings and mine are not, however, statistically significant.[164]

The GHG Protocol interprets "operational control" in a manner that may reduce the comparability of GHG emissions. It recognizes the possibility that a facility may have operational control of itself, with the result that none of the owners who benefit from its operations are responsible for its emissions. The GHG Protocol states that "[i]f the

[163] Elizabeth Stanny, *Reliability and Comparability of GHG Disclosure to the CDP by US Electric Utilities*, 38 SOC. & ENV'T. ACCOUNTABILITY J. 111, 124 (2018) (2014 data on 18 companies showing eight using the equity approach, one using the financial approach, six using the operational approach, and three using other approaches).

[164] The Fisher's Exact two-tailed p-value equals 0.166.

operation itself will introduce and implement its own operating policies, the partners with joint financial control over the operation will not report any emissions under operational control."[165] To illustrate by analogy, Apple does not report GHG from its collocated data facilities — essentially its cloud servers.[166] One can easily imagine a world in which companies strategically contract their GHG-emitting operations out or isolate them in subsidiaries over which the companies retain financial control but not operational control.

The SEC Proposed Rule may perpetuate this loophole. Although the Rule requires that companies report Scope 1 and Scope 2 emission "from all sources that are included in the registrant's organizational and operational boundaries," the Rule expressly authorizes companies to "exclude emissions from investments that . . . are not proportionately consolidated."[167]

5. Geographical Boundary

The goal of corporate GHG reporting is "a true and fair representation of the company's GHG emissions."[168] The GHG Protocol does not authorize geographical exclusions.[169] But the Climate Registry promulgates protocols that do.[170] Six of the studied reports stated that the emissions from certain countries were included, without making clear whether emissions from other countries were being excluded.[171]

165 GREENHOUSE GAS PROTOCOL, *supra* note 9, at 18.

166 APPLE, ENVIRONMENTAL PROGRESS REPORT 67 n.4 (2021), https://www.apple.com/environment/pdf/Apple_Environmental_Progress_Report_2021.pdf [https://perma.cc/4E28-9TNK] ("The building operations and cooling emissions (PUE) associated with our colocated data facilities are beyond our operational control and therefore these emissions are not included in our report.").

167 The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334, 21468 (Apr. 11, 2022) (to be codified at 17 C.F.R. pts. 210, 229, 232, 239, and 249) (§ 229.1504(b)(1) and (2).

168 GREENHOUSE GAS PROTOCOL, *supra* note 9, at 8.

169 *Id.*

170 CLIMATE REGISTRY PROTOCOL, *supra* note 124, at B-3 ("Organizations may use geography as a parameter in defining their reporting boundary. For example, organizations can choose to include specific countries, states, provinces or territories in their reporting boundary.").

171 Some companies reported data for specified countries without specifying that they did not have emissions in other countries. We investigated each of these reports to determine whether the company had substantial operations in countries not listed and found none that did. Ameren acknowledged that "[a]ll consumption at Ameren Missouri owned buildings . . . with the exception of the General Office Building" are not included in Ameren's Scope 1 and Scope 2 emissions. The exclusions were "due to lack of metering equipment." *See* CDP, AMEREN CORPORATION CDP CLIMATE CHANGE

One reported that the excluded emissions were less than a tenth of a percent of the company's total emissions. The other five did not estimate the omitted emissions.[172] Reporting instructions should mandate the reporting of emissions and use of "worldwide," "global," or some similar term in reporting. The SEC Proposed Rule does not expressly do that.

6. Exclusions

Thirty-three of the one hundred sixty-two GHG emissions-reporting companies (20%) excluded unlimited geographical or other categories of emissions from their reporting.[173] For example, the Williams Companies excluded Scope 2 emissions from "corporate office buildings."[174] UDR excluded "fugitive emissions from refrigerants, consistent with GRESB requirements for data estimates."[175] Ameren excluded "[energy] consumption at Amaren Missouri owned buildings," "due to lack of metering equipment."[176] Eaton excluded "air emissions" at non-manufacturing sites.[177] Trimble said the emissions they reported were for 50% of their total space and 33% of their employees.[178] The company said they planned to report 100% in the

QUESTIONNAIRE 2021, at 64-65 (2021), https://www.ameren.com/-/media/corporate-site/files/environment/esg-report-library/cdp-climate-change-questionnaire.pdf [https://perma.cc/W35D-YW7T] [hereinafter AMEREN CDP QUESTIONNAIRE]. I classified this as an exclusion problem, not a geographical limitation.

172 Eaton Corporation plc, which reported its emissions for 42 companies, disclosed elsewhere that it did business in 175 countries. It is possible that Eaton had no emissions in the additional countries.

173 These companies appear in the Appendix with a down arrow (🡻) in the "Exclusions" column beside their names.

174 WILLIAMS CO., INC., 2020 SUSTAINABILITY REPORT 107, 124 (2021), https://www.williams.com/wp-content/uploads/sites/6/2021/07/Williams_2020SustainabilityReport_Pages-2.pdf [https://perma.cc/XC84-NJTZ].

175 UDR, INC., UDR 2021 ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG) REPORT 30 (2021), https://www.udr.com/globalassets/corporate/corporate-responsibility/2021/udr_2021_esgreport.pdf [https://perma.cc/35AM-ESQR].

176 AMEREN CDP QUESTIONNAIRE, *supra* note 171, at 64-65.

177 EATON CORP., ESG DATA BOOK 1, 3 n.1 (2021), https://www.eaton.com/content/dam/eaton/company/sustainability/files/eaton-esg-results.pdf [https://perma.cc/CY3L-V8NW].

178 Trimble's report states:

> These totals include emissions for purchased electricity in 17 of our largest facilities accounting for ~50% of Trimble's total space worldwide and ~1/3 of global employees as of 2020. As part of our commitment to setting science-based targets, we are currently developing the capacity to collect a complete Scope 2 inventory and plan to report this in future sustainability reporting.

future. A few other companies omitted categories of emissions but estimated the amounts excluded. All of these exclusions are incompatible with the completeness principle of the GHG Protocol.[179]

> All relevant emissions sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled. In practice, a lack of data or the cost of gathering data may be a limiting factor. Sometimes it is tempting to define a minimum emissions accounting threshold (often referred to as a materiality threshold) stating that a source not exceeding a certain size can be omitted from the inventory. Technically, such a threshold is simply a predefined and accepted negative bias in estimates (i.e., an underestimate). Although it appears useful in theory, the practical implementation of such a threshold is not compatible with the completeness principle of the *GHG Protocol Corporate Standard*. . . . Instead companies need to make a good faith effort to provide a complete, accurate, and consistent accounting of their GHG emissions.[180]

By contrast, the Climate Registry's protocols specifically allow such exclusions. "[O]rganizations can choose to include specific countries, states, provinces or territories in their reporting boundary. Similarly, parameters can include specific business units or facilities."[181] Of the five companies that reported to the Climate Registry's protocols, none reported excluding emissions. Nevertheless, reporting instructions should require companies to measure what they can, estimate what they cannot, report a complete total, and justify the estimations.

The SEC Proposed Rule would require the reporting of Scope 1 and Scope 2 emissions from "all sources that are included in the registrant's organizational and operational boundaries."[182] Thus, the Rule would eliminate the type of exclusions discussed here.

TRIMBLE INC., 2020 SUSTAINABILITY REPORT 38 (2021), https://www.trimble.com/en/our-commitment/overview [https://perma.cc/DU2E-H7C3] (scroll down and click "2020 Sustainability Report").

179 *See* GREENHOUSE GAS PROTOCOL, *supra* note 9, at 8.

180 *Id.*

181 CLIMATE REGISTRY PROTOCOL, *supra* note 124, at B-3.

182 The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334, 21374 (Apr. 11, 2022) (to be codified at 17 C.F.R. pts. 210, 229, 232, 239, and 249).

7. Reporting Times

CSR reports, GHG emissions reports, and financial reports cover one-year periods. The period is usually a calendar year — January 1 through December 31. Some companies issue reports for non-calendar years; those reports are for periods ending at the end of a month other than December.[183] Table 5 shows the proportions of companies issuing reports for calendar and non-calendar years. Twenty-one percent of financial reporting — defined as the filing of SEC Form 10-K — is non-calendar year, as compared with 15% for CSR reporting and 11% for GHG reporting.

Table 5: Proportions of Calendar-year Reporting

	10-K	CSR Report	GHG Report
Calendar year	159 80%	158 85%	71 89%
Non-calendar year	41 21%	28 15%	9 11%
Total	100 100%	186 100%	163 100%

Reporting periods were considered to be the same if they ended with the same month, even if the ending date differed by up to five days.

The use of different reporting periods for financial, CSR, and GHG data reduces the comparability of data across companies and across report types. As an example of the latter, if a company reports its financial data for a year ending in June 2020 and its CSR and GHG data for a year ending in December 2020, the companies' revenues, assets or employees cannot easily be used to take company size into account when analyzing the CSR or GHG data.[184] The SEC Proposed Rule solves the problem with respect to GHG emissions disclosures by requiring that they be for the company's fiscal year.[185]

[183] Companies often end their year a few days before or after the end of a month. All these deviations were four days or less. We ignored the deviations in reporting the data shown on Table 5.

[184] Unlike CSR and GHG information, financial information is published quarterly. If calendar year financial information is needed for a company that is on a non-calendar fiscal year, it can be computed using the relevant quarters from two fiscal years. But not all such information is reported quarterly, and the quarters may not align.

[185] *See* The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21346.

Table 6 shows that nearly all companies used the same period for their 10-K, CSR, and GHG reporting.

Table 6: Companies Using the Same Reporting Period

	10-K and CSR	10-K and GHG	CSR and GHG
Companies using same period	177 96%	155 96%	157 97%
Companies using different periods	8 4%	7 4%	5 3%
Total	185 100%	162 100%	162 100%

Companies usually report CSR and GHG data in the same document and financial data in a separate document — the annual report on SEC Form 10-K.

Several organizations, most notably the Value Reporting Foundation, advocate "integrated reporting." Included in the usual meaning of that term is a requirement that financial and nonfinancial reporting will be in the same document and cover the same time period.[186] In current practice, integrated reporting appears to mean that the company files its annual report ("10-K") with the SEC as soon as it is ready, and then includes brief excerpts from the annual report in the CSR report when the latter is ready.[187]

The SEC Proposed Rule would require companies to report GHG emissions data for the companies' fiscal year in their registration statements and annual reports ("Form 10-K"), including their financial

[186] Arielle Bikard, *Where Financial Reporting and CSR Meet*, COMPLIANCE WK. (Dec. 20, 2010, 8:00 PM), https://www.complianceweek.com/where-financial-reporting-and-csr-meet/4666.article [https://perma.cc/294S-BQCR] ("The idea, integrated reporting, is to mesh financial and social responsibility reports into one document."); *see also* TRWG General Requirements, *supra* note 19, at ¶ 21 ("Some sustainability-related financial information could be positioned in the relevant sections of a general purpose financial report together with information from the financial statements to provide users a complete depiction of the entity's business.").

[187] *See, e.g.*, SOUTHWEST AIRLINES CO., FORM 10-K FOR THE FISCAL YEAR ENDED DECEMBER 31, 2020, (Feb. 8, 2021), https://www.southwestairlinesinvestorrelations.com/~/media/Files/S/Southwest-IR/2020%2010-K%20Final%20Filed.pdf [https://perma.cc/V3QY-KSHN] (annual report containing no greenhouse gas emissions data); SOUTHWEST, 2020 ONE REPORT (May 3, 2021), 30-35, 49 https://www.southwestairlinesinvestorrelations.com/financials/company-reports/one-reports [https://perma.cc/3DJU-ARYY] (containing a six page section on "Economic Performance" and greenhouse gas emissions data).

statements.[188] Such reporting would be fully integrated. The GHG and financial disclosures for a company would be comparable because they would be for the same time period. But unless U.S. companies abandon their non-calendar-year financial reporting, GHG data will be less comparable across companies internationally. Most companies' GHG reports are for calendar years.

Financial reporting to the SEC is by corporate groups. The boundaries of those groups are specified in SEC regulations and accounting standards.[189] The SEC Proposed Rule sets what appears to be a different boundary. Companies must calculate Scope 1 and Scope 2 emissions "from all sources that are included in the registrant's organizational and operational boundaries" but "may exclude emissions from investments that are not consolidated, are not proportionally consolidated, or that do not qualify for the equity method of accounting in the registrant's consolidated financial statements."[190] The effect of this boundary will depend on the imperviousness of accounting consolidation rules to manipulation.

As SASB has recognized, integrated reporting will require that financial and nonfinancial reporting be for the same period[191] and to the same boundary.[192] But Table 7 suggests that simultaneous release of financial and nonfinancial reports may be difficult to achieve. Under the current practice, companies release their 10-K reports at a median time of fifty days after the end of the company's fiscal year. They release their

188 The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21335 ("We are proposing to require registrants to provide certain climate-related information in their registration statements and annual reports, including certain information about climate-related financial risks and climate-related financial metrics in their financial statements.").

189 SEC. & EXCH. COMM'N, FORM 10-K ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(D) OF THE SECURITIES EXCHANGE ACT OF 1934, at 9 (2021), https://www.sec.gov/files/form10-k.pdf [https://perma.cc/9J7Z-5KV2] ("Financial statements of the registrant and its subsidiaries consolidated (as required by Rule 14a-3(b)) must be filed under this item."); *810 Consolidation*, FASB ACCT. STANDARDS CODIFICATION, https://asc.fasb.org/section&trid=2197482 (last visited Sept. 17, 2022) [https://perma.cc/BM8A-HMNG] ("[T]he usual condition for a controlling financial interest is ownership by one reporting entity, directly or indirectly, of more than 50 percent of the outstanding voting shares of another entity.").

190 The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21468.

191 SASB STANDARDS APPLICATION GUIDANCE, *supra* note 43, at 3 ("Unless otherwise specified, the reporting period shall correspond to the entity's fiscal year(s).").

192 *See id.* at 2 ("The reporting boundaries for disclosures that conform with the SASB standards shall include all parent and subordinate entities that are consolidated for financial reporting purposes. Disclosures for consolidated entities shall not be adjusted for minority interests.").

CSR and GHG reports at median times of 182 and 180 days respectively after the end of their reporting years. Companies have neither voluntarily delayed their 10-Ks nor accelerated their CSR and GHG reporting processes to achieve integration. Presumably to ease the burden of acceleration, the SEC Proposed Rule allows companies to estimate their fourth quarter GHG emissions in their 10-Ks and report their actual GHG emissions later.[193]

Table 7: Days from Covered Period End to Report Release

	10-K n=200	CSR Report n=181	GHG Report n=160
Median	50	182	180
Mean	49	191	192
Range	21 to 60	25 to 432	68 to 445

III. DATA COMPARABILITY

The promulgators of the leading protocols, frameworks, and standards — including the SEC but excluding the Climate Registry — agree that comparability of the reported data across companies is an objective of reporting.[194] Some define comparability as "the qualitative characteristic that enables users to identify and understand similarities in, and differences among, items."[195] That is not a definition, however; it is merely a statement of comparability's effect.

To "compare" items is "to look for the difference between two or more things."[196] Comparability is "the fact or quality of being similar

[193] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21346, 21416.

[194] *See, e.g.*, *id.* at 21335 ("[W]e believe that additional disclosure requirements may be necessary or appropriate to elicit climate-related disclosures and to improve the . . . comparability . . . of climate-related disclosures."); Eva Cerioni, Alessia D'Andrea, Marco Giuliani & Stefano Marasca, *Non-Financial Disclosure and Intra-Industry Comparability: A Macro, Meso and Micro Analysis*, 1177 SUSTAINABILITY 3 (2021) ("Even if . . . the different standards present several differences, they all share a few aspects. One of these is comparability."); GRI 1, *supra* note 41, at 20 (listing "comparability" as one of GRI's six "reporting principles"); TCFD FINAL REPORT, *supra* note 89, at 22 ("GHG emissions should be calculated in line with the GHG Protocol methodology to allow for aggregation and comparability across organizations and jurisdictions.").

[195] IFRS, COMPARABILITY OF DISCLOSURES 3 (2015), https://www.ifrs.org/content/dam/ifrs/meetings/2015/june/iasb/disclosure-initiative/ap11f-principles-diclosure-comparability.pdf [https://perma.cc/4FXU-2ZKV]; *see also* CDSB FRAMEWORK, *supra* note 118, at 15.

[196] *Compare*, CAMBRIDGE DICTIONARY, https://dictionary.cambridge.org/dictionary/english/compare (last visited Dec. 23, 2021) [https://perma.cc/VNA8-TWG7].

and able to be compared."[197] Items must be sufficiently similar before one can draw useful conclusions about the differences among them. Comparability thus includes the degree of similarity between the items to be compared.[198] In this study, the items compared are S&P 500 companies.

Comparability also requires a second similarity; the measurements of the items' characteristics must have been made in the same or a similar way.[199] The names of the companies and the values of the characteristics constitute the data set. The greater the similarity in the companies to be compared, the characteristics to be measured, and the manner of their measurement, the more comparable the data.[200] "Unlike the other qualitative characteristics, [verifiability, timeliness and understandability], comparability does not relate to a single item. A comparison requires at least two items."[201]

Comparison focuses on differences in a single characteristic or a small number of characteristics. In the comparison contemplated by this Article, that characteristic is the company's GHG emissions. Through ranking, comparison can reduce those emissions by enabling potential stakeholders to reward the companies with the lowest emissions and punish the companies with the highest.[202] Comparison would be easy if the companies were identical in all respects other than their GHG emissions and the companies measured those emissions the same way. The companies would rank in the order of their emissions, from lowest to highest.

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197 *Comparability*, OXFORDIFY, https://www.oxfordify.com/meaning/comparability (last visited Dec. 23, 2021) [https://perma.cc/36UU-7SH5].

198 *Comparable*, REVERSODICTIONARY, https://mobile-dictionary.reverso.net/en/english-cobuild/comparable+data (last visited Dec. 23, 2021) [https://perma.cc/JPC3-BSM8] ("If two or more things are comparable, they are of the same kind or are in the same situation, and so they can reasonably be compared.").

199 *See* John K. Simmons, *A Concept of Comparability in Financial Reporting*, 42 ACCT. REV. 680, 685 (1967) ("Uniformity in the reporting of detailed information between two companies is necessary for comparability."); Cardoni et al., *supra* note 26, at 5 ("[C]omparability is considered as a qualitative characteristic of the reporting information.").

200 Simmons, *supra* note 199, at 692 ("[T]he concept of comparability has the twin objectives of reporting similarities as similarities and differences as differences. The fact that basic identicalness does not exist among companies increases the importance of achieving comparability in financial reporting.").

201 IFRS, *supra* note 195, at 3.

202 *See* Cardoni et al., *supra* note 26, at 5 ("The more the company's strategy responds to the stakeholders' inquires, the more favorable are the stakeholders' actions toward the company.").

To the extent companies differ in other relevant respects, such as the size and nature of their operations, comparison is increasingly problematic. Some commentators believe that only companies within an industry are sufficiently similar for comparison. Others respond that ranking only within an industry wrongly assumes that all industries should exist. They argue that the oil industry should at least be ranked together with the solar or wind-generation industries. Those issues are addressed by a vibrant CSR-ranking industry[203] and are discussed in the next Part.

IV. CORPORATE RANKING

One purpose of this study was to explore the suitability of GHG emissions data for corporate comparison and ranking. The study accomplished that by collecting the data for two hundred randomly selected S&P 500 companies and using that data to rank the companies. The rankings of the two hundred companies are in the Appendix, and interactive rankings of all five hundred companies are available online.[204] The ultimate purpose of the rankings is to inform potential stakeholders and the public so they can exercise their market power over companies.[205]

A. Existing GHG Emissions Rankings

About six hundred organizations rank corporations based on CSR disclosures.[206] But only four organizations have previously published free rankings based on GHG emissions. The largest is the Carbon Majors Database, which contains "[GHG] emissions data on the largest company-related sources of all time."[207] The Carbon Majors Database categorizes emissions according to the GHG Protocol but bases its rankings on "the sum of Scope 1 and Scope 3 category 11" — and not

[203] *See* LoPucki, *Repurposing the Corporation*, *supra* note 3, at 1463-65.

[204] *Greenhouse Gas Emissions Rankings*, STAKEHOLDER TAKEOVER PROJECT, https://www.stakeholdertakeover.org/rankings.html (last visited Aug. 30, 2022) [https://perma.cc/2ME3-KK2R].

[205] *See* LoPucki, *Repurposing the Corporation*, *supra* note 3, at 1448.

[206] *See* CHRISTINA WONG & ERIKA PETROY, SUSTAINABILITY, RATE THE RATERS 2020: INVESTOR SURVEY AND INTERVIEW RESULTS 6 (2020), https://www.sustainability.com/globalassets/sustainability.com/thinking/pdfs/sustainability-ratetheraters2020-report.pdf [https://perma.cc/472R-JS75] ("The number of ESG standards and frameworks . . . has expanded, with 600+ ESG ratings and ranking existing globally as of 2018 and continuing to grow since.").

[207] GRIFFIN, *supra* note 31, at 2.

Scope 2 — to "avoid double counting."[208] The most recent data published are for 2015. A second ranking, published by Stacker, was based on research by seven academics.[209]

Third, the Political Economy Research Institute at the University of Massachusetts Amherst publishes a *Combined Toxic 100 / Greenhouse 100 Indexes* report, apparently at two-year intervals.[210] The report lists GHG emissions in CO_2-e, using data reported to the EPA by the emitting facilities. Fourth, M.J. Bradley & Associates publishes an annual report that contains a ranking of the highest one hundred carbon dioxide emissions reported to the EPA from major generating facilities.[211] In addition, Lynn M. LoPucki published a ranking of S&P 500 companies' GHG emissions as reported to the EPA.[212] Edmunds, Chona, and Meng published GHG emissions data from corporate GHG disclosures by the S&P 100 companies for 2015-19. They did not, however, rank the companies.[213] Table 8 compares the rankings.

[208] PAUL GRIFFIN, RICHARD HEEDE & IAN VAN DER VLUGT, CDP, THE CARBON MAJORS DATABASE: METHODOLOGY REPORT 2017, 3 (2017), https://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/comfy/cms/files/files/000/000/979/original/Carbon-Majors-Database-2017-Method.pdf [https://perma.cc/226N-6M2J].

[209] Atula Gupta, *The 90 Companies Responsible for Two-Thirds of Historical Greenhouse Gas Emissions*, STACKER (Dec. 13, 2021), https://stacker.com/stories/3971/90-companies-responsible-two-thirds-historical-greenhouse-gas-emissions [https://perma.cc/2PBS-A4D4]. The Stacker story is based on research reported in B. Ekwurzel, J. Boneham, M.W. Dalton, R. Heede, R.J. Mera, M.R. Allen & P.C. Frumhoff, *The Rise in Global Atmospheric CO2, Surface Temperature, and Sea Level from Emissions Traced to Major Carbon Producers*, 144 CLIMATE CHANGE 579 (2017).

[210] POL. ECON. RSCH. INST., COMBINED TOXIC 100 / GREENHOUSE 100 INDEXES (2021 REPORT, BASED ON 2019 DATA) (2021), https://peri.umass.edu/combined-toxic-100-greenhouse-100-indexes-current [https://perma.cc/X88T-WVZH]; Press Release, Pol. Econ. Rsch. Inst., PERI Names Top Climate, Air, and Water Polluters; Environmental Justice Indicators Track Unequal Risk for Poor and Minorities (2021), https://peri.umass.edu/images/Toxic_100_Press_Release_Jan_2021.pdf [https://perma.cc/STF7-XUP8].

[211] CHRISTOPHER VAN ATTEN, AMLAN SAHA, LUKE HELLGREN & TED LANGLOIS, M.J. BRADLEY & ASSOCS., BENCHMARKING AIR EMISSIONS OF THE 100 LARGEST ELECTRIC POWER PRODUCERS IN THE UNITED STATES 14 (2021), https://www.mjbradley.com/sites/default/files/Presentation_of_Results_2021.pdf [https://perma.cc/Q8QC-ET8E].

[212] LOPUCKI, RANK OF S&P 500, *supra* note 40.

[213] Edmunds et al., *supra* note 33, at 3. The report is available at https://cbey.yale.edu/sites/default/files/2021-01/CBEY_NET-ZERO-FINAL_Jan2021.pdf [https://perma.cc/5DVZ-BXB4]. The data are available at https://cbey.yale.edu/sites/default/files/2020-12/S%26P%20100%20Emissions%20Tracker%20vF.xlsx [https://perma.cc/Q82M-KSXX]).

Table 8. Public Rankings of Companies by GHG Emissions

	Entities ranked	Number ranked	Ranked-by metric	Data source	Data year	Ranking frequency
The Carbon Majors Database	Global fossil fuel producers	224	Scope 1 plus Scope 3, category 11	Multiple sources	2015	Continuous
Stacker	Global companies	90	Carbon dioxide and methane	Ekwurzel	1880-2010	Episodic**
Univ. of Mass. Amherst (PERI)	U.S. facilities	100	GHG emissions, CO_2-e	EPA disclosures	2019	Biennial
M.J. Bradley & Associates	U.S. electric power producers	100	Carbon dioxide only	EPA disclosures	2019	Annual
Edmunds, Chona, Meng	S&P 100	100	Did not rank companies	Company disclosures	2015-2019	Episodic**
LoPucki	S&P 500 companies	132/ 500*	GHG emissions, CO_2-e	EPA disclosures	2019	Episodic**
LoPucki	S&P 500 companies	500	Scope 1 and 2 emissions	Company disclosures	2020	Annual

* Only 132 of the S&P 500 companies reported emissions. No emissions linked to the remaining 368 companies were reported.
** "Episodic" means that the researcher has not publicly indicated an intention to report based on later data.

The ranking from the instant study is unique in two respects. This is the first public ranking based on voluntarily reported corporate GHG emissions. It is also the first public ranking based on the sum of Scope 1 and Scope 2 emissions.

B. Voluntary Constraints

Creation of the LoPucki S&P 500 company rankings was subject to two voluntarily assumed constraints. The first was to use only data disclosed by the companies publicly. The second was to design and finance the system so that the rankings and the source data could be available free to the public. These two constraints enable the system to be fully transparent, and hence will increase its credibility.

About 125 organizations gather data from companies, process it into ratings and rankings, and sell it to the public.[214] Most of those organizations consider portions of their systems proprietary and keep them secret.[215] The ratings and rankings they have produced are notoriously inconsistent with one another.[216] The secrecy prevents resolution of the inconsistencies through discussion or debate and renders the rankings not credible. Only small portions of those ratings and rankings are not behind paywalls.

We did not pay or seek permission to obtain any of the data used. The source documents for this study are public, as are the locations from which we gathered the data, the calculations we made to process the data, and the rankings themselves. Making this information publicly available will make the rankings more credible because users will be able to see, check, and replicate the rankings.

C. Ranking's Strategic Vulnerabilities

Companies act strategically. A strategy is a plan for achieving a goal or goals within the constraints of a system.[217] As potential stakeholders respond to the GHG rankings by favoring highly ranked companies in their dealings, the companies will attempt to reduce their emissions. They will consider strategies by which they can reduce their *reported* emissions without the expense of reducing their *actual* emissions.

Parts I and II of this Article identified several ways they might do that. Those ways are the strategic vulnerabilities of the GHG emissions reporting system. Companies can game the system by choosing which of the protocols, standards, and frameworks to which they report GHG emissions. They can choose firm boundaries and IPCC or EPA assessments that enable them to use lower rates when calculating CO_2-e. They can make "errors" that are less than 5%, the level of errors that the

[214] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21341 n.70.

[215] *E.g.*, Simpson et al., *supra* note 109 ("MSCI's detailed rating reports are available only to their financial industry clients.").

[216] *See, e.g.*, The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21341 n.70 (explaining the inconsistencies); LoPucki, *Repurposing the Corporation*, *supra* note 3, at 1463-65 (explaining the inconsistencies).

[217] Lynn M. LoPucki & Walter O. Weyrauch, *A Theory of Legal Strategy*, 49 DUKE L.J. 1405, 1428 (2000) ("A strategy is a plan for action intended to accomplish some goal.").

GHG Protocol deems acceptable.[218] By reporting to the Climate Registry protocols, they can exclude portions of their emissions while still reporting their emissions as Scope 1 and Scope 2.

The ranker can exclude companies whose reports are incomplete, but that reduces the rankings' coverage and utility. The ranker can impose penalties by highlighting the incompleteness or lowering the company's ranking. But the highlighting detracts from the ranking's credibility and the penalties introduce discretion that the ranker must then justify.

D. The Stakeholder Takeover GHG Rankings

The Appendix and Stakeholder Takeover Project website contain five rankings of each company. The first ranking is based on the total of the company's reported Scope 1 and Scope 2 GHG emissions ("the Company Ranking"). The second is based on the same total, normalized by revenues ("the Company Intensity Ranking"). The third ranking is within-industry ("the Company Within-Industry Intensity Ranking"). The fourth is based on emissions reported to the EPA ("the EPA Ranking"), and the fifth is based on those emissions normalized by revenues ("the EPA Intensity Ranking").

In all three Company rankings — Company Emissions, Intensity, and In-industry Intensity — companies acknowledging unlimited exclusions from their reported emissions are ranked on their reported emissions but flagged with a down arrow (🡻) to indicate that their appropriate rank may be lower than shown. Companies not reporting GHG emissions are ranked last. Potential stakeholders could use these rankings to associate with low-emissions-reporting companies.

1. Combining Scope 1 and Scope 2 Emissions

With only one exception,[219] companies that reported Scope 1 and Scope 2 GHG emissions reported an amount for each. Ranking, however, must be based on a single number. This Article proposes that the number be the total of Scope 1 and Scope 2 emissions. The Scope 2 emissions for each company should be market-based if available, otherwise location-based if available, otherwise undifferentiated if

[218] GREENHOUSE GAS PROTOCOL, *supra* note 9, at 69-70 ("As a rule of thumb, an error is considered to be materially misleading if its value exceeds 5% of the total inventory for the part of the organization being verified.").

[219] Hologic, Inc. reported only a total amount of GHG emissions. HOLOGIC, THE POWER OF PURPOSE: HOLOGIC 2020 SUSTAINABILITY REPORT 17 (Feb. 2021), https://www.hologic.com/sites/default/files/Sustainability/Hologic-Sustainability-Report-2020.pdf [https://perma.cc/M9EY-H79S].

available, otherwise the company should be treated as non-reporting and ranked as tied for last. The ranking system prefers market-based emissions over location-based emissions because the former provide incentives for the grid to reduce its emissions, while the latter do not.

Scope 1 and Scope 2 emissions are fungible in that both are measured in equivalent metric tons of GHG emissions. The combined number double-counts emissions in the sense that each metric ton of emissions results in a metric ton of Scope 1 emissions and a metric ton of Scope 2 emissions — two metric tons in total. The logic of this double counting is that two entities are responsible for GHG emissions: the company that emitted the greenhouse gases in generating the energy and the person or company that induced the generation by using the energy. Charging the same emissions to both the generator and the user incentivizes both to reduce their emissions by reducing their respective roles in creating them.

Charging the emissions to both creates a comparability problem, however, in the situation where a company both generates and consumes electricity. Generation creates Scope 1 emissions, but consumption may not create Scope 2 emissions. To illustrate, assume that Utility generates a pound of CO_2-e in producing a kilowatt hour of electricity. If Utility sells the kilowatt hour to Buyer and Buyer uses the electricity, Utility reports a pound of Scope 1 emissions and Buyer reports a pound of Scope 2 emissions. But if Utility uses the electricity, the GHG Protocol apparently allows Utility to report a pound of Scope 1 emissions and no Scope 2 emission: "Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company."[220] The SEC Proposed Rule replicates the error using slightly different language.[221] The solution is for both the GHG Protocol and the SEC Proposed Rule to make clear that the consumption of self-generated electricity gives rise to Scope 2 emissions.

2. Intensity

The purpose of rankings is usually to identify and promote merit. Lower emissions that result merely from the company's smaller size do not indicate merit. The problem can be addressed in essentially two

[220] GREENHOUSE GAS PROTOCOL, *supra* note 9, at 25.

[221] *See* The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21466 ("*Scope 2 emissions* are indirect GHG emissions from the generation of purchased or acquired electricity, steam, heat, or cooling that is consumed by operations owned or controlled by a registrant.").

ways. The first is to compare only companies of similar size. All five rankings from the instant study address the problem by ranking only S&P 500 companies — all of which are large — against each other. The second method is to "normalize" the emissions by calculating their ratio to some measure of the operations that produce them. Such quotients are referred to as the "intensity" of emissions.[222]

Two of the intensity rankings in the Appendix, for example, are based on the company's GHG emissions, divided by the company's revenues, and reported as metric tons of emissions per million dollars of revenues. The SEC Proposed Rule would require companies to calculate and disclose these "GHG intensity" amounts.[223]

Normalization can be done in a more sophisticated manner through regression analysis using multiple controls. But regression is an indeterminate tool that is easily misused. Rankings based on regression analysis might lack credibility. Normalization is more often accomplished by dividing the companies' emissions by the companies' numbers of units produced. Those units might be automobiles, barrels of oil, or any other product or service. But this method will work only if the units the compared companies produce are essentially the same, so the method is limited to within-industry ranking.

3. Within-Industry Comparison

To support ranking, data must be comparable across the companies to be ranked. Data that are comparable only within an industry can support the ranking of companies only within the industry.

SASB standards facilitate within-industry comparison. SASB designed them to provide only the data material to investors. SASB's model is an investor comparing companies within an industry to decide which is the best investment.[224] The resulting standards differ by industry. SASB considers GHG emissions material in some industries but not in others. SASB requires the disclosure of Scope 1 emissions in twenty-two of seventy-seven industries and does not require the disclosure of Scope 2 emissions in any industry. If companies reported only to SASB

[222] GREENHOUSE GAS PROTOCOL, *supra* note 9, at 67 ("Intensity ratios express GHG impact per unit of physical activity or unit of economic output.").

[223] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21469 ("Using the sum of Scope 1 and 2 emissions, disclose GHG intensity in terms of metric tons of CO_2e per unit of total revenue.").

[224] *SASB Standards & Other ESG Frameworks*, VALUE REPORTING FOUND.: SASB STANDARDS, https://www.sasb.org/about/sasb-and-other-esg-frameworks/ (last visited Dec. 24, 2021) [https://perma.cc/7CMA-7A8W] ("SASB Standards fill the need for ESG disclosure tailored to investors and other providers of financial capital.").

standards, only Scope 1 GHG emissions data would exist and only for companies in twenty-two industries. Only companies in those industries could be ranked by emissions.

SASB-only GHG emissions data might not be adequate to rank S&P 500 companies on the basis of Scope 1 emissions even within the industries in which Scope 1 would be reported. As shown in Table 9, 85% of the companies studied report that they operate in more than one industry.[225] Although the SEC associates a single "primary" Standard Industrial Classification ("SIC") code on EDGAR with each company, companies report multiple primary and secondary SIC codes elsewhere.[226]

Table 9. Numbers of Companies Reporting Multiple SIC Codes

	Primary codes	Secondary codes	Primary and secondary codes
Companies reporting more than one	95 (48%)	76 (38%)	169 (85%)
Companies reporting one	105 (53%)	89 (45%)	31 (16%)
Companies reporting none	0 (0%)	35 (18%)	0 (0%)
Total companies	200 (100%)	200 (100%)	200 (100%)

Data source: Wharton Research Data Services, Cap IQ, Compustat, North America, Segments (non-historical)

[225] *See* U.S. ENV'T PROT. AGENCY, USER'S MANUAL FOR RSEI VERSION 2.3.2 [1996 – 2011 TRI DATA] 94 (2013), https://www.epa.gov/sites/default/files/2014-03/documents/rsei_users_manual_v2.3.2.pdf [https://perma.cc/YP8Q-ZW8P] ("A given facility may produce more than one type of product or may be associated with more than one type of activity, and therefore, the facility may report up to six SIC codes on TRI Form R, with one code designated as primary.").

[226] Companies report more than one Standard Industrial Classification ("SIC") code through Cap IQ.

The SIC code system was designed for reporting the industry of "establishments" (facilities) not "enterprises" (companies).[227] "Each establishment is to be classified according to its primary activity."[228]

> For purposes of this classification, an establishment is an economic unit, generally at a single physical location, where business is conducted or where services or industrial operations are performed. (For example: a factory, mill, store, hotel, movie theater, mine, farm, ranch, bank, railroad depot, airline terminal, sales office, warehouse, or central administrative office.)[229]

"An enterprise consists of all establishments having more than [fifty] percent common direct or indirect ownership."[230] Thus, each establishment has a primary SIC code, and each enterprise that owns establishments in different industries will have multiple primary SIC codes.

Companies in some industries have higher GHG emissions than companies in other industries. For example, electric utilities is a high-emissions industry. Edison International, with 2,200,000 metric tons of CO_2-e, ranks first (best) among the seven electric utilities in this study, but one hundred twenty-seventh among the one hundred sixty-two companies reporting GHG emissions. Asset management is a low emissions industry. Northern Trust, with 25,761 metric tons of CO_2-e, ranks last (worst) of the four asset management companies studied, even though it ranks twentieth among the one hundred sixty-two companies that reported GHG emissions.[231]

If a company has electric utility and asset management operations of equal size, the company's total emissions will probably be low for an electric utility and high for an asset manager. Ideally, this company would be disaggregated for within-industry comparison. The company's electric utility operations would be compared with other companies' electric utility operations, while the company's asset management

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[227] OFF. OF MGMT. & BUDGET, STANDARD INDUSTRIAL CLASSIFICATION MANUAL 11 (1987), https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/industrial/sic_manual_1987.pdf [https://perma.cc/64YY-EBX3] ("The Standard Industrial Classification for *establishments* differs from a classification for *enterprises* (companies) . . . . Each establishment is to be classified according to its primary activity.").

[228] *Id.*

[229] *Id.* at 12.

[230] *Id.* at 11.

[231] *See infra* Appendix.

operations would be compared with other companies' asset management operations.

The data necessary to make such disaggregated comparisons do not yet exist. At minimum, the company would need to provide separate totals for its GHG emissions in each industry. I am aware of no company that made such a separation in their Scope 1 and 2 reporting.

An alternative approach is to calculate emission "intensities" for the companies to be compared. For example, electric utilities may report GHG emissions per gigawatt hour of electricity produced.[232] But utilities that operate in two industries would still have to compile their GHG emissions separately for each industry to calculate the intensities. Each separate compilation for a company takes the system further from its goal of a single number by which the company can be ranked. As the data and calculations become more complex, they become less credible.

Because SASB's standards differ by industry, much of SASB's data can support only within-industry comparison and rankings. GRI's standards do not differ by industry, and so can support cross-industry comparison. The SEC Proposed Rule does not address ranking at all.

E. The Dynamics of Ranking

It should be apparent from this Article that the currently available GHG emissions data are deeply flawed as a basis for ranking S&P 500 companies. But, as numerous other ranking systems have demonstrated, even deeply flawed rankings can compel ranked entities to improve their performances.[233]

If a ranking system is not the best that can be built in the circumstances, it will likely be replaced by one that is. But if it is the best, it does not matter whether the companies are competing on a level playing field, whether the system recognized all aspects of merit, or whether cheating occurs. All that matters is whether the system creates substantial incentives for companies to reduce emissions without overwhelming side effects.

If the resulting system does not treat companies fairly, that becomes the companies' problem. If the ranking system can be improved, the companies should insist that the system be improved. If the ranking system favors companies with certain combinations of industries, other

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[232] *E.g.*, CHEVRON, 2020 CORPORATE SUSTAINABILITY REPORT 11 (2021), https://www.chevron.com/-/media/shared-media/documents/chevron-sustainability-report-2020.pdf [https://perma.cc/Y2AK-DNEH] (touting an intensity of 24 kilograms CO_2-e per barrel of oil equivalent).

[233] The U.S. News rankings of law schools are an example.

companies may have to reshape themselves to that combination. In that situation, the ranking system might adversely affect the companies' operations. But that possibility should not be considered dispositive. If the ranking system can shift the company's focus from externalizing social costs to providing social benefit, the "adverse" effect may be warranted.

V. CONCLUSIONS AND RECOMMENDATIONS

The GHG Protocol is the product of an astonishing level of consensus. Dozens of participating NGOs, seeking to reflect the views of thousands of other interested NGOs, government agencies, and companies, have all accepted the principle that corporate GHG emissions should be reported in the form of Scope 1 and Scope 2 emissions. Eighty-one percent of S&P 500 companies reported Scope 1 and Scope 2 emissions in CSR reports for the year 2020.[234] The voluntarily disclosed data for 2020 are sufficiently comparable to rank S&P 500 companies plausibly by total Scope 1 and Scope 2 emissions.

This study revealed, however, that the GHG Protocol has at least seven loopholes. Because none of these loopholes appear to be widely exploited, they probably do not yet affect the rankings' plausibility. But as GHG rankings become more credible and so more powerful, companies will exploit them. Adoption of the SEC Proposed Rule would dramatically reduce the potential for use of those loopholes.

1. *Alternate standards*. The GHG consensus is not entirely around the language of the GHG Protocol. Several organizations, most notably The Climate Registry, offer different, and often less demanding, versions of the GHG Protocol. Some companies may report to them instead of the GHG Protocol. The SEC Proposed rule would require reporting by all public companies to a single set of protocols.

2. *Exclusions*. Some companies excluded some emissions categories or geographical areas from their reported numbers. Some of the excluders asserted that their exclusions were de minimis and others estimated them. But thirty-three of one hundred sixty-two GHG emissions reporters (20%) did neither. The Climate Registry protocols expressly allow such exclusions, provided they are disclosed. The SEC Proposed Rule would prohibit exclusions.

[234] *See supra* Table 2.

3. *Lack of assurances*. Nearly half the companies that reported GHG emissions did not obtain third-party assurances. Those companies can easily make mistakes or even cheat. The SEC Proposed Rule would require all but the smallest public companies to obtain assurances from independent auditors.

4. *Boundaries*. The GHG Protocol offers companies three options for determining their own boundaries. In addition, it allows a company that chooses operational control as its boundary to cede control of a facility to an independent party, even while retaining ownership, and thereby escape responsibility for the facility's emissions.[235] The SEC Proposed Rule contains a single boundary specification applicable to all public companies. The degree to which companies would be able to manipulate that boundary is unclear.

5. *Conversions*. The GHG Protocol and related protocols allows companies various options among ratios for converting other greenhouse gases to CO_2-e.[236] The SEC Proposed Rule eliminates those safe harbors, leaving control over conversion rates to the audit process.[237]

6. *Biogenic emissions*. Biogenic emissions add GHG to the atmosphere. The GHG Protocol requires biogenic emissions reporting but the numbers of companies reporting them are insufficient to include biogenic emissions in the ranking process.[238] The SEC Proposed Rule does not address biogenic emissions, leaving it unclear whether and how they should be reported.

7. *Scope 3 emissions*. A company's Scope 3 emissions occur outside its boundaries. They are emissions that occur in the supply chain to produce the company's product or that occur through use of the company's product. Company rankings and comparisons cannot take Scope 3 emissions into account because too few companies report them. Yet Scope 3 emissions dwarf Scope 1 and Scope 2

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235 *See supra* note 165 and accompanying text.

236 *See supra* Part I.B.2.

237 *See* The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21403 ("The GHG emissions attestation report would also be required to include a statement that describes any significant inherent limitations associated with the measurement or evaluation of the subject matter (at a minimum, Scopes 1 and 2 emissions) against the criteria (*i.e.*, the applicable requirements in proposed Item 1504).").

238 *See supra* Part II.C.3.

> emissions.[239] The SEC Proposed Rule requires the reporting of Scope 3 emissions "if material" or if the company "has set a GHG emissions reduction target or goal that includes its Scope 3 emissions."[240] As a practical matter, that leaves Scope 3 emissions reporting largely voluntary.

Raters and rankers cannot yet use Scope 3 emissions as a basis for ranking. But they can include the reporting of Scope 3 emissions in formulae for ratings and rankings of the companies' transparency.[241]

Adoption of the SEC Proposed Rule in its current form would be a tremendous advance in GHG emissions reporting. It would close most of the loopholes in U.S. reporting and perhaps catalyze their closing in the rest of the world.

Congress delegated to the SEC the authority to promulgate disclosure regulations that are "necessary or appropriate in the public interest or for the protection of investors."[242] Traditionally, the SEC has focused largely on the protection of investors. In promulgating the SEC Proposed Rule, however, the SEC states that "[w]e have considered this statutory standard and determined that disclosure of information about climate-related risks and metrics would be in the public interest and would protect investors."[243] Thus, the SEC explanation is in accord with double-materiality and in conflict with single-materiality.

Even more importantly, the SEC has proposed a double-materiality reporting scheme. The GHG emissions of companies in low-emissions industries are not material to investors in those companies. That was the point made by SASB in excusing companies in those industries from reporting pursuant to SASB standards. The SEC has rejected SASB's single-materiality solution in favor of a comprehensive disclosure regime that will enable all stakeholders — including the public — to compare and evaluate companies for their own purposes.

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239 *See* GRIFFIN, *supra* note 31, at 10 (graph showing Scope 3 emissions far exceeding Scope 1 emissions for the 50 largest carbon emitters in the world).

240 The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21468.

241 *E.g.*, *Transparency*, STAKEHOLDER TAKEOVER PROJECT, https://www.stakeholdertakeover.org/transparency.html (last visited Sept. 17, 2022) [https://perma.cc/X7B2-YVYH] (including the reporting of Scope 3 emissions as one of ten factors in rating the transparency of S&P 500 companies).

242 *See, e.g.*, Securities Act § 7, 15 U.S.C. 77(g); Exchange Act §§ 12-13, 15, 15 U.S.C. 78*l*(b)(1), 78m(d)(1), and 78o(b)(1) (using the quoted language to specify the scope of SEC rulemaking).

243 The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21335.

SASB's single-materiality threat to the GHG Protocol consensus is fading. The unmistakably double-materiality GHG Protocol is likely to survive as an unacknowledged exception to single materiality. But through the newly announced IFRS Foundation alliance, the threat to CSR reporting from SASB's single-materiality standards appears stronger than ever.

The GHG Protocol's success demonstrates that investors and the public want to know what the effect of the company is on the world; only the most cynical limit their interest to environmental transgressions for which the company will be held to account. The SEC should recognize that only CSR reporting that provides potential stakeholders and the public with actionable information will enable the public to bring its market power to bear on the climate change problem.

CSR disclosure should provide potential stakeholders and the public with the information they need to decide which corporations to deal with and on what terms. Public rating and ranking are necessary to make that information usable. Single-materiality would disrupt the broad consensus in favor of CSR reporting, make cross-industry CSR rating and ranking impossible, and disenfranchise the public. Single materiality is not only a violation of democratic principles, but a dangerous lack of vision.[244]

[244] *See* LoPucki, *Repurposing the Corporation*, *supra* note 3, at 1501-02 (arguing that repurposing is democratic).

APPENDIX

		Company Emissions Ranking				Intensity Ranking			In-industry Ranking		EPA Emissions Ranking			
	Company	Rank	Scope 1+2	Exclusions	Assurances	Rank	Revenues	Scope 1+2/ Revenues	Industry	Rank	Rank by scope 1	Scope 1	Rank by ratio	Scope 1/ Revenues
1	Realty Income	1	131	no	no assurances	1	1,680	0.08	Real Estate	1	1	0	1	0.00
2	Ameriprise Financial	2	1,640	no	limited	2	12,287	0.13	Asset Management & Custody	1	1	0	1	0.00
3	Moody's	3	1,667	no	limited	3	5,681	0.29	Professional & Commercial	1	1	0	1	0.00
4	Arista Networks	4	5,099	no	no assurances	21	2,462	2.07	Hardware	1	1	0	1	0.00
5	Hasbro	5	5,895	no	moderate	12	5,475	1.08	Toys & Sporting Goods	1	1	0	1	0.00
6	Capital One Financial	6	7,198	no	limited	4	24,369	0.30	Consumer Finance	1	1	0	1	0.00
7	Bank of New York Mellon	7	8,359	no	limited	8	15,537	0.54	Asset Management & Custody	2	1	0	1	0.00
8	Lincoln National	8	8,492	no	moderate	6	17,548	0.48	Insurance	1	1	0	1	0.00
9	Invesco	9	9,117	↓	no assurances	15	6,206	1.47	Asset Management & Custody	3	1	0	1	0.00
10	Trimble	10	9,700	↓	no assurances	23	3,242	2.99	Electrical & Electronic	1	1	0	1	0.00
11	Alexion Pharmaceuticals	11	11,264	no	reasonable	20	6,262	1.80	Biotechnology	1	1	0	1	0.00
12	Cboe Global Markets	12	11,325	↓	no assurances	25	3,516	3.22	Security & Commodity	1	1	0	1	0.00
13	Aflac	13	12,121	no	limited	7	22,854	0.53	Insurance	2	1	0	1	0.00
14	F5 Networks	14	14,642	no	no assurances	36	2,468	5.93	Hardware	2	1	0	1	0.00
15	NortonLifeLock	15	19,408	no	no assurances	45	2,551	7.61	Software & IT Services	1	1	0	1	0.00
16	ServiceNow	16	20,410	no	no assurances	30	4,833	4.22	Software & IT Services	2	1	0	1	0.00
17	Unum Group	17	22,618	↓	limited	18	13,363	1.69	Insurance	3	1	0	1	0.00
18	Expedia Group	18	24,833	no	limited	35	4,236	5.86	Internet Media & Services	1	1	0	1	0.00
19	PayPal Holdings	19	25,000	↓	limited	13	22,869	1.09	Software & IT Services	3	1	0	1	0.00
20	Northern Trust	20	25,761	no	limited	32	6,063	4.25	Asset Management & Custody	4	1	0	1	0.00
21	C.H. Robinson Worldwide	21	27,796	no	no assurances	16	17,206	1.62	Air Freight & Logistics	1	1	0	1	0.00
22	Cadence Design Systems	22	29,244	no	no assurances	54	2,801	10.44	Software & IT Services	4	1	0	1	0.00
23	Teradyne	23	31,653	no	no assurances	53	3,199	9.90	Semiconductors	1	1	0	1	0.00
24	IDEX	24	36,880	↓	no assurances	70	2,409	15.31	Industrial Machinery	1	1	0	1	0.00
25	Facebook	25	37,594	no	limited	5	94,399	0.40	Internet Media & Services	2	1	0	1	0.00
26	Comerica	26	38,025	no	limited	65	2,931	12.97	Commercial Banks	1	1	0	1	0.00
27	Dentsply Sirona	27	38,600	↓	no assurances	58	3,495	11.04	Medical Equipment	1	1	0	1	0.00
28	UDR	28	42,453	↓	limited	98	1,242	34.19	Real Estate	2	1	0	1	0.00
29	Citizens Financial Group	29	42,650	no	reasonable	43	6,031	7.07	Commercial Banks	2	1	0	1	0.00
30	Booking Holdings	30	44,367	no	no assurances	47	5,649	7.85	Internet Media & Services	3	1	0	1	0.00
31	Adobe	31	44,382	no	limited	24	14,389	3.08	Software & IT Services	5	1	0	1	0.00
32	Broadridge Financial	32	44,547	no	no assurances	51	4,824	9.23	Software & IT Services	6	1	0	1	0.00
33	Omnicom Group	33	44,961	no	no assurances	27	13,191	3.41	Advertising & Marketing	1	1	0	1	0.00
34	Global Payments	34	45,832	no	no assurances	37	7,510	6.10	Software & IT Services	7	1	0	1	0.00
35	Arthur J. Gallagher	35	47,191	no	no assurances	41	7,083	6.66	Professional & Commercial	2	1	0	1	0.00
36	Essex Property Trust	36	47,711	no	no assurances	90	1,515	31.48	Real Estate	3	1	0	1	0.00
37	KeyCorp	37	48,703	no	no assurances	44	6,402	7.61	Commercial Banks	3	1	0	1	0.00
38	IQVIA Holdings	38	49,355	no	type unknown	29	12,014	4.11	Biotechnology	2	1	0	1	0.00
39	Agilent Technologies	39	52,666	no	moderate	50	5,817	9.05	Medical Equipment	2	1	0	1	0.00
40	Juniper Networks	40	52,726	↓	no assurances	60	4,522	11.66	Hardware	3	1	0	1	0.00
41	Expeditors International	41	54,452	no	no assurances	34	11,572	4.71	Air Freight & Logistics	2	1	0	1	0.00
42	Interpublic Group of	42	55,531	no	no assurances	42	8,120	6.84	Advertising & Marketing	2	1	0	1	0.00
43	Biogen	43	57,736	no	limited	33	12,604	4.58	Biotechnology	3	149	29,570	152	2.35
44	Prudential Financial	44	59,014	no	limited	11	60,576	0.97	Insurance	4	1	0	1	0.00
45	Tapestry	45	59,367	no	no assurances	61	4,846	12.25	Apparel, Accessories	1	1	0	1	0.00
46	Xylem	46	63,817	no	limited	63	5,009	12.74	Industrial Machinery	2	1	0	1	0.00
47	Regions Financial	47	76,837	no	limited	67	5,667	13.56	Commercial Banks	4	1	0	1	0.00
48	Crown Castle International	48	77,800	no	no assurances	66	5,904	13.18	Real Estate	4	1	0	1	0.00
49	Motorola Solutions	49	79,246	↓	limited	55	7,532	10.52	Hardware	4	1	0	1	0.00
50	Allstate	50	80,123	no	limited	17	47,376	1.69	Insurance	5	1	0	1	0.00
51	Regeneron	51	81,100	no	limited	49	9,011	9.00	Biotechnology	4	1	0	1	0.00
52	Citigroup	52	82,299	no	limited	14	64,838	1.27	Commercial Banks	5	1	0	1	0.00
53	Dover	53	87,842	↓	moderate	62	6,896	12.74	Industrial Machinery	3	1	0	1	0.00
54	Public Storage	54	98,457	no	no assurances	92	3,036	32.43	Real Estate	5	1	0	1	0.00
55	Allegion	55	99,492	no	no assurances	102	2,740	36.32	Electrical & Electronic	2	1	0	1	0.00
56	Akamai Technologies	56	105,138	no	limited	91	3,277	32.09	Software & IT Services	8	1	0	1	0.00
57	Teledyne Technologies	57	105,739	no	no assurances	96	3,107	34.03	Aerospace & Defense	1	1	0	1	0.00
58	Cooper Companies	58	107,900	no	no assurances	103	2,660	40.57	Medical Equipment	3	1	0	1	0.00
59	Cognizant Technology	59	108,122	↓	limited	39	16,828	6.43	Software & IT Services	9	1	0	1	0.00
60	Mid-America Apartment	60	109,001	no	no assurances	114	1,685	64.69	Real Estate	6	1	0	1	0.00
61	AMETEK	61	110,000	no	no assurances	79	4,554	24.16	Electrical & Electronic	3	1	0	1	0.00
62	AmerisourceBergen	62	113,218	no	moderate	9	196,282	0.58	Health Care Distributors	1	1	0	1	0.00
63	Ulta Beauty	63	114,426	no	no assurances	72	6,917	16.54	Multiline and Specialty	1	1	0	1	0.00
64	McCormick & Company	64	119,280	no	no assurances	73	5,871	20.32	Processed Foods	1	1	0	1	0.00
65	Cerner	65	133,884	no	no assurances	81	5,482	24.42	Software & IT Services	10	1	0	1	0.00
66	Applied Materials	66	151,300	↓	limited	46	19,827	7.63	Semiconductors	2	1	0	1	0.00
67	Vornado Realty Trust	67	163,187	no	limited	121	1,558	104.77	Real Estate	7	1	0	1	0.00
68	ViacomCBS	68	166,430	no	no assurances	38	26,198	6.35	Media & Entertainment	1	1	0	1	0.00
69	PNC Financial Services	69	170,574	no	no assurances	59	15,075	11.32	Commercial Banks	6	1	0	1	0.00
70	HP	70	171,000	no	limited	22	61,075	2.80	Hardware	5	1	0	1	0.00
71	UnitedHealth Group	71	173,228	↓	moderate	10	262,916	0.66	Managed Care	1	1	0	1	0.00
72	Accenture	72	176,928	no	limited	28	47,949	3.69	Software & IT Services	11	1	0	1	0.00
73	Masco	73	180,000	no	no assurances	78	7,577	23.76	Building Products	1	1	0	1	0.00

			Company Emissions Ranking			Intensity Ranking			In-industry Ranking		EPA Emissions Ranking			
	Company		Rank	Scope 1+2	Exclusions	Assurances	Rank	Revenues	Scope 1+2/ Revenues	Industry	Rank	Rank by scope 1	Scope 1	Rank by ratio	Scope 1/ Revenues
74	Morgan Stanley	Morgan Stanley	74	181,400	no	limited	26	54,643	3.32	Investment Banking	1	1	0	1	0.00
75		MGM Resorts International	75	199,686	no	limited	107	4,352	45.88	Casinos & Gaming	1	162	138,029	170	31.71
76		Truist Financial	76	203,576	no	moderate	52	21,086	9.65	Commercial Banks	7	1	0	1	0.00
77		Otis Worldwide	77	209,000	no	no assurances	71	13,198	15.84	Electrical & Electronic	4	1	0	1	0.00
78	ROSS	Ross Stores	78	226,714	no	type unknown	69	15,205	14.91	Multiline and Specialty	2	1	0	1	0.00
79		Host Hotels & Resorts	79	237,299	no	limited	133	942	251.91	Real Estate	8	1	0	1	0.00
80		Bristol-Myers Squibb	80	278,040	no	no assurances	40	42,810	6.49	Biotechnology	5	159	84,259	150	1.97
81		Microsoft	81	287,639	no	limited	19	159,969	1.80	Software & IT Services	12	1	0	1	0.00
82		Healthpeak Properties	82	288,724	no	limited	127	1,719	167.95	Real Estate	9	1	0	1	0.00
83		Zoetis	83	298,206	↓	no assurances	105	7,012	42.53	Biotechnology	6	1	0	1	0.00
84		Westinghouse Air Brake	84	305,095	no	limited	104	7,456	40.92	Industrial Machinery	4	1	0	1	0.00
85		QUALCOMM	85	315,526	no	no assurances	57	29,409	10.73	Semiconductors	3	156	62,144	151	2.11
86	APTIV	Aptiv	86	322,870	no	limited	77	13,863	23.29	Auto Parts	1	1	0	1	0.00
87	ECOLAB	Ecolab	87	340,004	no	limited	89	11,655	29.17	Chemicals	1	1	0	1	0.00
88		BorgWarner	88	342,520	↓	no assurances	87	11,895	28.80	Auto Parts	2	1	0	1	0.00
89		Ventas	89	371,234	no	limited	120	3,714	99.96	Real Estate	10	1	0	1	0.00
90		Equinix, Inc. (REIT)	90	382,800	no	no assurances	113	6,115	62.60	Real Estate	11	1	0	1	0.00
91	Carrier	Carrier Global	91	391,750	↓	no assurances	76	18,267	21.45	Electrical & Electronic	5	1	0	1	0.00
92		Philip Morris	92	412,999	no	reasonable	68	29,126	14.18	Tobacco	1	1	0	1	0.00
93		Oracle	93	429,577	no	no assurances	56	40,479	10.61	Software & IT Services	13	1	0	1	0.00
94	ITW	Illinois Tool Works	94	458,900	no	limited	101	12,890	35.60	Industrial Machinery	5	147	9,104	148	0.71
95		Sealed Air	95	465,009	no	no assurances	118	4,996	93.07	Containers & Packaging	1	1	0	1	0.00
96	TEXTRON	Textron	96	511,242	no	no assurances	106	11,753	43.50	Aerospace & Defense	2	157	66,577	157	5.66
97		American Water Works	97	545,111	↓	no assurances	123	3,821	142.66	Water Utilities	1	1	0	1	0.00
98	Baxter	Baxter International	98	611,000	no	reasonable	110	11,817	51.71	Medical Equipment	4	1	0	1	0.00
99	IBM	International Business	99	621,271	↓	limited	48	73,779	8.42	Software & IT Services	14	1	0	1	0.00
100		Starbucks	100	627,000	no	limited	84	23,843	26.30	Restaurants	1	1	0	1	0.00
101		Sherwin-Williams Company	101	627,265	no	no assurances	93	18,871	33.24	Chemicals	2	1	0	1	0.00
102	Lilly	Eli Lilly	102	671,230	↓	limited	85	25,486	26.34	Biotechnology	7	1	0	1	0.00
103		Baker Hughes	103	684,385	no	limited	97	20,062	34.11	Oil & Gas - Services	1	1	0	1	0.00
104	Campbell's	Campbell Soup	104	722,200	↓	limited	117	8,711	82.91	Processed Foods	2	165	197,537	169	22.68
105		Johnson Controls	105	779,167	no	limited	99	22,232	35.05	Electrical & Electronic	6	1	0	1	0.00
106	PPG	PPG Industries	106	789,236	no	limited	111	14,338	55.05	Chemicals	3	163	144,905	163	10.11
107	ETN	Eaton Corporation	107	900,557	↓	reasonable	109	17,761	50.70	Electrical & Electronic	7	1	0	1	0.00
108		Abbott Laboratories	108	906,100	no	limited	80	37,338	24.27	Medical Equipment	5	160	113,543	153	3.04
109		Albemarle	109	935,000	no	no assurances	136	3,219	290.43	Chemicals	4	166	242,639	175	75.37
110		Corteva	110	980,000	no	no assurances	115	14,439	67.87	Chemicals	5	161	117,617	162	8.15
111		Merck & Co.	111	993,800	no	limited	74	48,017	20.70	Biotechnology	8	169	368,933	161	7.68
112	Sysco	Sysco	112	1,088,973	↓	limited	82	44,028	24.73	Food Retailers	1	1	0	1	0.00
113		CVS Health	113	1,142,764	no	limited	31	270,115	4.23	Drug Retailers	1	1	0	1	0.00
114		Boeing Company	114	1,185,000	↓	limited	75	56,467	20.99	Aerospace & Defense	3	164	172,670	154	3.06
115		Seagate Technology	115	1,199,080	no	limited	122	10,185	117.73	Hardware	6	1	0	1	0.00
116		Kansas City Southern	116	1,230,000	no	limited	142	2,607	471.82	Rail Transportation	1	1	0	1	0.00
117		Kraft Heinz Company	117	1,297,152	↓	limited	108	26,422	49.09	Processed Foods	3	152	46,698	149	1.77
118		Pfizer	118	1,350,000	no	limited	88	46,407	29.09	Biotechnology	9	167	252,419	156	5.44
119	CAT	Caterpillar	119	1,461,000	no	limited	95	43,000	33.98	Industrial Machinery	6	170	596,462	166	13.87
120	Hormel	Hormel Foods	120	1,469,043	no	no assurances	125	9,869	148.85	Meat, Poultry & Dairy	1	155	61,277	160	6.21
121	Mondelēz	Mondelez International	121	1,527,318	no	reasonable	112	27,112	56.33	Processed Foods	4	1	0	1	0.00
122		Raytheon Technologies	122	1,557,479	no	limited	83	60,478	25.75	Aerospace & Defense	4	1	0	1	0.00
123		Home Depot	123	1,821,000	no	no assurances	64	141,350	12.88	Multiline and Specialty	3	1	0	1	0.00
124		Digital Realty Trust	124	1,866,188	no	limited	139	4,169	447.63	Real Estate	12	1	0	1	0.00
125	LUMEN	Lumen Technologies	125	2,003,874	no	limited	119	20,513	97.69	Telecommunication	1	1	0	1	0.00
126		General Electric	126	2,080,000	no	no assurances	86	77,248	26.93	Electrical & Electronic	8	172	789,177	164	10.22
127		Edison International	127	2,200,000	no	no assurances	126	13,748	160.02	Electric Utilities & Power	1	177	1,241,056	176	90.27
128	Honeywell	Honeywell International	128	2,218,536	no	limited	116	32,628	67.99	Electrical & Electronic	9	171	731,027	168	22.40
129	MOHAWK	Mohawk Industries	129	2,626,945	no	no assurances	134	9,935	264.40	Building Products	2	168	337,741	171	33.99
130		Halliburton	130	2,692,612	no	no assurances	129	12,859	209.40	Oil & Gas - Services	2	158	79,442	159	6.18
131	HESS	Hess	131	3,353,482	no	limited	146	5,092	658.58	Oil & Gas - Exploration	1	184	3,581,050	192	703.27
132		Newmont	132	3,455,480	no	moderate	137	11,788	293.14	Metals & Mining	1	174	1,114,027	177	94.51
133		Consolidated Edison	133	3,660,000	no	no assurances	135	12,689	288.44	Electric Utilities & Power	2	182	2,805,163	182	221.07
134		Devon Energy	134	4,230,000	no	no assurances	148	5,365	788.44	Oil & Gas - Exploration	2	183	2,906,584	191	541.77
135	3M	3M	135	4,850,000	no	moderate	124	32,960	147.15	Chemicals	6	176	1,188,192	172	36.05
136	Mosaic	Mosaic Company	136	4,920,000	↓	limited	143	9,181	535.91	Chemicals	7	178	1,255,351	179	136.74
137	DUPONT	DuPont de Nemours	137	5,148,000	↓	limited	132	20,703	248.66	Chemicals	8	175	1,116,805	174	53.94
138		Marriott International	138	5,166,032	no	limited	157	1,771	2,917.01	Hotels & Lodging	1	1	0	1	0.00
139		AT&T	139	5,788,258	no	moderate	94	172,920	33.47	Telecommunication	2	1	0	1	0.00
140		Tyson Foods	140	10,005,000	↓	no assurances	130	43,242	231.37	Meat, Poultry & Dairy	2	180	1,804,812	173	41.74
141	NUCOR	Nucor	141	10,100,000	no	no assurances	141	21,532	469.06	Iron & Steel Producers	1	185	5,554,873	185	257.98
142		Williams Companies	142	11,930,000	↓	limited	153	8,418	1,417.20	Oil & Gas - Midstream	1	189	10,074,614	195	1,196.79
143		International Paper	143	12,400,000	no	no assurances	145	20,591	602.20	Containers & Packaging	2	186	6,149,848	186	298.67
144		Southwest Airlines	144	12,630,318	no	moderate	156	6,866	1,839.55	Airlines	1	1	0	1	0.00
145		Exelon	145	12,970,146	no	reasonable	138	34,182	379.44	Electric Utilities & Power	3	187	8,591,771	184	251.35

		Company Emissions Ranking				Intensity Ranking			In-industry Ranking		EPA Emissions Ranking			
	Company	Rank	Scope 1+2	Exclusions	Assurances	Rank	Revenues	Scope 1+2/ Revenues	Industry	Rank	Rank by scope 1	Scope 1	Rank by ratio	Scope 1/ Revenues
146	Republic Services	146	13,453,373	no	limited	151	10,196	1,319.46	Waste Management	1	190	10,363,032	194	1,016.37
147	Amazon.com	147	14,888,000	no	reasonable	100	419,130	35.52	E-commerce	1	1	0	1	0.00
148	United Airlines Holdings	148	15,660,450	no	limited	154	10,597	1,477.82	Airlines	2	1	0	1	0.00
149	ConocoPhillips	149	16,200,000	↓	limited	147	22,772	711.40	Oil & Gas - Exploration	3	188	9,187,289	189	403.45
150	Archer-Daniels-Midland	150	16,230,000	no	limited	131	68,278	237.70	Agricultural Products	1	191	12,388,843	180	181.45
151	Waste Management	151	16,319,371	↓	limited	150	15,601	1,046.05	Waste Management	2	192	12,711,114	193	814.76
152	United Parcel Service	152	16,500,000	no	reasonable	128	89,501	184.36	Air Freight & Logistics	3	1	0	1	0.00
153	Delta Air Lines	153	17,815,645	↓	no assurances	152	12,653	1,408.02	Airlines	3	179	1,501,650	178	118.68
154	CF Industries Holdings	154	18,689,037	no	no assurances	161	4,201	4,448.71	Chemicals	9	194	20,066,539	200	4,776.61
155	American Airlines Group	155	20,067,000	no	limited	155	12,830	1,564.07	Airlines	4	151	42,300	155	3.30
156	Ameren	156	26,025,341	↓	limited	162	5,661	4,597.30	Electric Utilities & Power	4	197	24,314,880	198	4,295.16
157	Valero Energy	157	27,500,000	no	no assurances	140	59,067	465.57	Oil & Gas - Refining	1	196	23,474,041	188	397.41
158	Dow	158	34,760,000	no	limited	149	40,654	855.02	Chemicals	10	193	16,409,523	190	403.64
159	American Electric Power	159	49,713,300	no	high	159	15,452	3,217.25	Electric Utilities & Power	5	198	69,794,576	199	4,516.83
160	Chevron	160	57,000,000	no	reasonable	144	95,842	594.73	Oil & Gas - Exploration	4	195	22,445,606	183	234.19
161	Duke Energy	161	74,979,700	no	high	158	23,654	3,169.85	Electric Utilities & Power	6	199	85,956,926	196	3,633.93
162	Southern Company	162	75,279,857	no	no assurances	160	21,267	3,539.75	Electric Utilities & Power	7	200	87,486,577	197	4,113.72
163	Abiomed	163	no report	no report	no 2020 GHG data	163	848	no report	Medical Equipment	10	1	0	1	0.00
164	Advance Auto Parts	163	no report	no	no assurances	163	10,739	no report	Multiline and Specialty	6	1	0	1	0.00
165	Atmos Energy	163	no report	no report	no 2020 GHG data	163	3,201	no report	Gas Utilities	1	173	1,006,969	187	314.53
166	Brown-Forman	163	no report	no report	no 2020 GHG data	163	3,461	no report	Alcoholic Beverages	2	154	57,438	167	16.60
167	CME Group	163	no report	no report	no 2020 GHG data	163	4,603	no report	Security & Commodity	2	1	0	1	0.00
168	Constellation Brands	163	no report	no report	no 2020 GHG data	163	8,615	no report	Alcoholic Beverages	2	1	0	1	0.00
169	Copart	163	no report	no report	no 2020 GHG data	163	2,470	no report	Professional & Commercial	4	1	0	1	0.00
170	Costco Wholesale	163	no report	no report	no 2020 GHG data	163	186,637	no report	Multiline and Specialty	6	1	0	1	0.00
171	D.R. Horton	163	no report	no report	no 2020 GHG data	163	24,171	no report	Home Builders	2	1	0	1	0.00
172	DexCom	163	no report	no report	no 2020 GHG data	163	2,027	no report	Medical Equipment	10	1	0	1	0.00
173	Electronic Arts	163	no report	no report	no 2020 GHG data	163	5,629	no report	Software & IT Services	17	1	0	1	0.00
174	Enphase Energy	163	no report	no report	no 2020 GHG data	163	871	no report	Solar Technology & Project	1	1	0	1	0.00
175	Fastenal	163	no report	no report	no 2020 GHG data	163	5,697	no report	Multiline and Specialty	6	1	0	1	0.00
176	FedEx	163	no report	no report	no 2020 GHG data	163	83,959	no report	Air Freight & Logistics	4	1	0	1	0.00
177	FLEETCOR Technologies	163	no report	no report	no 2020 GHG data	163	2,336	no report	Software & IT Services	17	1	0	1	0.00
178	Fox	163	no report	no report	no 2020 GHG data	163	12,437	no report	Media & Entertainment	2	1	0	1	0.00
179	Garmin	163	no report	no report	no 2020 GHG data	163	4,403	no report	Hardware	7	1	0	1	0.00
180	Generac Holdings	163	no report	no report	no 2020 GHG data	163	2,817	no report	Electrical & Electronic	10	1	0	1	0.00
181	Gilead Sciences	163	no report	no report	no 2020 GHG data	163	25,564	no report	Biotechnology	10	1	0	1	0.00
182	Hologic	163	no report	no report	no 2020 GHG data	163	5,317	no report	Medical Equipment	10	1	0	1	0.00
183	Huntington Ingalls	163	no report	no report	no 2020 GHG data	163	9,376	no report	Aerospace & Defense	5	153	55,380	158	5.91
184	IDEXX Laboratories	163	no report	no report	no 2020 GHG data	163	2,858	no report	Medical Equipment	10	1	0	1	0.00
185	IHS Markit	163	no report	no report	no 2020 GHG data	163	4,482	no report	Professional & Commercial	4	1	0	1	0.00
186	KLA	163	no report	no report	no 2020 GHG data	163	6,453	no report	Semiconductors	5	1	0	1	0.00
187	L Brands	163	no report	no report	no 2020 GHG data	163	13,217	no report	Apparel, Accessories	3	1	0	1	0.00
188	Lennar	163	no report	no report	no 2020 GHG data	163	24,452	no report	Home Builders	2	1	0	1	0.00
189	Live Nation	163	no report	no report	no 2020 GHG data	163	786	no report	Leisure Facilities	1	1	0	1	0.00
190	Loews	163	no report	no report	no 2020 GHG data	163	13,072	no report	Insurance	7	181	2,660,914	181	203.56
191	Maxim Integrated	163	no report	no report	no 2020 GHG data	163	2,458	no report	Semiconductors	5	150	33,634	165	13.68
192	Paycom Software	163	no report	no report	no 2020 GHG data	163	871	no report	Software & IT Services	17	1	0	1	0.00
193	Penn National Gaming	163	no report	no report	no 2020 GHG data	163	3,738	no report	Casinos & Gaming	2	1	0	1	0.00
194	People's United	163	no report	no report	no 2020 GHG data	163	1,913	no report	Commercial Banks	8	1	0	1	0.00
195	Progressive	163	no report	no report	no 2020 GHG data	163	44,760	no report	Insurance	7	1	0	1	0.00
196	Quanta Services	163	no report	no report	no 2020 GHG data	163	11,142	no report	Engineering & Construction	1	1	0	1	0.00
197	Snap-on	163	no report	no report	no 2020 GHG data	163	4,117	no report	Industrial Machinery	7	1	0	1	0.00
198	Tesla	163	no report	no report	no 2020 GHG data	163	35,940	no report	Automobiles	1	148	23,613	147	0.66
199	Under Armour	163	no report	no report	no 2020 GHG data	163	4,802	no report	Apparel, Accessories	3	1	0	1	0.00
200	Zimmer Biomet Holdings	163	no report	no report	no 2020 GHG data	163	7,088	no report	Medical Equipment	10	1	0	1	0.00

The sample is 200 randomly selected S&P 500 companies. The data are from voluntary CSR reports and mandatory EPA reports.