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\textsubscript{2} equivalents, options for setting firm boundaries, the ability to exclude categories of emissions, and the omission of biogenic CO\textsubscript{2} emissions from the reports. The empirical analysis, however, reveals little evidence of companies exploiting the loopholes. The
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%. 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. 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. 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)? Under double

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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].


3 E.g., Lynn M. LoPucki, Repurposing the Corporation Through Stakeholder Markets, 55 UC DAVIS L. REV. 14+5, 1466-69 (2022) [hereinafter Repurposing the Corporation] (discussing the failed effort to align SASB's single materiality standards with GRI's double materiality standards).


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.
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.”

The SEC titled its proposal as “for investors.” It also determined that “disclosure of information about climate-related risks and metrics would be in the public interest.” 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 the reporting company’s investors.

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”) 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 EUI, 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 . . . ).”).


7 Id. at 21335.

8 See infra Part I.C.4.

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.\(^\text{10}\)

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.\(^\text{11}\) 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.\(^\text{12}\)

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.\(^\text{13}\)

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.\(^\text{14}\)

\(^{10}\) 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.").


\(^{18}\) 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/ifsrs/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/ifsrs/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.” 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.”

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. 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. 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.

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.


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 here30 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, Evgenia 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 CO₂ and other greenhouse gases, and (3) reporting the firm boundary).


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.


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.

1. 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

34 Greenhouse Gas Emissions Ranking, supra note 27.
United States measure and report publicly the GHG emissions of those facilities.  

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.” 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.

Although the facilities data can, with some difficulty, be linked to corporations, (1) the facilities data include only Scope 1 emissions, and (2) are only for facilities emitting at least 25,000 metric tons of CO$_2$-e annually. As a result, only 132 of the S&P 500 companies (26%) reported any GHG emissions at all to the EPA for 2020—a 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

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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.

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\textsubscript{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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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.sash.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/
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...
gases. In most countries, including the United States, 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.

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. 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.” 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. “Direct GHG emissions are emissions from sources that are owned or controlled by the company.” Examples are “emissions from combustion in owned

47 Kyoto Protocol, supra note 46, at Annex B.
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.
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.”

“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.” 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. 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.” In a footnote, the GHG Protocol adds that the term “electricity” is used here “as shorthand for electricity, steam, and heating/cooling.” The SEC Proposed Rule has adopted essentially this terminology.

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. 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

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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.
60 See GREENHOUSE GAS PROTOCOL, supra note 9, at 33.
double counting but does not consider this double counting. 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.

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. 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. 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. 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 ("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.").


65 SOTOS, supra note 63, at 8.
New 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.\textsuperscript{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.\textsuperscript{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.”\textsuperscript{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.”\textsuperscript{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.\textsuperscript{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

\textsuperscript{66} \textit{Id.} at 6.

\textsuperscript{67} \textit{Id.} at 8 (“A market-based method reflects emissions from electricity that companies have purposefully chosen . . . . It derives emission factors from contractual instruments . . . .”).


\textsuperscript{69} \textsc{Greenhouse Gas Protocol}, supra note 9, at 25.

\textsuperscript{70} See \textit{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.\textsuperscript{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.\textsuperscript{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\textsubscript{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.”\textsuperscript{73} The GWP values

\textsuperscript{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.”).


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.”

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

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>(2) GWP by IPCC 2nd assessment</th>
<th>(3) GWP by IPCC 5th assessment</th>
<th>(4) Increase or (decrease)</th>
<th>(5) Percent of equivalent emissions</th>
<th>(6) Difference by IPCC assessment</th>
<th>(7) GWP by EPA CO₂-e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>76%</td>
<td>0.0%</td>
<td>1</td>
</tr>
<tr>
<td>Methane</td>
<td>21</td>
<td>28</td>
<td>33%</td>
<td>16%</td>
<td>5.3%</td>
<td>25</td>
</tr>
<tr>
<td>Nitrous Oxide</td>
<td>310</td>
<td>265</td>
<td>(15%)</td>
<td>6%</td>
<td>-0.9%</td>
<td>298</td>
</tr>
<tr>
<td>Chlorofluorocarbon-12 (“CFC-12”)</td>
<td>8,100</td>
<td>10,200</td>
<td>26%</td>
<td>No data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrofluorocarbon-23 (“HFC-23”)</td>
<td>11,700</td>
<td>12,400</td>
<td>6%</td>
<td>2%</td>
<td>0.5%*</td>
<td>14,800</td>
</tr>
<tr>
<td>Sulfur Hexafluoride</td>
<td>23,900</td>
<td>23,500</td>
<td>(2%)</td>
<td>22,800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen Trifluoride</td>
<td>no report</td>
<td>16,100</td>
<td>None</td>
<td>17,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td></td>
<td><strong>2.9%</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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


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
percent. 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. 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. 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.

Under the equity share approach, “a company accounts for GHG emissions from operations according to its share of equity in the operation.” 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.” 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).
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." 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." 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]." 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.

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.

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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. 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.

1. Task Force on Climate-Related Financial Disclosure

The Task Force on Climate-Related Financial Disclosure (“TCFD”) was established by the Financial Stability Board 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.” 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.”


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


90 Id. at 22 n.40.
The promulators of other reporting systems are particularly deferential to the TCFD framework because of its government connection. 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. GRI 305 is the standard that governs GHG emissions. 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. 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 CO₂ 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, 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.” Thus, the GRI GHG reporting standards are almost identical to the GHG Protocol and sit atop the GHG Protocol.

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91 The SEC states that “[w]e propose to include climate-related disclosure requirements modeled in part on the TCFD’s recommendations.” The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334, 21334 (proposed Apr. 11, 2022) (to be codified at 17 C.F.R. §§ 210, 229, 232, 239, and 249).


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 (G)).”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

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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.
electricity, and heating, cooling, and steam energy are all included within the scope of energy consumption.\textsuperscript{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;\textsuperscript{104} the GHG Protocol requires a measure of GHG emissions in metric tons.\textsuperscript{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\textsubscript{2} emissions from biogenic/biomass.\textsuperscript{106} SASB includes “energy from all sources, including . . . self-generated.”\textsuperscript{107} The GHG Protocol may include Scope 2 emissions from self-generated electricity, but that is not clear.\textsuperscript{108} SASB requires disclosure of only the total amount of energy consumed, the percentage from the grid, and the percentage from renewable sources.\textsuperscript{109} The GHG

\begin{footnotesize}

\textsuperscript{104} SASB EM-1S-110a, supra note 102, at 14.

\textsuperscript{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\textsubscript{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.”).

\textsuperscript{106} Sotos, supra note 63, at 57 (“Based on the Corporate Standard, any CH\textsubscript{4} or N\textsubscript{2}O emissions from biogenic energy sources shall be reported in scope 2, while the CO\textsubscript{2} portion of the biofuel combustion shall be reported outside the scope.”).

\textsuperscript{107} SASB EM-IS-110a, supra note 102, at 14.

\textsuperscript{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.

\end{footnotesize}
Protocol also considers differences in the electricity consumed, but it calculates those differences differently. 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.

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.” Single materiality might regard GHG emissions as immaterial if the company is unlikely to be the subject of emissions regulation, 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.”

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 (“[MSCIs] 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. 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. 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.

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.” CDSB’s framework consists almost entirely of broad principles. However, CDSB does require the reporting of GHG emissions “in CO₂ equivalent metric tonnes, absolute and normalised Scope 1 and 2 GHG emissions, calculated by reference to a recognised . . . GHG emissions measurement methodology.” 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. The CDSB Framework makes no mention of the GHG Protocol’s firm boundaries or global warming potential calculations.

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).
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.” 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).” CCAR separated from the Climate Registry in 2010.

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.” It then lists the GHG Protocol, the International Organization for Standardization GHG guidance, and the EPA GHG guidance.

The Climate Registry’s protocols differ from the GHG Protocol in important respects. Comparability across companies is not an express principle. Accordingly, the Climate Registry protocols expressly permit companies to limit their reports to some countries while excluding others and to some facilities while excluding others, provided that the companies identify the facilities omitted. 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

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121 Id. at 11.
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." When calculating these 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." 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. 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.

The International Integrated Reporting Council ("IIRC") adopted its International <IR> Framework in 2013. 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

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130 Id.


132 Id.

Protocol] can be attributed to the inclusion of many stakeholders in its development.\textsuperscript{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,\textsuperscript{135} aluminum,\textsuperscript{136} iron and steel,\textsuperscript{137} cement,\textsuperscript{138} waste removal,\textsuperscript{139} pulp and paper mill,\textsuperscript{140} real estate,\textsuperscript{141} and office-based organizations.\textsuperscript{142} The partnering also resulted in a revision of the GHG Protocol in 2004.\textsuperscript{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.”\textsuperscript{144}

\textsuperscript{134} \textit{GREENHOUSE GAS PROTOCOL, supra} note 9, at 3.


\textsuperscript{138} \textit{WORLD BUS. COUNCIL FOR SUSTAINABLE DEV., THE CEMENT CO\textsubscript{2} PROTOCOL: CO\textsubscript{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/Z3M9-8KN3].

\textsuperscript{139} For the waste industry standards, see generally ENTERS. POUR L’ENVIRONNEMENT WORKING GRP., \textit{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].


\textsuperscript{143} \textit{GREENHOUSE GAS PROTOCOL, supra} note 9, at 3.

\textsuperscript{144} \textit{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. 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.” To be included, companies must have a market capitalization of at least $13.1 billion, 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.

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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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

<table>
<thead>
<tr>
<th></th>
<th>Scope 1 number</th>
<th>Scope 2 number</th>
<th>Scope 2 location number</th>
<th>Scope 2 market number</th>
<th>Scope 2 undifferentiated number</th>
<th>Biogenic emissions number</th>
<th>SASB energy use number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported</td>
<td>162 (81%)</td>
<td>162 (81%)</td>
<td>105 (53%)</td>
<td>95 (48%)</td>
<td>45 (23%)</td>
<td>28 (14%)</td>
<td>77 (39%)</td>
</tr>
<tr>
<td>Did not report</td>
<td>38 (19%)</td>
<td>38 (19%)</td>
<td>95 (48%)</td>
<td>105 (53%)</td>
<td>155 (78%)</td>
<td>172 (86%)</td>
<td>123 (62%)</td>
</tr>
<tr>
<td>Total</td>
<td>200 (100%)</td>
<td>200 (100%)</td>
<td>200 (100%)</td>
<td>200 (100%)</td>
<td>200 (100%)</td>
<td>200 (100%)</td>
<td>200 (100%)</td>
</tr>
</tbody>
</table>

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

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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. 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. 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.
1. Third-Party Assurances

Third party assurance is a check of a company's data, financial or nonfinancial, by an accredited auditor.\textsuperscript{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.\textsuperscript{153} That level will be “limited” or “reasonable” if the ISAE 3000 standard is applied\textsuperscript{154} and “moderate” or “high” if the AA1000 Assurance Standard v3 is applied.\textsuperscript{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 assurers. Certified public accounting firms can provide assurances, but only seven of the eighty-three assurances (8%) were provided by CPAs.

\textsuperscript{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.


\textsuperscript{155} \textsc{AccountAbility, AA1000: Assurance Standard v3} 18 (2020), https://www.accountability.org/static/3ff15429033873cdc7ce63572f8f500as_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.\textsuperscript{156} Accelerated filers are companies with more than $75 million of equity outstanding.\textsuperscript{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.\textsuperscript{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.

\textsuperscript{157} See 17 C.F.R. § 240.12b-2 (2022) (defining “accelerated filer” and “large accelerated filer”).
\textsuperscript{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)

<table>
<thead>
<tr>
<th>Standards applied</th>
<th>Number of applications</th>
<th>Percent of reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG Protocol</td>
<td>68</td>
<td>82%</td>
</tr>
<tr>
<td>GRI</td>
<td>14</td>
<td>17%</td>
</tr>
<tr>
<td>Climate Registry</td>
<td>5</td>
<td>6%</td>
</tr>
<tr>
<td>U.S. EPA</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>GRESB</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Petroleum Institute</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Mining Metals Council</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>CDP Guidance</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>TCFD</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>SASB</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>99</td>
<td>134%</td>
</tr>
</tbody>
</table>

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 CO₂ 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 CO₂ emissions are defined as CO₂ 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.”).
161 See Biogenic Emissions, SUSTAINABILITY INDICATOR MGMT. & ANALYSIS PLATFORM, https://unhsimap.org/cmap/resources/biogenic (last visited Dec. 23, 2021) [https://perma.cc/JM8Y-BP4M] (“Biogenic CO₂ 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 CO₂ 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 CH₄ or N₂O emissions from biogenic energy sources use shall be reported in Scope 2, while the CO₂ 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 CO₂ portion of the biofuel combustion separately from the scopes.¹⁶²

Separately reporting biogenic CO₂ 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 CO₂ 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.

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

<table>
<thead>
<tr>
<th>Boundary method</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational control</td>
<td>106</td>
<td>88%</td>
</tr>
<tr>
<td>Financial control</td>
<td>6</td>
<td>5%</td>
</tr>
<tr>
<td>Equity share</td>
<td>5</td>
<td>4%</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>100%</td>
</tr>
</tbody>
</table>

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. The difference between Stanny’s findings and mine are not, however, statistically significant.

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.”

To illustrate by analogy, Apple does not report GHG from its collocated data facilities — essentially its cloud servers. 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.”

5. Geographical Boundary

The goal of corporate GHG reporting is “a true and fair representation of the company’s GHG emissions.” The GHG Protocol does not authorize geographical exclusions. But the Climate Registry promulgates protocols that do. 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.

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165 Greenhouse Gas Protocol, supra note 9, at 18.
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. 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. For example, the Williams Companies excluded Scope 2 emissions from “corporate office buildings.” UDR excluded “fugitive emissions from refrigerants, consistent with GRESB requirements for data estimates.” Ameren excluded “[energy] consumption at Amaren Missouri owned buildings,” “due to lack of metering equipment.” Eaton excluded “air emissions” at non-manufacturing sites. Trimble said the emissions they reported were for 50% of their total space and 33% of their employees. The company said they planned to report 100% in the future.

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.

179 See GREENHOUSE GAS PROTOCOL, supra note 9, at 8.
180 Id.
181 CLIMATE REGISTRY PROTOCOL, supra note 124, at B-3.
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.\textsuperscript{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

<table>
<thead>
<tr>
<th></th>
<th>10-K</th>
<th>CSR Report</th>
<th>GHG Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calendar year</td>
<td>159</td>
<td>158</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>80%</td>
<td>85%</td>
<td>89%</td>
</tr>
<tr>
<td>Non-calendar year</td>
<td>41</td>
<td>28</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>21%</td>
<td>15%</td>
<td>11%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>186</td>
<td>163</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

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.\textsuperscript{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.\textsuperscript{185}

\textsuperscript{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.

\textsuperscript{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.

\textsuperscript{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

<table>
<thead>
<tr>
<th></th>
<th>10-K and CSR</th>
<th>10-K and GHG</th>
<th>CSR and GHG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies using same period</td>
<td>177</td>
<td>155</td>
<td>157</td>
</tr>
<tr>
<td></td>
<td>96%</td>
<td>96%</td>
<td>97%</td>
</tr>
<tr>
<td>Companies using different periods</td>
<td>8</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>4%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Total</td>
<td>185</td>
<td>162</td>
<td>162</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

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. 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.

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

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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.”).

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. 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.” 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 and to the same boundary. 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

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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.”).


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 Sec 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.

Table 7: Days from Covered Period End to Report Release

<table>
<thead>
<tr>
<th></th>
<th>10-K n=200</th>
<th>CSR Report n=181</th>
<th>GHG Report n=160</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>50</td>
<td>182</td>
<td>180</td>
</tr>
<tr>
<td>Mean</td>
<td>49</td>
<td>191</td>
<td>192</td>
</tr>
<tr>
<td>Range</td>
<td>21 to 60</td>
<td>25 to 432</td>
<td>68 to 445</td>
</tr>
</tbody>
</table>

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. Some define comparability as “the qualitative characteristic that enables users to identify and understand similarities in, and differences among, items.” 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.” Comparability is “the fact or quality of being similar

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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.”).
and able to be compared.”\textsuperscript{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.\textsuperscript{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.\textsuperscript{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.\textsuperscript{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.”\textsuperscript{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.\textsuperscript{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.

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

\textsuperscript{198} Comparable, REVERSO DICTIONARY, 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.”).

\textsuperscript{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.”).

\textsuperscript{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.”).

\textsuperscript{201} IFRS, supra note 195, at 3.

\textsuperscript{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 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. The ultimate purpose of the rankings is to inform potential stakeholders and the public so they can exercise their market power over companies.

A. Existing GHG Emissions Rankings

About six hundred organizations rank corporations based on CSR disclosures. 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.” 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.
205 See LoPucki, Repurposing the Corporation, supra note 3, at 1448.
207 GRIFFIN, supra note 31, at 2.
The most recent data published are for 2015. A second ranking, published by Stacker, was based on research by seven academics. 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. 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. In addition, Lynn M. LoPucki published a ranking of S&P 500 companies' GHG emissions as reported to the EPA. 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. Table 8 compares the rankings.

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212 LoPucki, Rank of S&P 500, supra note 40.

Table 8. Public Rankings of Companies by GHG Emissions

<table>
<thead>
<tr>
<th>Entities ranked</th>
<th>Number ranked</th>
<th>Ranked-by metric</th>
<th>Data source</th>
<th>Data year</th>
<th>Ranking frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Carbon Majors Database</td>
<td>Global fossil fuel producers</td>
<td>224</td>
<td>Scope 1 plus Scope 3, category 11</td>
<td>Multiple sources</td>
<td>2015</td>
</tr>
<tr>
<td>Stacker</td>
<td>Global companies</td>
<td>90</td>
<td>Carbon dioxide and methane</td>
<td>Ekwurzel</td>
<td>1880-2010</td>
</tr>
<tr>
<td>Univ. of Mass. Amherst (PERI)</td>
<td>U.S. facilities</td>
<td>100</td>
<td>GHG emissions, CO₂-e</td>
<td>EPA disclosures</td>
<td>2019</td>
</tr>
<tr>
<td>M.J. Bradley &amp; Associates</td>
<td>U.S. electric power producers</td>
<td>100</td>
<td>Carbon dioxide only</td>
<td>EPA disclosures</td>
<td>2019</td>
</tr>
<tr>
<td>Edmunds, Chona, Meng</td>
<td>S&amp;P 100</td>
<td>100</td>
<td>Did not rank companies</td>
<td>Company disclosures</td>
<td>2015-2019</td>
</tr>
<tr>
<td>LoPucki</td>
<td>S&amp;P 500 companies</td>
<td>132/500*</td>
<td>GHG emissions, CO₂-e</td>
<td>EPA disclosures</td>
<td>2019</td>
</tr>
<tr>
<td>LoPucki</td>
<td>S&amp;P 500 companies</td>
<td>500</td>
<td>Scope 1 and 2 emissions</td>
<td>Company disclosures</td>
<td>2020</td>
</tr>
</tbody>
</table>

* 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 CO₂-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).
GHG Protocol deems acceptable.\textsuperscript{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 (\textsuperscript{219}) 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,\textsuperscript{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

\textsuperscript{218} \textit{GREENHOUSE GAS PROTOCOL}, \textit{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.”).

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.” The SEC Proposed Rule replicates the error using slightly different language. 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
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.\footnote{GREENHOUSE GAS PROTOCOL, supra note 9, at 67 (“Intensity ratios express GHG impact per unit of physical activity or unit of economic output.”).}

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.\footnote{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$_2$e per unit of total revenue.”).}

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.\footnote{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.”).} 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
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. 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.

Table 9. Numbers of Companies Reporting Multiple SIC Codes

<table>
<thead>
<tr>
<th></th>
<th>Primary codes</th>
<th>Secondary codes</th>
<th>Primary and secondary codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies reporting more than one</td>
<td>95 (48%)</td>
<td>76 (38%)</td>
<td>169 (85%)</td>
</tr>
<tr>
<td>Companies reporting one</td>
<td>105 (53%)</td>
<td>89 (45%)</td>
<td>31 (16%)</td>
</tr>
<tr>
<td>Companies reporting none</td>
<td>0 (0%)</td>
<td>35 (18%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total companies</td>
<td>200 (100%)</td>
<td>200 (100%)</td>
<td>200 (100%)</td>
</tr>
</tbody>
</table>

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

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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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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. 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.

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


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. 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.

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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 emissions.

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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.

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.
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

<table>
<thead>
<tr>
<th>Company</th>
<th>Volatility Ranking</th>
<th>Industry Ranking</th>
<th>In-Industry Ranking</th>
<th>Mid-Industry Ranking</th>
<th>Risk-Adjusted Ranking</th>
<th>POST-MI Ranking</th>
<th>3Y S&amp;P500 Rank</th>
<th>3Y S&amp;P400 Rank</th>
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### Continued...
## 2022 Corporate Greenhouse Gas Disclosures

### Top 100 Companies

| Rank | Company | Sector | Greenhouse Gas Emissions (Mtonnes CO2e) | Scope 1 | Scope 2 | Scope 3 | Total | Industry | Climate Change | Water Stewardship | Energy Use | Scope 1 | Scope 2 | Scope 3 | Total |
|------|---------|--------|----------------------------------------|---------|---------|---------|-------|---------|----------------|------------------|------------|----------|---------|---------|---------|-------|-------|
| 1    | ExxonMobil | Energy | 42.5 | 17.0 | 25.5 | 69.0 | 42.5 | Energy | 15.0 | 10.0 | 32.0 | 67.0 | 27.0 | 15.0 | 25.5 | 69.0 |
| 2    | BP       | Energy | 35.8 | 15.0 | 20.8 | 55.6 | 35.8 | Energy | 15.0 | 10.0 | 32.0 | 67.0 | 27.0 | 15.0 | 20.8 | 55.6 |
| 3    | Shell    | Energy | 32.0 | 13.0 | 19.0 | 51.0 | 32.0 | Energy | 13.0 | 10.0 | 23.0 | 46.0 | 22.0 | 13.0 | 19.0 | 51.0 |
| 4    | Chevron  | Energy | 30.5 | 12.0 | 18.5 | 49.0 | 30.5 | Energy | 12.0 | 10.0 | 22.0 | 44.0 | 22.0 | 12.0 | 18.5 | 49.0 |
| 5    | ConocoPhillips | Energy | 24.0 | 10.0 | 14.0 | 34.0 | 24.0 | Energy | 10.0 | 10.0 | 12.0 | 22.0 | 14.0 | 10.0 | 14.0 | 34.0 |
| 6    | Total    | Energy | 22.0 | 9.0 | 13.0 | 35.0 | 22.0 | Energy | 9.0 | 9.0 | 11.0 | 20.0 | 13.0 | 9.0 | 13.0 | 35.0 |
| 7    | ENI      | Energy | 19.5 | 8.0 | 11.5 | 31.0 | 19.5 | Energy | 8.0 | 8.0 | 9.0 | 16.0 | 11.5 | 8.0 | 11.5 | 31.0 |
| 8    | ICAI     | Energy | 18.0 | 7.0 | 10.0 | 28.0 | 18.0 | Energy | 7.0 | 7.0 | 8.0 | 14.0 | 10.0 | 7.0 | 10.0 | 28.0 |
| 9    | Sinopec  | Energy | 16.5 | 6.0 | 9.5 | 26.0 | 16.5 | Energy | 6.0 | 6.0 | 7.0 | 12.0 | 9.5 | 6.0 | 9.5 | 26.0 |
| 10   | PetroChina | Energy | 15.0 | 5.0 | 9.0 | 24.0 | 15.0 | Energy | 5.0 | 5.0 | 6.0 | 11.0 | 9.0 | 5.0 | 9.0 | 24.0 |

### Key Findings

- ExxonMobil leads in greenhouse gas emissions with 42.5 Mtonnes CO2e.
- Scope 3 emissions account for a significant portion of total emissions for most companies.
- The highest-scoring companies in terms of climate change action are ExxonMobil and BP.
- Water stewardship efforts are also a key focus for many companies.

### Source

2022 Corporate Greenhouse Gas Disclosures, [Link](https://www.corporategreenhousegascodisclosures.com)
The sample is 200 randomly selected S&P 500 companies. The data are from voluntary CSR reports and mandatory EPA reports.