What's Scope 3 Good For?

Madison Condon[*]

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INTRODUCTION

At the twenty-seventh annual Conference of the Parties to the United Nation's Framework Convention on Climate Change, a coalition of nonprofits unveiled the product of the last three years of work: the most advanced database of greenhouse gas ("GHG") sources assembled to date.[1] The online map has a Google-Earth like interface, compiling

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[1] Eric Roston, *World's CO2 Hotspots Pinpointed by Al Gore-Backed Climate Project*, BLOOMBERG (Nov. 8, 2022, 9:00 PM PST), https://www.bloomberg.com/news/articles/2022-11-09/world-s-co2-hotspots-pinpointed-by-al-gore-backed-climate-project [https://perma.cc/9YL5-353E].

information from hundreds of researchers, 300 satellites, 11,000 sensors, and a variety of web-scraped and public datasets.[2] Emissions are tracked down to the asset-level, covering more than seven million different facilities. An interactive tool enables filtering and comparing by industry and country: rice fields in Bangladesh, copper mines in Chile, waste disposal sites in Rhode Island.[3] The New York Times's coverage of the dataset opened with a specific steel plant in China that had never disclosed its emissions, though the map now revealed it was likely the world's worst steel GHG emitter: "the owner . . . declined to comment."[4]

While the project received some critique, and challenges remain in real-time emissions monitoring and modeling, especially for land use, we are rapidly approaching a point where we know where all man-made emissions are coming from.[5] According to Carbon TRACE, the nonprofit project, we also increasingly know who owns the assets that produce them.[6] Carbon TRACE's specific data may not make it into an investor's environmental, social, and governance ("ESG") risk metrics tomorrow, but the days of a company — even a private one — trying to hide its "Scope 1" emissions are quickly coming to a close. Yet, even though we know where the emissions are, there is nevertheless an enormous global project underway to account for them.

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[2] *Id.* (detailing the methods used, including processing years of heat data from a steel plant to estimate its production output and then emissions); Raymond Zhong, *Who's Driving Climate Change? New Data Catalogs 72,000 Polluters and Counting*, N.Y. TIMES, https://www.nytimes.com/2022/11/09/climate/climate-change-emissions-satellites.html (last updated Nov. 15, 2022) [https://perma.cc/BHL3-GRGD].

[3] CLIMATE TRACE, https://climatetrace.org/comparison (last visited Feb. 6, 2022) [https://perma.cc/7K9Q-6A82].

[4] Zhong, *supra* note 2 ("The owner of the steel plant in China, Shagang Group, declined to comment.").

[5] Roston, *supra* note 1; David Wallace-Wells, *The Global Carbon Surveillance State Is Coming*, N.Y. TIMES (Nov. 16, 2022), https://www.nytimes.com/2022/11/16/opinion/environment/surveillance-state-climate-change.html [https://perma.cc/L533-635R].

[6] Lee Gans, Brad Hall, Gavin McCormick, Ishan Saraswat, Gabriela Volpato, Krsna Raniga, Christy Lewis, Jeremy Freeman, Aaron Davitt & Lauren Schmeisser et al., Asset & Company-Level Ownership Methodology 2 (Fall 2022) (unpublished manuscript), https://github.com/climatetracecoalition/methodology-documents/blob/main/Manufacturing/Asset%20%26%20Company-Level%20Ownership%20Methodology.pdf [https://perma.cc/D9HV-7NAB] (documenting methodology and reporting that "Climate TRACE's ownership data covers the 500 top emitting assets in 8 out of 23 Climate TRACE sectors[;] In total, asset-level emissions estimates with ownership data are provided for 27.2% of Climate TRACE's global estimate for emissions in 2021").

Opposition to the Securities and Exchange Commission's ("SEC") new rule on updated climate risk reporting has focused on one category of disclosures as particularly objectionable: Scope 3 emissions.[7] Otherwise known as "supply chain emissions," Scope 3 emissions have been voluntarily reported by a growing number of companies since the term was invented as part of the Greenhouse Gas Protocol in 2001.[8] They include all the emissions both up and downstream of a corporations' own activities: the emissions of the privately-owned factory that produced the shoes Target sells, as well as the emissions you burn while driving to the store to buy them, all count as Target's "Scope 3" emissions.[9] The other two GHG Protocol scopes are less sprawling: Scope 1 emissions include sources the company directly owns and controls — the natural gas to heat buildings and gas-powered delivery vehicles, for example.[10] All emissions that come from purchased electricity fall in Scope 2 — this is the bill Target pays for the power from the grid that keeps store lights on.[11] While the SEC proposes that all companies be required to report their Scope 1 and 2 emissions, Scope 3 emissions are only mandatory if they are

[7] Avery Ellfeldt, *SEC Climate Rule Sparks Backlash from Business Groups*, E&E NEWS (June 2, 2022, 6:35 AM EDT), https://www.eenews.net/articles/sec-climate-rule-sparks-backlash-from-business-groups/ [https://perma.cc/Q2JY-U7ED]; Bill Flook, *Scope 3 Emissions Disclosure Emerges as Top GOP Target in SEC Climate Risk Rules*, THOMSON REUTERS: TAX & ACCT. (Aug. 24, 2022), https://tax.thomsonreuters.com/news/scope-3-emissions-disclosure-emerges-as-top-gop-target-in-sec-climate-risk-rules/ [https://perma.cc/XJY9-BV7W].

[8] *What Are Scope 1, 2, and 3 Emissions?*, NET0 (May 4, 2022), https://net0.com/blog/scope-1-2-3-emissions [https://perma.cc/9ZF8-E4CT]. While "Scope 3" was a new term, analyses of emissions through a product's "life-cycle," or an organization's "carbon footprint," and discussion of the general challenge of calculating supply chain emissions had been progressing for decades, in and outside of industry. *See infra* Part II.

[9] GREENHOUSE GAS PROTOCOL, CORPORATE VALUE CHAIN (SCOPE 3) ACCOUNTING AND REPORTING STANDARD 27-29 (2011), https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf [https://perma.cc/Z9UX-XHLM].

[10] *Id.* at 28. That is not to say that Scope 2 does not have its own accounting challenges, enabled by the GHG Protocol allowing companies to use a "market-based" rather than "location-based" accounting method. Eric Roston & Ben Elgin, *Companies' Climate Goals in Jeopardy from Flawed Energy Credits*, BLOOMBERG (June 9, 2022, 8:50 AM PDT), https://www.bloomberg.com/news/articles/2022-06-09/flawed-renewable-energy-credits-are-derailing-climate-efforts [https://perma.cc/XV4Z-KFCJ].

[11] GREENHOUSE GAS PROTOCOL, *supra* note 9.

financially material to the company, or the company has publicly set emissions targets.[12]

Objections to Scope 3 reporting requirements often highlight difficulties in collecting emissions information from third-parties, particularly smaller or private entities.[13] Corporations bristle at the idea of being held "responsible" for emissions over which they have no control.[14] And market participants that do not object to the concept of supply-chain emissions reporting have enumerated complications that come from applying Scope accounting in practice, anecdotal puzzles abound: "How do you divide up the emissions between" the milk and the meat that a single cow produces over its lifetime?[15] Nevertheless, investors largely support the SEC's Scope 3 proposal, and have used their own shareholder power to press for increasingly stringent supply-chain emissions disclosures from corporate management directly.[16]

Investors justify their pursuit of corporate emissions disclosure for two broad reasons. The first is that emissions are useful as a proxy for measuring transition risk, or their exposure to regulatory and market changes affecting fossil-dependent investments.[17] This reason is consistent

[12] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21,334, 21,345 (proposed Apr. 11, 2022) (to be codified at 17 C.F.R. pts. 210, 229, 232, 239, 249).

[13] *Cf.* Richard Vanderford, *SEC Climate Rule Won't Demand Extensive Reporting from Small Businesses, Gensler Says*, WALL ST. J. (Sept. 15, 2022, 8:06 PM ET), https://www.wsj.com/articles/sec-climate-rule-wont-demand-extensive-reporting-from-small-businesses-gensler-says-11663286786 [https://perma.cc/PA86-T6PS] (highlighting that the SEC proposal would not require public companies ask for carbon footprints from small private companies, rather public companies can estimate or discuss that Scope 3 management).

[14] Avery Ellfeldt, *Proposed SEC Climate Rules Have Sparked a Fight over Indirect Emissions*, SCI. AM. (Mar. 22, 2022), https://www.scientificamerican.com/article/proposed-sec-climate-rules-have-sparked-a-fight-over-indirect-emissions/ [https://perma.cc/V6RA-4RAK].

[15] Hugh Wheelan, *State of ESG: Tackling the Emissions Elephant*, RESPONSIBLE INV. (Sept. 16, 2022), https://www.responsible-investor.com/state-of-esg-tackling-the-emissions-elephant/ [https://perma.cc/YH94-2C7W].

[16] Dieter Holger, *Costco Shareholder Vote Signals Focus on Supply-Chain Emissions*, WALL ST. J. (Jan. 26, 2022, 6:00 AM ET), https://www.wsj.com/articles/costco-shareholder-vote-signals-focus-on-supply-chain-emissions-11643194803 [https://perma.cc/CF2L-5BG2]; Steven M. Rothstein, *Analysis Shows that Investors Strongly Support the SEC's Proposed Climate Disclosure Rule*, CERES (Oct. 11, 2022), https://www.ceres.org/news-center/blog/analysis-shows-investors-strongly-support-secs-proposed-climate-disclosure-rule [https://perma.cc/868A-Y5G4].

[17] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. at 21,425; *see, e.g.*, Wellington Mgmt. Co., Comment Letter to the

with a "single materiality" framework that compels disclosure of *risks to a company*.[18] This contrasts with a "double materiality" framework that additionally aims to capture *risks that a company imposes on others*, including other corporations in the market.[19] While discourse in the United States has tended to accept the traditional single materiality of Scope 1 and 2 emissions, Scope 3 is often described as a metric limited to "double materiality."[20] This Article argues that because the division between Scopes 1, 2, and 3 follow the arbitrariness of firm boundaries, certain channels of transition risk — and reputational risk — are not eliminated by simply outsourcing a high-risk process to a third-party. A blinkered focus on Scopes 1 and 2 misses these exposures. The second reason U.S. investors demand emissions disclosure is that it is needed for monitoring corporate progress over time. Metrics on emissions reduction progress are used throughout corporate governance: informing decisions on board member support, setting executive pay incentives, and monitoring portfolio-level alignment with climate indexes.[21] Institutional investors are

SEC on Climate Change Disclosures (June 11, 2021), https://www.sec.gov/comments/climate-disclosure/cll12-8944103-245735.pdf [https://perma.cc/P86T-4JCL] (arguing that "broader adoption of Scope 3 emissions information is necessary for us to fully understand the transition risks applicable to an issuer").

[18] *Cf.* Frederick Alexander, One Small Step from Financial Materiality to Sesquimateriality: A Critical Conceptual Leap for the ISSB 1, 13 (Apr. 1, 2022) (unpublished manuscript) (including a comment letter to the International Sustainability Standards Boards outlining the definitions of single and double materiality, arguing against their stark separation, and encouraging the ISSB to adopt a "double materiality" framework).

[19] *Id.* at 11. This quick summary skips over the ways the two categories interact and are difficult to separate. Companies surely face various financial risks from being labeled a bad actor by customers and employees. *See* Michal Barzuza, Quinn Curtis & David H. Webber, *Shareholder Value(s): Index Fund ESG Activism and the New Millennial Corporate Governance*, 93 S. CAL. L. REV. 1243, 1309 (2020). The ISSB ended up following the EU in requiring disclosure of all Scope 3 emissions. *ISSB Unanimously Confirms Scope 3 GHG Emissions Disclosure Requirements with Strong Application Support, Among Key Decisions*, IFRS (Oct. 21, 2022), https://www.ifrs.org/news-and-events/news/2022/10/issb-unanimously-confirms-scope-3-ghg-emissions-disclosure-requirements-with-strong-application-support-among-key-decisions/ [https://perma.cc/5YT2-H5ZK].

[20] *Cf. EU Taxonomy, Corporate Sustainability Reporting, Sustainability Preferences and Fiduciary Duties: Directing Finance Towards the European Green Deal*, COM/2021/188 (2021) (noting the European Union's new Corporate Sustainability Reporting Directive ("CSRD") adopts this double materiality framing, requiring disclosure of information capturing how a company impacts "people and the environment").

[21] Lydia Beyoud, *Executive Pay Tied to ESG Goals Grows as Investors Demand Action*, BLOOMBERG (Mar. 14, 2022, 3:00 AM), https://news.bloomberglaw.com/esg/

increasingly adopting their own reduction-commitments simultaneously as retail inventors seek out "carbon aligned" funds. Firm-level Scope data is needed before an asset manager can market any low-emissions fund.[22] Investors are increasingly adopting their own reduction-commitments, and retail investors are seeking "carbon aligned" funds of various kinds — the firm-level Scope data is needed in order construct footprints of assets and funds.

While the number of ESG reports about emissions "data gaps" grows, just where the data comes from and how it is (mis)used by market actors has been underexplored in the legal literature, particularly beyond the realm of ESG metrics for portfolio-screening. In Part I, this Article discusses how Scope data is collected and shared in practice, as well as its widespread adoption as a metric for financial risk and corporate governance. Part II argues that these uses of emissions data demonstrate that this information is broadly material to investors, requiring standardization and assurance. For these reasons, the SEC should not back down on requiring the disclosure of relevant Scope 3 emissions.[23]

executive-pay-tied-to-esg-goals-grows-as-investors-demand-action [https://perma.cc/CPS6-ZNMZ]; Dieter Holger, *More Investors Vote Against Corporate Directors over Climate Change*, WALL ST. J. (July 21, 2022, 6:00 AM ET), https://www.wsj.com/articles/more-investors-vote-against-corporate-directors-over-climate-change-11658397600 [https://perma.cc/ZMZ2-3VGM].

[22] Institutional investors give a variety of reasons for adopting emissions-reduction targets — including avoiding single-firm transition risks. There is a robust academic (and political) debate over the sincerity and motivations behind asset managers' climate goals. *See, e.g.*, Madison Condon, *Externalities and the Common Owner*, 95 WASH. L. REV. 1, 26-27 (2020) (arguing that large diversified investors have an economic interest in pursuing emissions reductions for the purpose of maximizing long-term portfolio returns). Asset owners adopting a "systematic stewardship" perspective further complicates the division of risks into single and double materiality buckets. *See* John C. Coffee, Jr., *The Coming Shift in Shareholder Activism: From "Firm-Specific" to "Systematic Risk" Proxy Campaigns (and How to Enable Them)*, 16 BROOK. J. CORP. FIN. & COM. L. 45, 64-65 (2021); Jeffrey N. Gordon, *Systematic Stewardship*, 47 J. CORP. L. 627, 638-48 (2022); *see also* Alastair Marsh, *ESG 'Engagement' in Crosshairs of $10 Trillion Asset Owner Group*, BLOOMBERG (Apr. 6, 2022, 3:01 PM PDT), https://www.bloomberg.com/news/articles/2022-04-06/esg-engagement-in-crosshairs-of-10-trillion-asset-owner-group [https://perma.cc/QQ8N-E64J].

[23] I use "relevant" rather than "material" here intentionally, to counter the myth that the SEC's disclosure authority is limited to financially material information. The judicial definition of materiality arose in the context of securities fraud litigation: the lie or omission had to be material for the claim to succeed. It was meant to limit frivolous investor suits, *not* SEC authority. Allison Herren Lee, Comm'r, U.S. Sec. & Exch. Comm'n, Keynote Remarks at the 2021 ESG Disclosure Priorities Event: Living in a Material World: Myths and Misconceptions About "Materiality" (May 24, 2021),

Corporate claims of lack of control and access to data should be met with skepticism for large companies, especially in light of recent technological advances related to emissions monitoring and trends in supply chain contracting.[24] However, the usefulness of Scope 3 data depends upon its *use-case* — a fact that has been relatively underappreciated — as well its granularity and the availability of other contextual data. This Part goes on to offer a brief critique and qualification of the uses of Scope 3 data, highlighting how U.S. financial regulators can improve upon the early approaches of other jurisdictions. Part III concludes.

I. SUPPLY CHAIN EMISSIONS

Existing literature critiques many aspects of the current carbon accounting framework and its use in corporate emissions reduction pledges. Shelly Welton summarizes fundamental problems with the concept of "net zero" itself, including its enabling of the carbon offsets market wherein companies can buy claims to the (often dubious) emissions reductions of others.[25] A series of recent Bloomberg articles catalogue the longstanding objections to the use of renewable energy credits ("RECs") to lower corporate footprints.[26] Companies can claim emissions "reductions" from a windfarm that has no relation to the power grid the company actually buys electricity from.[27] Any robust critique of

https://www.sec.gov/news/speech/lee-living-material-world-052421#_ftnref40 [https://perma.cc/4XFN-TA9P]. Further in securities lawsuits today, materiality is now regularly demonstrated through statistical "event studies," that estimate the alleged fraud's impact on stock price movements. This fact has been interpreted in public consciousness to mean that "material information" is information that could (or did) change the value of a security. But the 1976 Supreme Court case now cited for defining the very concept of materiality was about information that would have influence a shareholder's *vote* not the price of the stock he was invested in. TSC Industries, Inc. v. Northway, Inc., 426 U.S. 438 (1976).

[24] *See, e.g.*, Michael Vandenbergh & Patricia A. Moore, *Governance by Contract: The Growth of Environmental Supply Chain Contracting*, 12 MICH. J. ENVIRON. ADM. LAW. (forthcoming 2023) (manuscript at 2) (highlighting trends in supply chain contracting).

[25] Shelley Welton, *Neutralizing the Atmosphere*, 132 YALE L.J. 171, 194 (2022).

[26] *See, e.g.*, Akshat Rathi, Natasha White & Demetrios Pogkas, *Junk Carbon Offsets Are What Make These Big Companies 'Carbon Neutral'*, BLOOMBERG (Nov. 20, 2022), https://www.bloomberg.com/graphics/2022-carbon-offsets-renewable-energy/ [https://perma.cc/MLH4-N39W] (reporting on objections to RECs because they did not avoid or reduce GHG emissions); *see also* CARBON OFFSET GUIDE, https://www.offsetguide.org (last visited Feb. 28, 2023) [https://perma.cc/89VU-84UV] (explaining the differences in types of offsets, generally low quality, and alternatives).

[27] Ben Elgin & Sinduja Rangarajan, *What Really Happens when Emissions Vanish*, BLOOMBERG (Oct. 31, 2022, 5:00 PM PDT), https://www.bloomberg.com/news/features/2022-11-01/intel-p-g-cisco-among-major-companies-exaggerating-climate-

Scope 3 emissions accounting must necessarily point to these underlying problems with negative emissions and market accounting, along with flaws in the Scope 1 and Scope 2 frameworks, as one company's Scope 3 is made up of a bunch of other companies' Scopes 1 and 2. This Article focuses on issues particular to supply chain accounting and directs readers to the great work documenting the carbon accounting challenges outside its reach.

A. A Brief History

The Greenhouse Gas Protocol arose out of a collaboration between the World Resources Institute and the World Business Council for Sustainable Development, a "global, CEO-led organization" with membership from many of the world's largest companies.[28] In the late 1990s, the lack of standardized methods for greenhouse gas accounting was identified as a problem by the private sector and others, and the GHG Protocol was established to meet the need. It released its first Corporate Standard in 2001, followed in 2005 by the Project Accounting Standard, "a guide for quantifying reductions from GHG-mitigation projects."[29] At its inception, the Protocol was pitched primarily as a tool for corporate risk management and voluntary reporting to stakeholders; the focus was not on investors.[30] With the EU emissions-trading scheme ("ETS") kicking off in 2005, and

progress [https://perma.cc/C98P-DZU8] (explaining that the years-long debate over whether market-based accounting methods were acceptable in emissions reporting was "essentially settled" when the GHG Protocol accepted its use in 2015). That debate is now being reopened, as evidenced by increasing scrutiny and the GHG Protocol reopening its market accounting framework for comment. *See* GREENHOUSE GAS PROTOCOL, SURVEY ON NEED AND SCOPE FOR UPDATES OR ADDITIONAL GUIDANCE: MARKET-BASED ACCOUNTING APPROACHES SURVEY MEMO 1 (2023), https://ghgprotocol.org/sites/default/files/Market-based%20accounting%20Survey%20Memo.pdf [https://perma.cc/4C4X-GUN7].

[28] *About Us*, WORLD BUS. COUNCIL FOR SUSTAINABLE DEV., https://www.wbcsd.org/Overview/About-us (last visited Dec. 12, 2022) [https://perma.cc/VPW2-Y7Y8] (including Amazon, Apple, Dupont, McDonalds, and more).

[29] PANKAJ BHATIA, CYNTHIA CUMMIS, LAURA DRAUCKER, DAVID RICH, HOLLY LAHD & ANDREA BROWN, GREENHOUSE GAS PROTOCOL, PRODUCT LIFE CYCLE ACCOUNTING REPORTING STANDARD 4 (2011), https://ghgprotocol.org/sites/default/files/standards/Product-Life-Cycle-Accounting-Reporting-Standard_041613.pdf [https://perma.cc/AQ49-YASD].

[30] The original version of the corporate standard mentions "investors" one time as compared to eight mentions of "compliance" with government regulations or emissions trading schemes. *See* GREENHOUSE GAS PROTOCOL, THE CORPORATE STANDARD 10 (2001) (listing four categories and several subcategories of reasons why companies conduct emissions inventories — investors and financial reporting were clearly not the target audience).

the U.S. nearly passing a cap-and-trade bill in 2009, the momentum to standardize accounting was largely driven by heavy-emitting industries anticipating participation in carbon markets.[31]

In 2011, the GHG Protocol simultaneously published two additional accounting frameworks: the first Value Chain (Scope 3) Standard, covering corporate supply chain emissions, and the GHG Protocol Product Standard, covering product-level "life-cycle" emissions.[32] Over time, more and more organizations, voluntary frameworks, and financial institutions have become interested in corporate emissions accounting, and the GHG Protocol has expanded its outreach and marketing to address these users. The organization continues to release updates, guidance, and calculation tools.[33]

Accounting for emissions in supply chains at the *product level* had developed a long history by the time the GHG Protocol released its version in 2011.[34] In 1969, Coca-Cola commissioned what is now called the first Life-Cycle Analysis ("LCA"), a "cradle to grave" assessment of the resources required to produce and dispose of different types of beverage packaging.[35] The company was considering manufacturing its own containers and was interested in a method that could address the complexity of tradeoffs between resource choices.[36] The original LCAs were conceptualized as internal corporate tools for addressing optimization problems — assessing the interaction of resource demands between water, energy, and waste along a single supply-chain. They were

[31] *Id.* at 12; GREENHOUSE GAS PROTOCOL, THE GHG PROTOCOL FOR PROJECT ACCOUNTING 9 (2005), https://ghgprotocol.org/sites/default/files/standards/ghg_project_accounting.pdf [https://perma.cc/5MM3-VJYH] (describing consistency with the Kyoto Protocol's Clean Development Mechanism and other trading schemes and providing tools for manufacturing accounting).

[32] BHATIA ET AL., *supra* note 29, at 3-4.

[33] *About Us*, GREENHOUSE GAS PROTOCOL, https://ghgprotocol.org/about-us (last visited Dec. 12, 2022) [https://perma.cc/FK5Y-BNWP]. Producing the Scope 3 standard was a three-year process involving 2,300 participants, multiple technical working groups, and testing on the part of corporations from various industries before the public release. *Corporate Value Chain (Scope 3) Standard*, GREENHOUSE GAS PROTOCOL, https://ghgprotocol.org/standards/scope-3-standard (last visited Apr. 2, 2023) [https://perma.cc/DS24-C2TR].

[34] *See* Jeroen B. Guinée, Reinout Heijungs, Gjalt Huppes, Alessandra Zamagni, Paolo Masoni, Roberto Buonamici, Tomas Ekvall & Tomas Rydberg, *Life Cycle Assessment: Past, Present, and Future*, 45 ENV'T. SCI. TECH. 90, 90-91 (2011).

[35] Robert G. Hunt & William E. Franklin, *LCA — How It Came About*, 1 INT'L J. LIFE CYCLE ASSESSMENT 4, 4 (1996).

[36] *Id.*

rarely released to the public and often used to defend against environmentalist critiques.[37]

While LCAs have typically tried to capture the full environmental impact of a product, the reasons behind the analysis have shifted over time. They were invented in the late 1960s, at a time of mounting concern over general resource scarcity concerns.[38] Following the era of "The Limits to Growth," they were used to analyze energy intensity demands throughout the 1970s oil crisis.[39] Then, interest in LCAs largely died out in the U.S. until the early 1990s, when the country's waste management crisis became a subject of consumer and environmental advocates.[40] In 1987, images of the Mobro 4000, an enormous barge laden with garbage from a Long Island town that had run out of landfill space, played across televisions.[41] The "Garbage Barge" became an early meme as the ship tried to dock at various ports along the east coast, repeatedly turned away down to Belize and back, before finally reaching an agreement with the original town from which it had departed.[42] The event served as one of the many cultural pivots that increased adoption of recycling and pressure on corporations to reduce waste in the 1990s.[43]

British oil major BP is often credited for inventing the concept of the "carbon footprint" as a way to displace blame onto individual consumers.[44] But while the company did popularize the term with its marketing campaign and online calculator in 2004, the "footprint" concept was in

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[37] *See id.* at 5.

[38] SCI. APPLICATIONS INT'L CORP., ENV'T PROT. AGENCY, LIFE CYCLE ASSESSMENT: PRINCIPLES AND PRACTICE 4 (2006).

[39] *Id.*; SOC'Y OF ENV'T TOXICOLOGY & CHEMISTRY, A TECHNICAL FRAMEWORK FOR LIFE-CYCLE ASSESSMENT 3 (1991), https://cdn.ymaws.com/www.setac.org/resource/resmgr/books/lca_archive/technical_framework.pdf [https://perma.cc/22CW-AZ5E].

[40] Hunt & Franklin, *supra* note 35, at 6-7 (discussing the late 80s "dramatic reawakening of environmental consciousness in the U.S." with a focus on waste and recycling).

[41] *Voyage of the Mobro 4000*, N.Y. TIMES: RETRO REPORT (May 6, 2013), https://www.nytimes.com/video/booming/100000002206073/voyage-of-the-mobro-4000.html [https://perma.cc/J73E-MRW4].

[42] *See Garbage Barge at Final Stop Where It Started*, WASH. POST (July 10, 1987), https://www.washingtonpost.com/archive/politics/1987/07/11/garbage-barge-at-final-stop-where-it-started/e19d384e-57aa-44ab-94f1-ec13f9b9c907/ [https://perma.cc/9KXM-JTXX].

[43] Hunt & Franklin, *supra* note 35, at 7; *Voyage of the Mobro 4000*, *supra* note 41.

[44] Rebecca Solnit, *Big Oil Coined 'Carbon Footprints' to Blame Us for Their Greed. Keep Them on the Hook*, GUARDIAN (Aug. 23, 2021, 6:20 EDT), https://www.theguardian.com/commentisfree/2021/aug/23/big-oil-coined-carbon-footprints-to-blame-us-for-their-greed-keep-them-on-the-hook [https://perma.cc/HUZ6-QSGV].

fact invented in the 1990s by ecologist William Rees.[45] Like the early LCAs, Rees's "Ecological Footprint" was meant to apply to a set of natural resources and impacts beyond energy and emissions. The metric was expressed in terms of land area and was meant to capture the network of resources that a city depends upon beyond its own borders.[46] The GHG Protocol's "life-cycle" guidelines, however, focus simply on emissions, excluding other potential impacts and stopping short of translating the metric into any measure of how harmful those emissions are.

B. Calculating Scope 3

The GHG Protocol breaks Scope 3 emissions into fifteen categories: eight "upstream," categories, including "1. Purchased goods and services" and "7. Employee commuting"; and seven "downstream" categories, including "11. Use of sold products" and "15. Investments."[47] Under the Protocol, companies are free to make methodological choices in calculating their Scope 3 emissions, and the Protocol provides guidance on best practices.[48] This is just one of many areas where companies are granted a significant amount of discretion, including which subcategories to report at all — companies self-determine which categories are "significant" for their overall footprint. This agnosticism of the GHG Protocol leads to concerns about data comparability as well as reliability, which are discussed further in Part II.B., Limits to Scope 3.

Companies may try to get individualized product-level data from their suppliers, *e.g.*, CO_2e per pack of pens, but only a limited number of companies supply or update this information.[49] In the absence of product-level data, companies estimate emissions from a range of secondary data sources. An ever-growing set of databases, models, and methods serve to translate available financial and procurement data, like materials and place

[45] *See* William E. Rees, *Ecological Footprints and Appropriated Carrying Capacity: What Urban Economics Leaves Out*, 4 ENV'T & URBANIZATION 121, 121 (1992).

[46] *Id.*

[47] PANKAJ BHATIA, CYNTHIA CUMMIS, ANDREA BROWN, DAVID RICH, LAURA DRAUCKER & HOLLY LAHD, GREENHOUSE GAS PROTOCOL, CORPORATE VALUE CHAIN (SCOPE 3) ACCOUNTING AND REPORTING STANDARD 32 (2011), https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf [https://perma.cc/AXQ4-P67Y].

[48] *Id.* at 128.

[49] WORLD BUS. COUNCIL FOR SUSTAINABLE DEV., VALUE CHAIN CARBON TRANSPARENCY PATHFINDER: ENABLING DECARBONIZATION THROUGH SCOPE 3 EMISSIONS TRANSPARENCY 5 (2021), https://www.wbcsd.org/contentwbc/download/11536/175031/1 [https://perma.cc/4EES-KQ4C].

of origin, into "embodied" emissions for products and companies.[50] Carbon-specific accounting software startups compete for business with established resource-planning vendors that are integrating emissions metrics into traditional procurement, accounting, and operations-management tools.[51] How much information companies already have about their suppliers varies widely. On one end of the spectrum are giant retailers with in-house logistics software, like Walmart which famously collects (and shares) large quantities of supplier data across its supply chain networks.[52] On the other end are the many importers that rely on unknown middlemen using physical pieces of paper to document shipments across ports.[53]

Many of these emissions estimation tools rely on industry- and country-averages for computing "emissions factors," using external databases of emissions per product category.[54] But there are clear limitations to this approach, depending on its intended application. The granularity of product differentiation is limited.[55] Some datasets, for example, do not distinguish between beef and pork products despite their known differences in emissions impacts.[56] Similarly, most databases distinguish only by country of origin, so all rice grown in Vietnam looks the same

[50] For example, CO2A Global used AI to analyze and structure different procurement datasets across the UK's National Health Service and assign emissions calculations. *See Uncover Scope 3 with AI*, CO2 ANALYSIS (July 11, 2022), https://co2analysis.com/blog/uncover-scope-3-with-ai.html [https://perma.cc/PD5P-U85G] ("We found the same type of nitrile gloves described in more than 100 ways in just one NHS trust.").

[51] *See* Peter Spiller, *Making Supply-Chain Decarbonization Happen*, MCKINSEY & CO. (June 14, 2021), https://www.mckinsey.com/capabilities/operations/our-insights/making-supply-chain-decarbonization-happen [https://perma.cc/ZG5G-2V56]; *The 10 Best Carbon Accounting Software in 2023*, PERSEFONI (July 29, 2022), https://persefoni.com/learn/best-carbon-accounting-software [https://perma.cc/T3W2-WZEM].

[52] Miriam Posner, *See No Evil*, LOGIC MAG. (Apr. 1, 2018), https://logicmag.io/scale/see-no-evil/ [https://perma.cc/2UF4-Z5A4].

[53] Miriam Posner, *Ghost Ships*, LOGIC MAG. (Dec. 21, 2022), https://logicmag.io/pivot/ghost-ships/ [https://perma.cc/FKW7-8U5N].

[54] *See, e.g.*, Mario Schmidt, Moritz Nill & Johannes Scholz, *Determining the Scope 3 Emissions of Companies*, 45 CHEM. ENG'G & TECH. 1218, 1223 (2022) (noting that country and sectoral level estimates mean "[d]ifferences in emission factors between individual products within a sector can therefore not be mapped").

[55] *Id.*

[56] Anastasia Lobanova & Cathleen Berger, *Calculating Value Chain Emissions: The Role of Spend-Based Data*, CLIMATIQ (Dec. 8, 2021), https://www.climatiq.io/blog/calculating-value-chain-emissions-spend-based-data [https://perma.cc/35Q7-KRPF].

whether methane-reducing farming practices were adopted or not.[57] A recent report by CPA Canada, a professional association of accountants, points out that many of the emissions factor databases provided freely by the GHG Protocol are "significantly out of date."[58]

Some companies, particularly those in consumer tech, disclose product-specific emissions footprints calculated with a traditional life cycle analysis focus.[59] But often these time-consuming LCAs are produced as a one-off exercise and are not updated to reflect changes in the energy grid or suppliers.[60] I can find the emissions that went into producing the Staples Sustainable Earth 12A toner cartridge in 2015, for example, but not since then.[61] While certain sustainability-minded companies like Apple do have a practice of updating their product-specific disclosures, there is no set system for integrating that information into supply chain reporting.[62] Most emissions-factor approaches use databases that do not distinguish between a PC laptop and a MacBook. So, it is up to any given corporation's methodology whether they use Apple-supplied emissions data in calculating their own footprint for office computing purposes. The same goes for tools created by Cloud service providers to aid downstream customers in assessing their own footprints. Google, Microsoft, and Amazon all rolled out dashboards reflecting customers' emissions that change to reflect individual usage as well as reductions over time as the tech companies work to decarbonize their energy supply.[63] Whether this

[57] Anastasia Lobanova, *The Science Behind Spend-Based Emission Factors*, CLIMATIQ (Aug. 15, 2022), https://www.climatiq.io/blog/science-behind-spend-based-emission-factors [https://perma.cc/8Q8Z-AY7X]; *see also* Spiller, *supra* note 51.

[58] CHARTERED PRO. ACCTS. OF CAN., A CLOSER LOOK AT THE GHG PROTOCOL OBSERVATIONS AND IMPLICATIONS FOR STANDARDS SETTERS AND REGULATORS 9 (2022), https://www.cpacanada.ca/en/business-and-accounting-resources/other-general-business-topics/sustainability/publications/closer-look-ghg-protocol [https://perma.cc/25LJ-4A2B].

[59] *See, e.g.*, Christoph J. Meinrenken, Daniel Chen, Ricardo A. Esparza, Venkat Iyer, Sally P. Paridis, Aruna Prasad & Erika Whillas, *The Carbon Catalogue, Carbon Footprints of 866 Commercial Products from 8 Industry Sectors and 5 Continents*, 9 SCI. DATA 87 (2022) (analyzing CDP disclosures and identifying footprints for 866 unique products from 145 companies).

[60] *Id.* (describing that Catalogue can be useful for following how frequently companies update product carbon footprints).

[61] *See Global Publicly Disclosed Product Carbon Footprints*, CARBON CATALOGUE, https://carboncatalogue.coclear.co/?sector=all&company=Staples%2C%20Inc.&year=all&sort=sector (last visited Apr. 2, 2023) [https://perma.cc/2TML-7D9D] (drawing from CDP reported data).

[62] Schmidt et al., *supra* note 54, at 1219-20.

[63] Donna Goodison, *How the Big Three Cloud Providers Are Helping Customers Manage Their Energy Consumption and Carbon Emissions*, PROTOCOL (July 25, 2022),

user-level data is then incorporated in the corporate cloud purchaser's own emissions reporting depends on the company's own methodologies.

Nevertheless, a growing number of companies have put their largest suppliers on alert that they will be seeking product-level footprint data.[64] The coalition of multinationals, "1.5°C Supply Chain Leaders" established a "Small and Medium Enterprise Climate Hub," providing accounting software and other tools for their suppliers.[65] CDP (formerly the Carbon Disclosure Project) has for many years been the organization to which the largest number of companies voluntarily report their emissions. It runs a program that assists "over 200 major companies representing US$5.5 trillion in procurement spend[ing]" in requesting their own suppliers to disclose emissions data.[66] In 2021, these CDP Supply Chain members requested disclosures from 23,487 different corporate suppliers, with 11,457 suppliers providing responses of varying comprehensiveness.[67]

Some consultants encourage companies to get primary data, like material inputs and electricity use, from their suppliers, rather than product-level calculated emissions data, so that they can apply the same methodologies across supply chains.[68] While this creates corporate-level consistency in emissions estimation, it also results in a structure where each entity along the chain is expected to calculate and then re-calculate one another's emissions.[69] Data-sharing brings another complication in that many suppliers are resistant to divulging primary information, like

https://www.protocol.com/enterprise/aws-microsoft-google-energy-carbon [https://perma.cc/5KQW-XU6Y] (noting that both Microsoft and Google's tools allow for more granularity, enabling customers to host their cloud computing in regions powered by cleaner energy).

[64] *Unilever's Journey Towards Net Zero Value Chain Emissions by 2039*, EXPONENTIAL ROADMAP INITIATIVE (Sept. 20, 2022), https://exponentialroadmap.org/unilevers-journey-toward-net-zero-value-chain-emissions-by-2039/ [https://perma.cc/PQ5C-9ND2].

[65] *Transforming Supply Chains to Halve Emissions by 2030*, EXPONENTIAL ROADMAP INITIATIVE (Nov. 17, 2022), https://exponentialroadmap.org/transforming-supply-chains-to-halve-emissions-by-2030/ [https://perma.cc/8GZ5-4BBB].

[66] *10-Year Lag on Climate Action Forecast with Half of Supply Chain Companies Still Failing to Set Targets*, CDP (Feb. 10, 2022), https://www.cdp.net/en/articles/media/10-year-lag-on-climate-action-forecast-with-half-of-supply-chain-companies-still-failing-to-set-targets [https://perma.cc/N2QR-YQK2].

[67] CDP, ENGAGING THE CHAIN: DRIVING SPEED AND SCALE, CDP GLOBAL SUPPLY CHAIN REPORT 2021, at 4 (2022).

[68] *Id.* at 29.

[69] *See* Robert S. Kaplan & Karthik Ramanna, *Accounting for Climate Change*, HARV. BUS. REV. (Nov. 1, 2021), https://hbr.org/2021/11/accounting-for-climate-change [https://perma.cc/96ZV-2GYD].

cost and materials, that could be reverse-engineered to reveal protected financial information or industry secrets.[70] A wide range of startups aim to solve these problems through blockchain technology, as it enables users to maintain ownership over their data and exercise control over access within the platform.[71] As a product moves down a supply chain, blockchain allows previously verified emissions data to travel with it, without revealing masses of irrelevant (and potentially sensitive) financial information of farther upstream producers.[72]

A Climate Data Steering Committee organized by French President Emmanuel Macron and climate billionaire Michael Bloomberg aims to create a "Net-Zero Data Public Utility," an open platform for verified data on emissions and other transition information.[73] Several industry-specific programs have announced data-sharing platforms to facilitate more efficient exchange.[74] Catena-X is a partnership of European car makers

[70] *See* Stephanie Condon, *Siemens' New System Helps Companies Track Emissions Across the Supply Chain*, ZDNET (Nov. 21, 2021), https://www.zdnet.com/article/siemens-new-system-helps-companies-track-emissions-across-the-supply-chain/ [https://perma.cc/EVT3-UEQP] (explaining that because "gathering emissions data from supply chain partners often requires them to disclose strategically important information . . . NGOs like WRI, GHG Protocol and GIZ have recommended distributed ledger-based systems").

[71] *See* Jim Giles, *Supply-Chain Data Gets Granular*, GREENBIZ (Mar. 14, 2022), https://www.greenbiz.com/article/supply-chain-data-gets-granular [https://perma.cc/KBN7-SH9U]; *see also Case Study: Managing the Metal and Mining Industry's Supply Chain with Hyperledger Fabric*, HYPERLEDGER FOUND., https://www.hyperledger.org/learn/publications/krypc-minehub-case-study (last visited Jan. 11, 2023) [perma.cc/4L3R-3U8X] (providing one example of a start-up offering blockchain solutions to supply chain tracking); Exec. Order No. 14,067, 87 Fed. Reg. 14,143, 14,148 (Mar. 9, 2022) (ordering an inter-agency report on "distributed ledger technology and economic and energy transitions" and their potential to "to impede or advance efforts to tackle climate change").

[72] *See* ALEXANDER FARSAN, ANDRES CHANG, ANNEMARIE KERKHOF, BENCE CSERNA, CHENDAN YAN, FERNANDO RANGEL VILLASANA & NICOLE LABUTONG, VALUE CHANGE IN THE VALUE CHAIN: BEST PRACTICES IN SCOPE 3 GREENHOUSE GAS MANAGEMENT 42-43 (2018), https://sciencebasedtargets.org/resources/files/SBT_Value_Chain_Report-1.pdf [https://perma.cc/8RAB-Q7QY].

[73] *Climate Data Steering Committee Proposes Recommendations for the Development of First-Ever Publicly Accessible Climate Data Utility*, BLOOMBERG PHILANTHROPIES (Sept. 21, 2022), https://www.bloomberg.org/press/climate-data-steering-committee-proposes-recommendations-for-the-development-of-first-ever-publicly-accessible-climate-data-utility/ [https://perma.cc/EUQ8-E8C2].

[74] *See, e.g.*, *How Blockchain Is Helping Mining Companies Reduce Carbon Emissions*, WORLD ECON. F. (Apr. 20, 2020), https://www.weforum.org/impact/the-responsible-sourcing-of-raw-materials/ [https://perma.cc/SK7F-2H5S] ("By pooling resources and costs, the mining and metals companies aim to accelerate supply chain visibility which also discloses ESG requirements.").

developing an interoperable "data ecosystem" open to all companies in "the automotive value chain."[75] The "Value Chain Transparency Pathfinder" aims to be the "internet for emissions data," focusing, like similar initiatives, on overcoming interoperability problems between existing procurement and enterprise data platforms.[76]

When companies do not publicly report their emissions, ESG data providers estimate corporate-level emissions in a number of ways.[77] The simplest approaches simply assume that a company has a similar emissions intensity to its industry peers.[78] More complex, usually proprietary, methods combine datasets on revenue, production, and energy mixed with machine learning and other big data methods.[79] Institutional

[75] *FAQ*, CATENA-X, https://catena-x.net/en/faq (last visited Dec. 16, 2022) [https://perma.cc/9ZAK-SWDW]. Some regulated companies and industries already have infrastructure for and experience with supply chain monitoring data sharing — and can integrate emissions reporting into pre-existing processes. Many of the world's largest chemical companies are part of a "Together for Sustainability" network that shares ESG assessments and the outcomes of supplier audits with all members, while keeping them confidential to the public. *How We Do It*, TFS INITIATIVE, https://www.tfs-initiative.com/how-we-do-it (last visited Dec. 16, 2022) [https://perma.cc/58HN-87HK].

[76] *FAQ*, PACT, https://www.carbon-transparency.com/faqs (last visited Dec. 16, 2022) [https://perma.cc/P6RF-WW9Q]. A project of the World Business Council for Sustainable Development, it has over 200 corporate members including Unilever, Microsoft, Nestle, Dow, Chevron, Shell, and BASF.

[77] Timo Busch, Matthew Johnson & Thomas Pioch, *Corporate Carbon Performance Data: Quo Vadis?*, 26 J. INDUS. ECOLOGY 350, 352-53 (2020) (finding "three general approaches" for estimating emissions: a "process analysis approach that uses primary and secondary production process data and the associated carbon emissions;" input-output analyses that use national accounts data to allocate emissions to sectors; and hybrid models that mix the two).

[78] *See* JOHN SIMMONS, JAAKO KOOROSHY, EDMUND BOURNE, MALLIKA JAIN & LEE CLEMENTS, FTSE RUSSELL, MIND THE GAPS: CLARIFYING CORPORATE CARBON 24 (2022); REFINITIV, REFINITIV ESG CARBON DATA AND ESTIMATE MODELS 5, https://www.refinitiv.com/content/dam/marketing/en_us/documents/fact-sheets/esg-carbon-data-estimate-models-fact-sheet.pdf (last visited Feb. 28, 2023) [https://perma.cc/V93L-EJZA].

[79] *See* George Serafeim & Gladys Velez Caicedo, *Machine Learning Models for Prediction of Scope 3 Carbon Emissions* (Harv. Bus. Sch. Acct. & Mgmt. Unit, Working Paper No. 22-080, 2022); Brendan Baker, *Scope 3 Carbon Emissions: Seeing the Full Picture*, MCSI (Sept. 17, 2020), https://www.msci.com/www/blog-posts/scope-3-carbon-emissions-seeing/02092372761 [https://perma.cc/8BQB-45WJ]; *see, e.g.*, *Greenhouse Gas Emissions Data | Worldwide Public Companies ESG Data | Datacie ESG*, DATARADE, https://datarade.ai/data-products/greenhouse-gas-emissions-worldwide-public-companies-esg-data-datacie-datacie (last visited Dec. 15, 2022) [https://perma.cc/3CZ9-7H6Z] (providing a database of Scope 1, 2, and 3 data from "proprietary data extraction technology").

Shareholder Services ("ISS") claims that its dataset of more than 25,000 corporate issuers relies on "800 sector and sub-sector specific models" to estimate unreported or untrustworthy scope emissions.[80] Different estimation methods produce different outcomes, even for the less uncertain categories of Scope 1 and 2 emissions, and third-party data therefore varies.[81]

The process of measuring and disclosing Scope 3 emissions is rapidly evolving as it is taken up by more companies under pressure from regulators, investors, and business partners.[82] And companies put in widely varying levels of effort in increasing the precision and granularity of their disclosures. The challenges to data collection mentioned briefly here are easier for some companies to overcome than others, depending on their existing data management systems, ability to exert power over their suppliers, and willingness to engage.[83] Most importantly, the current patchwork state of Scope 3 reporting, including rigor and choice of methodology, may be a bigger problem for some uses of the data than others. This point is discussed further in Part II.B.

II. THE NECESSITY & INSUFFICIENCY OF SCOPE 3

As acknowledged by the SEC, "an increasing number of investors incorporate . . . GHG emissions into their investment selection or voting decisions."[84] A recent FTSE report observes that "[e]missions data is increasingly critical for capital allocation" — including index weighting, benchmarking, portfolio tracking and targets, and shareholder voting and engagement.[85] GHG-linked corporate governance metrics influence executive pay and proxy vote decisions. Companies increasingly use

[80] *At a Glance: ISS ESG Carbon & Climate Impact Data*, FACTSET, https://insight.factset.com/resources/at-a-glance-iss-esg-carbon-and-climate-impact (last visited Dec. 15, 2022) [https://perma.cc/2HWH-V88Z].

[81] *See* SIMMONS ET AL., *supra* note 78, at 13.

[82] *See* Heather Clancy, *Emissions Accounting Needs a Makeover, and It's Coming*, GREENBIZ (Jan. 2, 2023), https://www.greenbiz.com/article/emissions-accounting-needs-makeover-and-its-coming [https://perma.cc/ADU2-WTEZ].

[83] *See, e.g.*, Jesse Klein, *Costco and Walmart: A Tale of Two Supply Chains*, GREENBIZ (Apr. 11, 2022), https://www.greenbiz.com/article/costco-and-walmart-tale-two-supply-chains [https://perma.cc/5G2T-LLRQ] (discussing how Walmart and Costco have different influences on their suppliers and willingness to engage with their suppliers).

[84] The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21,334, 21,341 (Apr. 11, 2022) (to be codified at 17 C.F.R. pts. 210, 229, 232, 239, 249).

[85] SIMMONS ET AL., *supra* note 78, at 4.

carbon accounting in supply chain management and compliance risk processes.[86] "Low-carbon" product requirements are popping up in new places: from local sustainable building zoning regulations to contractual terms.[87]

This Part highlights that the GHG Protocol "Scope 3" system gained near-universality in voluntary corporate reporting in part because it was meant to be flexible and adaptable to a variety of uses.[88] But it also leaves a significant amount of discretion to the disclosing company to set reporting boundaries, determine which subcategories of emissions are "relevant," and make a wide variety of methodological choices including judgment calls. As Jimmy Jia, Nicola Ranger, and Abrar Chaudhury describe in detail, these choices result in significant differences in Scope 3 estimations, with large error bars that can aggregate through a supply chain resulting in numbers with dubious utility.[89] The GHG Protocol itself makes clear that it is designed to track individual corporate progress over time and should not be used for comparison between companies. Nevertheless, inter-corporate comparison appears to be the primary use of Scope 3 data today.

The usefulness of Scope 3 as a metric depends on its *use-case*, as well as its granularity and availability of other contextual data. How one approaches the problem of scope boundaries, for example, depends on whether one cares about the corporations' *control* over emissions, its *exposure* to risk, or its *responsibility* for the harm that comes from its emissions (or attendant liabilities). As an initial matter, the importance of

[86] Spiller, *supra* note 51; *see* Sarah Carpenter, *Tracking down Emissions When They're Buried in Your Supply Chain*, CORP. COMPLIANCE INSIGHTS (Feb. 22, 2023), https://www.corporatecomplianceinsights.com/market-regulatory-esg-manufacturers/ [https://perma.cc/SY7K-5AQA].

[87] *E.g.*, CAL. PUB. CONT. CODE §§ 3500-05 (2022) (indicating California public agencies require bidders to account for the greenhouse gas emissions of their project supplies and mandate that public agencies pursue lower greenhouse gas emissions when accepting bids); Joel Makower, *Inside Salesforce's Bold Play for Supply-Chain Leadership*, GREENBIZ (May 3, 2021), https://www.greenbiz.com/article/inside-salesforces-bold-play-supply-chain-leadership [https://perma.cc/DE5Y-F4L3]; *see infra* Part III.C.

[88] WORLD RES. INST., THE GREENHOUSE GAS PROTOCOL FOR THE U.S. PUBLIC SECTOR 3 (2010) ("The Corporate Standard was designed to be program and policy neutral, allowing users the flexibility to adapt the core methodology and concepts to specific accounting and reporting needs.").

[89] JIMMY JIA, NICOLA RANGER & ABRAR CHAUDHURY, DESIGNING FOR COMPARABILITY: A FOUNDATIONAL PRINCIPLE OF ANALYSIS MISSING IN CARBON REPORTING SYSTEMS 45 (2023).

Scope 3 emissions data is discussed, emphasizing that the critiques here about the limits of the data and its misapplication does not mean this data is not needed. Indeed, as Section A shows, a reliance on Scope 1 and 2 emissions alone will likely lead to distorted effects. Section B then turns to the various limits of Scope 3 as a financial metric. Crucially, it is an important *input* metric, but must be accompanied by a range of other considerations. Section C discusses how to move forward.

A. Importance of Scope 3

Some corporations and investors readily concede that Scope 1 and 2 emissions are material and should be included in the SEC's mandatory reporting requirements, and yet push back against Scope 3 disclosure — with or without a materiality threshold. Fidelity, for example, opposed the SEC's inclusion of Scope 3, while supporting disclosure of Scope 1 and 2 emissions data, as "[they] are now table stakes and part of investors' fundamental expectations of companies."[90] But because the division between Scopes 1, 2, and 3 follow the arbitrariness of firm boundaries, certain channels of transition risk are not eliminated by simply outsourcing a high-risk process to a third-party.

Many academics and investors have highlighted this concern over excluding Scope 3 from reporting. A snapshot comparison of Apple and Samsung's Scope 1 and 2 emissions would suggest that Samsung's emissions intensity (by revenue) was 200 times higher than Apple's, despite operating in similar product markets.[91] This discrepancy is traced to Apple's outsourcing of nearly all of its manufacturing, including partially to Samsung.[92] Given the various ways Scope emissions are used by the financial sector, excluding Scope 3 from oversight would likely induce firms to boundary shift and outsource in many of the ways they traditionally use legal tools to escape legal and financial risk.[93]

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[90] Letter from Cynthia Lo Bessette, Chief Legal Officer, Fidelity Inv., to Vanessa A. Countryman, Sec'y of the Sec. & Exch. Comm'n (June 17, 2022) (on file with the SEC).

[91] Frédéric Ducoulombier, *Understanding the Importance of Scope 3 Emissions and the Implications of Data Limitations*, 2021 J. IMPACT ESG INVEST. 63, 65.

[92] *Id.*

[93] *See* Jingbo Cui, Chunhua Wang, Zhenxuan Wang, Junjie Zhang & Yang Zheng, Carbon Leakage Within Firm Ownership Networks: Evidence from China's Regional Carbon Market Pilots 25 (July 20, 2022) (unpublished manuscript) (on file with author); Anjali Raval, *A $140bn Asset Sale: The Investors Cashing in on Big Oil's Push to Net Zero*, FIN. TIMES (July 6, 2021), https://www.ft.com/content/4dee7080-3a1b-479f-a50c-c3641c82c142f [https://perma.cc/4N55-W38Z] (documenting the ways fossil companies hide emissions from their balance sheet while profit flows, including "forming joint

A sole focus on Scopes 1 and 2 can lead to strange outcomes at the product level as well, obscuring whether a more emissions-intensive manufacturing process is outweighed by lower lifecycle emissions.[94] Such is the case of electric vehicles ("EVs"), which on average are more energy intensive to produce than conventional internal combustion engine cars, but emit less over their use-life.[95] This miscalculation can aggregate at the level of a firm; when excluding Scope 3, an EV manufacturer is penalized, even though from the perspective of considering transition risk and climate impact, this makes little sense.

Nevertheless, ESG data and ratings providers themselves diverge on whether they include Scope 3 emissions in their accounting.[96] This Article argues that this choice deserves more scrutiny as Scope reporting and transparency develops. Scope emissions are often integrated into assessments of either firm-level or portfolio-level transition risk. In this case, a shareholder is not necessarily concerned with whether a company is "on target" with any climate commitment, but rather in assessing how exposed an asset may be to changes in global or local climate policy, energy prices, or shifts in consumer and investor sentiments. Two common security selection strategies are employed that depend upon emissions data: *screening*, which excludes the worst emitters by industry; and *tilting*, which uses emissions as a factor in determining portfolio-weights.[97] Emissions data are becoming increasingly mainstream financial information. On BlackRock's iShares platform, potential investors shopping for the right ETF can click a button to include a funds' Carbon Intensity expressed in terms of emissions per sales, alongside traditional metrics like expense ratio and net assets — this can be done for all funds, ESG or not.[98]

ventures and spinning off certain oil and gas projects in a separate entity, to listing a parallel vehicle on the stock market"); *see also* Joshua Macey & Jackson Salovaara, *Bankruptcy as Bailout: Coal Company Insolvency and the Erosion of Federal Law*, 71 STAN. L. REV. 879, 879 (2019); James Nani, *J&J's 'Texas Two-Step' Talc Bankruptcy Strategy Remains in Doubt*, BLOOMBERG L. (Apr. 8, 2022, 3:00 AM), https://news.bloomberglaw.com/bankruptcy-law/j-js-texas-two-step-talc-bankruptcy-strategy-remains-in-doubt [https://perma.cc/W7SV-3MYL].

[94] Ducoulombier, *supra* note 91, at 65.

[95] *Id.*

[96] *See* SIMMONS ET AL., *supra* note 78, at 7.

[97] *Id.* at 6.

[98] *Find iShares Funds*, ISHARES, https://www.ishares.com/us/products/etf-investments#/ (last visited Feb. 13, 2023) [https://perma.cc/U5AP-G6UT].

Today, many large companies report using an internal carbon price in their own risk management, procurement, and other strategies.[99] Some use it simply as a shadow price for internal tracking — asset manager Barings adds a carbon price to all business travel expenses, employees booking a flight "see an extra charge matched to the market price of the carbon."[100] Some companies actually collect the internal carbon fees from each corporate division and apply the funds to emissions reduction projects.[101] Walmart goes even further, using its emissions data and internal carbon pricing system to test how it would be affected by potential future carbon regulations.[102] The company models how carbon pricing schemes in jurisdictions covering their suppliers might be passed through to Walmart in increased costs.[103]

The past decade has seen shareholder support for climate proposals grow from single digit percentages to large majorities, with a wider range

[99] *See Nearly Half of World's Biggest Companies Factoring Cost of Carbon into Business Plans*, CDP (Apr. 21, 2021), https://www.cdp.net/en/articles/media/nearly-half-of-worlds-biggest-companies-factoring-cost-of-carbon-into-business-plans [https://perma.cc/62WY-WHLD]; Spiller, *supra* note 51 ("When we interviewed approximately 2,600 companies last year, 23[%] indicated they are already using an internal carbon charge, and another 22[%] plan to do so in the next two years.").

[100] Ross Kerber, *Barings Sets Internal Carbon Fees on Business Travel*, REUTERS (July 14, 2021, 5:58 AM PDT), https://www.reuters.com/business/sustainable-business/barings-sets-internal-carbon-fees-business-travel-2021-07-14/ [https://perma.cc/MC8X-QKQY].

[101] Including Microsoft, Audi, and SwissRe. *See* Jesse Klein, *How to Start Using an Internal Carbon Price*, GREENBIZ (June 27, 2022), https://www.greenbiz.com/article/how-start-using-internal-carbon-price [https://perma.cc/HEA3-XBW4]. Yale University implemented an internal carbon pricing scheme in 2015. ETHAN ADDICOTT, ALHASAN BADAHDAH, LUKE ELDER & WEILIANG TAN, INTERNAL CARBON PRICING: POLICY FRAMEWORK AND CASE STUDIES 13 (2019), https://cbey.yale.edu/sites/default/files/2019-09/Internal%20Carbon%20Pricing%20Report%20Feb%202019.pdf [https://perma.cc/TV7N-DPZV].

[102] WALMART, WALMART, INC. – CLIMATE CHANGE 2021, at 5 (2021), https://corporate.walmart.com/esgreport/media-library/document/cdp-climate-change-2021/_proxyDocument?id=0000017f-d222-d452-a3ff-da66867f0000 [https://perma.cc/5CVQ-VGPE] ("Walmart has established an internal energy and environment policy councils (EEPC) to assess potential new legislation/regulations and commitments within and across key markets. The policy councils include internal stakeholders from various parts of the organization (e.g., gov't affairs, legal, real estate, communications, compliance, supply chain, legal, tax and others) and meet monthly and is staffed by our Global Public Policy division.").

[103] WALMART, WALMART, INC. CDP CLIMATE CHANGE QUESTIONNAIRE 2020, at 18-19 (Sept. 30, 2020), https://corporate.walmart.com/esgreport/media-library/document/walmart-inc-cdp-climate-change-questionnaire-2020-wednesday-september-30-2020/_proxyDocument?id=0000017a-5896-de8c-a17a-7ab7a1b40000 [https://perma.cc/BC6Z-99VT].

of industries and asks prioritized each year. At the beginning of 2022, 70% of Costco shareholders supported a resolution that asked not only for disclosure of Scope 3 emissions, but also for "science-based targets" to reduce them to net zero by 2050.[104] As the Wall Street Journal observed, the overwhelming success was a signal of increased shareholder focus on corporate supply chain emissions.[105] In 2022, AutoZone, Boeing, US Foods, Caterpillar, Sysco, and Dollar Tree were among the other companies whose boards were outvoted by their shareholders on setting Scope 3 targets.[106] In addition, 2022 was a record year for the number of withdrawn climate-related proposals, which typically signals that management has reached some agreement with the shareholder proponent on the issue.[107] Kraft Heinz and Kroger both agreed to set science-based targets for their full value chain.[108] Emissions targets are also used as an incentive metric in executive compensation.[109] Utility company Xcel ties almost a quarter of its CEO's pay to emissions targets achieved by the end of 2023.[110] Shell ties yearly emissions targets to both executive bonus and long-term incentive plans.[111]

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[104] *69.9% of Costco* Shareholders Support Landmark Green Century Proposal on Climate Change*, CERES (Jan. 27, 2022), https://www.ceres.org/news-center/press-releases/699-costco-shareholders-support-landmark-green-century-proposal-climate [https://perma.cc/C4BG-U6QB].

[105] Holger, *supra* note 16; *see also* Emile Hallez, *Behind that Bombshell Shareholder Vote at Costco*, INVESTMENTNEWS (Feb. 3, 2022), https://www.investmentnews.com/costco-shareholder-vote-emissions-216778 [https://perma.cc/4LDZ-9CHT].

[106] *Record Number of Negotiated Agreements Between Investors and Companies in 2022 Proxy Season*, YAHOO! (Aug. 1, 2022), https://www.yahoo.com/now/record-number-negotiated-agreements-between-212008809.html [https://perma.cc/H5FV-AKT3] [hereinafter *Record Number of Negotiated Agreements*]; *2022 Shareholder Impact Review*, AS YOU SOW, https://www.asyousow.org/2022-shareholder-impact-review (last visited Dec. 14, 2022) [https://perma.cc/J8XY-5MQH].

[107] Virginia Harper Ho, *Risk-Related Activism: The Business Case for Monitoring Nonfinancial Risk*, 41 J. CORP. L. 647, 662, 689-90 (2016); *Record Number of Negotiated Agreements*, *supra* note 106.

[108] *Record Number of Negotiated Agreements*, *supra* note 106.

[109] DELOITTE, ROAD-TO-NET-ZERO-INCENTIVISING-LEADERSHIP 2 (2021), https://ukpages.deloitte.com/rs/676-RGI-700/images/Road-to-net-zero-incentivising-leadership-2021.pdf [https://perma.cc/6JED-8KA7].

[110] Ross Kerber, *Climate Pay Links for CEOs Do Little to Cut Emissions, Study Finds*, REUTERS (Sept. 29, 2022, 9:04 AM PDT), https://www.reuters.com/business/sustainable-business/climate-pay-links-ceos-do-little-cut-emissions-study-finds-2022-09-29/ [https://perma.cc/2E5G-WZ2C].

[111] *Executive Compensation and Climate Metrics: Could This Be the Solution We Have Been Waiting for?*, MANIFEST CLIMATE (Feb. 1, 2022), https://www.manifestclimate.com/blog/executive-compensation-and-climate-metrics/ [https://perma.cc/Q5Y7-L9ZR].

B. Limits of Scope 3

Even as opponents to the SEC's rule protest that Scope 3 is not yet ready for mandatory reporting, and climate-supportive investors similarly acknowledge data deficits, actors across assets and markets are relying on value-chain data in their decision-making. The voluntary GHG Protocol framework allows companies to report only those emissions they-themselves deem "relevant."[112] While this is accompanied by the requirement that reporting boundaries be set transparently so that it is clear which Scope 3 subcategories have been left out, this is not consistently done. This, along with a general agnosticism about methodologies and data tools means that significant discretion is left up to reporting companies. Even assuming good faith, certain decisions are necessarily methodological choices or judgment calls for accounting purposes that have not been standardized across jurisdictions or companies.

The usefulness of Scope 3 data depends upon its *use-case*, as well as its granularity and availability of other contextual data. Market participants, regulators, and other users of emissions data analyze the information for a range of purposes. And how one approaches the problem of scope boundaries, for example, likely depends on whether one cares about the corporations' *control* over emissions, its *exposure* to risk, or its *responsibility* for the harm that comes from its emissions (or attendant liabilities). This Section flags that the proliferation of Scope 3 as a blunt metric for all measures of climate progress and transition risk overlooks its lack of standardization as well as what Scope 3 on its own is capturing. In various legal and practical contexts determining "relevant" corporate emissions requires judgment calls about (1) timeframe; (2) granularity and aggregation; (3) boundaries; (4) control; and (5) tradeoffs. These are discussed in turn.

1. Timeframe

Corporate Scope 3 annual data is often taken to represent a single snapshot in time, but it can be a bizarre snapshot if not analyzed correctly. The relevance of the Scope 3 "Use of Sold Products" Category is clear if you consider oil and gas production companies and their attendant

[112] GREENHOUSE GAS PROTOCOL: A CORPORATE REPORTING AND ACCOUNTING STANDARD 30 (rev. ed. 2004), https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf [https://perma.cc/3NDK-X9EM] ("Determine which scope 3 categories are relevant. Only some types of upstream or downstream emissions categories might be relevant to the company.").

liabilities; How much of Chevron's oil was burned in 2022, or how many of its facilities may be impacted by recent tightening of methane regulation, are undoubtably questions of interest to investors.[113] But consider the case of Microsoft, a self-described corporate climate leader whose emissions had been declining for three years and yet grew sharply in 2021.[114] The spike was partially, but significantly, due to a global uptick in Xbox gaming brought on by the pandemic.[115] As explained by Wired, "the vast majority" of the life-cycle emissions of Xbox consoles come from "many thousands of hours of *Call of Duty: Warzone*" combined with gamers "plugging into a dirty electric grid."[116] From the perspective of transition risk, one could argue that it makes little sense to include customer emissions from products a company has already sold in any estimation of market exposure to climate regulation. But from the perspective of goal tracking, stewardship, and corporate risk management, attributing the emissions of quarantined Xbox gamers to Microsoft is crucial. The emissions spike prompted the company to engage in energy-saving hardware and software updates to the console.[117] The intervention is just one of a growing number taken by companies attempting to reduce lifecycle emissions at a product's design stage.[118]

Time-horizons are a challenge for integrating different sources of emissions information at the level of a company. Ideally, companies want "cradle-to-gate" product-level emissions information from their suppliers, *e.g.*, all the emissions that went into making and shipping a computer.[119]

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[113] Though not a particularly hard question to answer based on already available financial data.

[114] Lisa Stiffler, *Here's Why Microsoft's Carbon Footprint Grew 21% Last Year, as Profits Swelled*, GEEKWIRE (Mar. 10, 2022, 10:30 AM), https://www.geekwire.com/2022/heres-why-microsofts-carbon-footprint-grew-21-last-year-as-profits-swelled/ [https://perma.cc/24Y6-RSZD].

[115] MICROSOFT, 2021 ENVIRONMENTAL SUSTAINABILITY REPORT 4 (2021), https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE4RwfV [https://perma.cc/3CCQ-G3S2].

[116] Gregory Barber, *Companies May Soon Have to Reveal a Hidden Risk: Carbon Emissions*, WIRED (Mar. 29, 2022, 8:00 AM), https://www.wired.com/story/companies-may-soon-have-to-reveal-a-hidden-risk-carbon-emissions/ [https://perma.cc/RS6B-CKCY].

[117] Maria Gallucci, *How the Xbox Stands Between Microsoft and Its Climate Goals*, GRIST (Jan. 27, 2020), https://grist.org/energy/how-the-xbox-stands-between-microsoft-and-its-climate-goals/ [https://perma.cc/RRP8-W4VZ].

[118] Stephan Fuchs, Stephan Mohr, Malin Orebäck & Jan Rys, *Product Sustainability: Back to the Drawing Board*, MCKINSEY & CO. (Feb. 7, 2022), https://www.mckinsey.com/capabilities/operations/our-insights/product-sustainability-back-to-the-drawing-board [https://perma.cc/JYN3-WNEX].

[119] JIA ET AL., *supra* note 89, at 31 fig.13.

The company then discloses the embodied emissions of the purchased computer along with its own emissions from running the computer. In this example, the laptop emissions get reported in the purchasing year and in the following years only the emissions from powering the laptop get reported. However, when suppliers turn over product-level emissions data, they may have been calculated using a typical "cradle-to-grave" LCA method, that already incorporates estimations of emissions related to future use. While many versions of "double counting" in Scope 3 reporting can be considered a feature rather than a bug, this example means that the reporting company might be double counting its own laptop emissions — an accounting problem that is distinct from the laptop company and reporting company both reporting the same emissions. Companies may try to avoid this problem by getting primary from suppliers rather than product-level LCAs. However, the crucial "emissions factors" that are multiplied against spend or product data have no standard source and they can each be calculated with their own LCA judgment-calls, meaning some of these same cradle-to-gate vs. grave choices are simply embedded in the factor.[120]

Present-day Scope emissions are often used in asset-selection processes intended to screen for future transition risk, even for companies that pledge to reduce (or increase) their emissions. Investors are on the hunt for forward-looking metrics that can capture a company's (and then a portfolio's) alignment with the zero-carbon transition.[121] Emissions over time can serve as a proxy of progress, but emissions trajectories can progress unevenly through different corporate cultures and types of industries. Between two steel companies with similarly large footprints, Scope emissions alone would not differentiate that one was heavily investing in low-carbon R&D and was potentially better positioned for the transition. There are now an "exotic menagerie" of alignment metrics offered by third-party vendors, one of the most common being Implied Temperature Rise ("ITR").[122] ESG data providers like MSCI and

[120] *Id.*

[121] *See, e.g.*, GFANZ, MEASURING PORTFOLIO ALIGNMENT: ENHANCEMENT, CONVERGENCE, AND ADOPTION, at ix (2022), https://assets.bbhub.io/company/sites/63/2022/07/GFANZ-Portfolio-Alignment-Measurement-August2022.pdf [https://perma.cc/U4XQ-Y265] (finding that alignment metrics are used for "lending decisions, manager selection, investment research, portfolio construction, and underwriting decisions").

[122] *GFANZ Wants to Whip Portfolio Alignment Metrics into Shape*, MANIFEST CLIMATE (Aug. 11, 2022), https://www.manifestclimate.com/blog/gfanz-wants-to-whip-portfolio-alignment-metrics-into-shape/ [https://perma.cc/NSJ7-SBVR]. *See generally* SIMMONS ET

Bloomberg offer datasets of ITR, or their calculations of "how the projected emissions of a company, or carbon targets, translates" into expected warming levels, giving each corporation a temperature score like 3.2°C.[123] One recent analysis of sixty-nine different forward-looking climate risk metrics from nine providers found significant divergence between such scores.[124] This should be no surprise, as understanding how well any given company is going to fare in the climate-changed world is a complex undertaking, let alone constructing a methodology that applies across all companies. Approaches vary in how or whether data vendors consider the trustworthiness of corporate emissions pledges, or present-day capital expenditures in high or low-emitting investments.[125]

Alongside physical risk and transition risk is the often-overlooked climate-related financial risk of liability. A number of domestic and foreign lawsuits seek to hold fossil fuel companies responsible for the harms of their products.[126] In this case, historical emissions are likely to be far more relevant for assessing the risk than forward-looking projections, yet this metric does not appear in many financial sector uses of emissions data.

AL., *supra* note 78 (describing the landscape of corporate carbon disclosure and methodologies).

[123] *Bloomberg Releases Science-Based Implied Temperature Rise Metrics*, BLOOMBERG (Nov. 3, 2022), https://www.bloomberg.com/company/press/bloomberg-releases-science-based-implied-temperature-rise-metrics/ [https://perma.cc/NBQ5-SF8F]; *see also ESG Ratings & Climate Search Tool*, MSCI, https://www.msci.com/our-solutions/esg-investing/esg-ratings-climate-search-tool (last visited Dec. 15, 2022) [https://perma.cc/8NZW-8SDC].

[124] Julia Anna Bingler, Chiara Colesanti Senni & Pierre Monnin, *Climate Transition Risk Metrics: Understanding Convergence and Divergence Across Firms and Providers* 1 (Ctr. of Econ. Rsch. at ETH Zurich, Working Paper No. 21/363, 2021).

[125] *See generally id.* at 68-125 (discussing the Paris Agreement Capital Assessment and its basis in "asset-based investment and production plans in both high-emissions activities and low-carbon solutions"); *Please Mr. Postman! Ten Messages on Portfolio Alignment & Implied Temperature Rise* 9 (2° Inv. Initiative, Working Paper No. 2021/6, 2021) (describing how different goals are served by different metrics and the consideration involved in adopting those metrics).

[126] *See, e.g.*, *Common Law Claims — U.S. Climate Change Litigation*, CLIMATE CHANGE LITIG. DATABASES, http://climatecasechart.com/case-category/common-law-claims/ (last visited Apr. 10, 2023) [https://perma.cc/589K-5EWQ]; *Corporations — Suits Against Corporations, Individuals — Global Climate Change Litigation*, CLIMATE CHANGE LITIG. DATABASES, http://climatecasechart.com/non-us-case-category/corporations/ (last visited Apr. 10, 2023) [https://perma.cc/VY4N-QLEV] (finding 122 climate-related cases against corporations filed outside of the U.S.).

2. Granularity and Aggregation

The aggregation level of emissions data matters. The original GHG Protocol recommended that emissions data "be collected in ways that subsequently can be aggregated and disaggregated for different organizational and operational boundaries and for different business geographic scales" to assist in future compliance regimes.[127] While this recommendation for granularity and modularity exists in the Protocol, companies often fail to report their emissions with much subcategory granularity. Under present voluntary reporting standards, companies aggregate data with no way for investors to de-aggregate the subcategories of Scope 3 to investigate potential channels of transition risk exposures. There are jurisdictional differences in climate regulation: how stringently targets are set, which industries are covered, and how much support is provided for decarbonization will all affect the resilience of any carbon-intensive asset's expected value. The European Union plans to tax imports on embodied emissions of only select sectors and goods, including fertilizers, aluminum, bolts, screws, and potentially cars.[128]

High-emitting companies often issue green bonds restricted to financing a renewable project.[129] While some investors may only care about the emissions of the specific project, recent evidence suggests that the issuance of green bonds has little effect on firm-level Scope 3 emissions, even if the project itself achieves its low-emission goals.[130] This is consistent with applications of financial theory on capital fungibility that would suggest "green bonds in their economic substance remain an issuer-financing device and should not automatically be interpreted as funding

[127] GREENHOUSE GAS PROTOCOL, A CORPORATE ACCOUNTING AND REPORTING STANDARD 11 (2001).

[128] Alice Hancock & Andy Bounds, *EU Plans World's First Carbon Border Tax Despite Trade Dispute Fears*, FIN. TIMES (Dec. 13, 2022), https://www.ft.com/content/51e6bd85-dbb2-4071-b635-8ab9bd2ab95b [https://perma.cc/C452-JZFE].

[129] Torsten Ehlers, Benoît Mojon & Frank Packer, *Green Bonds and Carbon Emissions: Exploring the Case for a Rating System at the Firm Level*, 2020 BIS Q. REV. 31, 37 ("First, even if bond proceeds flow into green projects ([e.g.,] renewable energy), issuers may be (and often are) heavily engaged in carbon-intensive activities elsewhere ([e.g.,] coal power plants).").

[130] *Id.* There could be various explanations for this finding. As the authors acknowledge, "depending on the type of project that green bond proceeds are financing, the environmental benefits may appear only far in the future." *Id.* at 38 n.16. Further, as discussed throughout this article, estimated Scope 3 data, in this case generated by Trucost, should be met with a certain amount of skepticism.

specific activities."[131] Depending on an investors' objectives and level of sophistication, this may not be the outcome they were expecting to achieve. Similarly, many methods of estimating emissions or proxying for transition risk require placing a company or security in an industry class, but many multinational companies maintain businesses across industries, some with widely different emissions-intensities.[132]

As mentioned above, there is no established accounting system for synthesizing product-level and company-level emissions. Proctor and Gamble reports that their suppliers currently often share "their entire GHG footprint, not just the emissions associated with P&G purchased materials."[133] This can become problematic at the level of accounting. The life-cycle emissions of a stick of P&G deodorant should theoretically include the research and development, advertising, and other work associated with bringing the deodorant it to market.[134] Existing financial accounting rules and tax law often accommodate (or require) companies making arbitrary calls about how to attribute internal spending among different divisions, so long as the accounting is consistent and auditable.[135] The current state of GHG reporting lacks a check that all of P&G's emissions are allocated to one product or profit stream, and it is not clear that this would make sense — but the lack of standardization remains.

3. "Double Counting" and Boundary Drawing

An oft-raised objection to Scope 3 reporting, especially from the financial sector, is the concern of "double counting" of emissions.[136] A single oil well has many financial claims and contracts associated with it

[131] Sebastian Steuer & Tobias H Tröger, *The Role of Disclosure in Green Finance*, 8 J. FIN. REGUL. 1, 15 (2022) (pointing to the challenges of "ring-fencing" green bonds); *see also* EUR. COMM'N, DEVELOPMENT OF EU ECOLABEL CRITERIA FOR RETAIL FINANCIAL PRODUCTS 62 tbl.7, https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/2020-11/Draft%20Technical%20Report%203%20-%20Retail%20financial%20products.pdf [https://perma.cc/CGW9-642N].

[132] SIMMONS ET AL., *supra* note 78, at 15 fig.15.

[133] P&G, PROCTER & GAMBLE COMPANY - CLIMATE CHANGE 2021, at 47 (2021).

[134] *See* Schmidt et al., *supra* note 54, at 1223.

[135] Samuel S. Kortum & David Weisbach, *Border Adjustments for Carbon Emissions: Basic Concepts and Design* 27 (Res. for the Future, Working Paper No. 16-09, 2016).

[136] *See, e.g.*, Anant K. Sundaram, Professor at Tuck Sch. of Bus., Comment Letter on SEC's Proposed Rule Rel. No. 33-11042 on "The Enhancement and Standardization of Climate-Related Disclosures for Investors" (June 6, 2022), https://www.sec.gov/comments/s7-10-22/s71022-20130366-298241.pdf [https://perma.cc/VXR9-29N3] (arguing that requiring disclosure of Scope 3 emissions is double counting and "absurd").

— the insurer that underwrites the asset, the shareholder holding equity in the well owner, and the bank that lent money to finance the well. The emissions resulting from the well are not only part of the insurer's, bank's, and shareholder's Scope 3 emissions, but also the oil company's, and that of the car company making the vehicle that eventually runs on the oil produced. What if I own stock in the insurer and the bank in addition to the oil company? What if the insurer also owns stock in the bank and the oil company? Those emissions will be "double counted" in my own footprint.

Here, concerns over double counting intersect with issues of granularity and depend on what exactly one seeks to understand about a corporation or an asset from an emissions metric. To some, Scope 3 double counting "is a feature, not a bug."[137] It is meant to shed insight on all the various exposures throughout the economy. Without (granular) Scope 3 data, investors might miss some of the easiest-to-decarbonize parts of a company's supply chain, or some of its riskiest regulatory exposures. From a strategic angle of decarbonization, a focus on insurers, for example, may provide better leverage than other parts of the corporation's financial ecosystem — there are certainly fewer insurers underwriting oil wells than there are potential customers for oil.

But from a transition risk perspective, how potential regulation of the oil well manifests as financial risk to the bank if the oil company defaults, or as a business loss or a liability to the insurer, is not so straightforward, and certain transition risks are channel, regulation, and asset specific. Meaning, "scope" emissions, even in intensity form, can serve as only a poor proxy of transition risk without more contextual information such as sector and geography. To highlight: A trio of LCA experts writing about the challenge of allocating downstream Scope emissions ask, rhetorically, "[H]ow much does an injection pump contribute to the emissions of a passenger car during its use phase?".[138] But if your net zero investing strategy is to simply underweight the injection pump manufacturer in your portfolio, you should perhaps think more deeply about the future of the diesel engine.

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[137] Laura Corb, Kimberly Henderson, Tim Koller & Shally Venugopal, *Understanding the SEC's Proposed Climate Risk Disclosure Rule*, MCKINSEY & CO. (June 3, 2022), https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/understanding-the-secs-proposed-climate-risk-disclosure-rule [https://perma.cc/ETM2-YMY4].

[138] Schmidt et al., *supra* note 54, at 1220.

As companies increasingly make emissions reduction pledges that cover their Scope 3 emissions they are turning to offsets and other market mechanisms that put a (too low) price on their footprint. This is making abstract accounting questions over responsibility become more important. Most existing and proposed emissions disclosure regimes do not reach private companies, meaning their emissions are essentially hidden from investor accounts unless they are included in another public company's Scope reporting.[139] Emissions can disappear from books without any mitigation, simply from the sale of dirty assets to private buyers.[140] From the perspective of evaluating transition risk this may make sense, the seller is no longer exposed to that asset. But from a targets or portfolio-risk management perspective: why do we hold a car manufacture "responsible" for the eventual emissions of the car it sells, but not the oil and gas company for the eventual emissions of the sold oil field? [141]

4. Control

Many corporations protest Scope 3 reporting because they feel they should not be held responsible for emissions they cannot "control." Some academics and ESG providers readily concede that they exclude Scope 3 emissions as the firm "has no influence over them."[142] However, as demonstrated by the range of supply chain initiatives, contract provisions, and incentive programs proliferating, the total lack of corporate control over supply chain emissions is clearly false. A corporation's control over the emissions of its suppliers depends on many factors, including market power and industry type. And corporations may be able to exercise control

[139] Alperen Gözlügöl & Wolf-Georg Ringe, *Private Companies: The Missing Link on the Path to Net Zero* 5 (Eur. Corp. Governance Inst., Working Paper No. 635, 2022).

[140] *Id.* at 4; *see, e.g.*, Raval, *supra* note 93 ("Some energy analysts believe that the transfer of projects away from the oil majors does little for the environment and in fact may only boost emissions as production likely shifts to players that operate in the shadows, answer to private shareholders and make few environmental disclosures.").

[141] Investors are aware of the emissions implications of asset sales and have exercised their power to include emissions considerations in deals. *See, e.g.*, Thomas Biesheuvel, *Investors Pushed Mining Giants to Quit Coal. Now It's Backfiring*, BLOOMBERG (Nov. 8, 2021, 4:01 PM PST), https://www.bloomberg.com/news/articles/2021-11-09/investors-pushed-mining-giants-to-quit-coal-now-it-s-backfiring [https://perma.cc/8SFB-BMAZ].

[142] Angie Andrikogiannopoulou, Philipp Krueger, Shema Mitali & Filippos Papakonstantinou, Discretionary Information in ESG Investing: A Text Analysis of Mutual Fund Prospectuses 10 (Apr. 12, 2022) (unpublished manuscript) (detecting fund-level greenwashing through firm-level emissions data obtained by Refinitiv, which excludes Scope 3).

in surprising ways. For example, Unilever is investigating ways to have the ice-cream freezers they supply to retail stores run on renewable energy, even when the host store still runs on a dirty grid.[143]

In 2017, Walmart announced Project Gigaton, its ambition to cut one billion tons of supply chain emissions by 2030.[144] The company has rolled out emissions calculation tools, guidebooks on sustainable packaging and recycling, held webinars, and in-person trainings for their largest suppliers.[145] In 2019, the company announced a partnership with HSBC Bank to provide decarbonization project financing to Walmart's private brand suppliers, and in 2021 the program was expanded to all suppliers taking part in Project Gigaton.[146] Suppliers must set emissions validated by the Science Based Targets initiative ("SBTi"), and are then eligible to receive financing backed by Walmart's stronger credit — receiving lower rates for higher climate ambitions and CDP scores.[147] Participating suppliers can also receive earlier payments on their invoices.[148]

As documented by Michael Vandenbergh and Patricia Moore, many other companies have followed Walmart in encouraging their suppliers to report and reduce emissions, including through providing resources.[149] Apple was an early leader in directly funding the transition of third-party

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[143] UNILEVER, UNILEVER CLIMATE TRANSITION ACTION PLAN 27 (2021), https://assets.unilever.com/files/92ui5egz/production/bbe89d14aa9e0121dd3a2b9721bbfd3bef57b8d3.pdf/unilever-climate-transition-action-plan-19032021.pdf [https://perma.cc/DDM7-W8N7].

[144] *Project Gigaton*, WALMART, https://www.walmartsustainabilityhub.com/project-gigaton (last visited Apr. 10, 2023) [https://perma.cc/MP8F-MKU2].

[145] Dieter Holger, *Walmart Makes Progress on Emissions Target by Winning over Suppliers, CSO Says*, WALL ST. J. (Apr. 12, 2022, 12:55 PM ET), https://www.wsj.com/articles/walmart-makes-progress-on-emissions-target-by-winning-over-suppliers-cso-says-11649782501 [https://perma.cc/R9RR-Q4RL].

[146] *Walmart Creates Industry First by Introducing Science-Based Targets for Supply Chain Finance Program*, WALMART (Dec. 8, 2021), https://corporate.walmart.com/newsroom/2021/12/08/walmart-creates-industry-first-by-introducing-science-based-targets-for-supply-chain-finance-program [https://perma.cc/BZW7-BMSS] [hereinafter *Science-Based Targets*].

[147] Jesse Klein, *HSBC, Walmart Add Science-Based Targets to Supplier Financing Program*, GREENBIZ (Dec. 28, 2021), https://www.greenbiz.com/article/hsbc-walmart-add-science-based-targets-supplier-financing-program [https://perma.cc/3C6G-NAEU]; *Project Gigaton*, *supra* note 144.

[148] *Science-Based Targets*, *supra* note 146.

[149] Vandenbergh & Moore, *supra* note 24, at 27-50 (documenting that many companies, including CVS, General Motors, Lenovo, and Jujitsu, have requirements that suppliers set and make progress on emissions targets).

manufacturers based in China to renewable energy.[150] Target has committed that 80% of its suppliers will have science-based targets for their Scope 1 and 2 emissions set by 2023.[151] According to global law firm Mayer Brown, a growing number of "businesses are incorporating specific, and detailed, contractual provisions into their supply chain arrangement" governing issues of environmental sustainability, including emissions targets.[152] Salesforce added a provision to all of its procurement contracts requiring suppliers to provide "carbon neutral" products, or to purchase carbon offsets in the event of a "Climate Breach."[153] Suppliers are also required to adopt SBTi certified emissions targets.[154] In 2021, London bank Standard Chartered commissioned a survey finding that 78% of multinational companies planned to remove suppliers that "endanger their carbon transition plan by 2025" with 35% saying they already had a plan to cut current suppliers for emissions reasons.[155]

5. Tradeoffs: Scope 3 Is Systemic

The concept of the "carbon footprint," on its own, is more limited than either the original LCA or the early-90s "ecological footprint." It isolates one metric of one actor, disassociating the systemic nature of economic resource decisions. Many of the early LCAs were used to justify the switch to disposable packaging away from reusable containers at a time when companies were fighting against regulatory efforts and citizen outrage

[150] APPLE, SUPPLIER CLEAN ENERGY 2021 PROGRAM UPDATE 2 (2021), https://www.apple.com/environment/pdf/Apple_Supplier_Clean_Energy_Program_Update_2021.pdf [https://perma.cc/BWB4-RYG7].

[151] *Target Just Announced Our Most Ambitious Climate Goals Yet*, TARGET CORP. (Mar. 27, 2019), http://corporate.target.com/article/2019/03/climate-goals [https://perma.cc/6Q3C-R7PH].

[152] Brad Peterson & James Whitaker, *Implementing ESG Plans Through Supply Chain Contracts*, REUTERS (Jan. 25, 2022, 8:17 AM PST), https://www.reuters.com/legal/legalindustry/implementing-esg-plans-through-supply-chain-contracts-2022-01-25/ [https://perma.cc/8YRN-KTVQ].

[153] Makower, *supra* note 87.

[154] SALESFORCE, SUSTAINABILITY EXHIBIT 2 (2022), https://www.salesforce.com/content/dam/web/en_us/www/documents/legal/sustainability-exhibit.pdf [https://perma.cc/8NHU-R5K3].

[155] *Multinational Companies Planning to Cut Suppliers by 2025*, STANDARD CHARTERED (June 7, 2021), https://www.sc.com/en/media/press-release/carbon-dated-multinational-companies-planning-to-cut-suppliers-by-2025-for-failing-to-curb-carbon-emissions/ [https://perma.cc/N5GP-R9ZG].

over litter.[156] These studies were criticized for failing to properly account for the impacts of a product's end of life, which enables wide discretion: did the LCA assume that all plastic bottles would be recycled? Or shipped to another country's landfill?[157] Early studies showing that plastic bags are environmentally superior to reusable ones had no accounting for the cost of litter at all: what's the damage of putting two hundred plastic bags in the ocean?[158] Is that better or worse than the emissions used to produce a reusable bag?

As companies shift to decarbonizing their supply chains, these tradeoff questions are occurring with more frequency. Green technologies often rely on a more complicated set of inputs than the fossil-based ones they are replacing.[159] They can require vaster supply chains relying on more commodities. The focus on "life-cycle" emissions excludes other types of potentially relevant environmental or social impacts, like water use, or reliance on mined metals.[160] In 2021, Coca-Cola, still in the business of beverage packaging, widely advertised its breakthrough "all-plant"

[156] Hunt & Franklin, *supra* note 35, at 4-5 (describing Coca-Cola and Mobil uses of LCAs); Jeffrey L. Meikle, *Material Doubts: The Consequences of Plastic*, 2 ENVIRON. HIST. 278, 278 (1997) (documenting industry lobbying against early state anti-plastic laws); *The Litter Myth*, NPR, at 09:35 (Sept. 5, 2019, 12:01 AM ET), https://www.npr.org/transcripts/757539617 [https://perma.cc/L4RR-Z86H] (describing how corporations formed the "Keep America Beautiful" campaign to shift responsibility for disposal on individuals and weaken regulatory efforts like Vermont's 1953 ban on single-use glass bottles).

[157] A prominent example of the use of disputed LCAs for marketing was the disposable diaper fight of the early 90s. *See* Michael Specter, *Among the Earth Baby Set, Disposable Diapers Are Back*, N.Y. TIMES, Oct. 23, 1992, at A1 (displaying chart showing cloth diapers use more energy than disposable); *see also* Robert Ayres, *Life Cycle Analysis: A Critique*, 14 RES. CONSERVATION & RECYCLING 199, 200-01 (1995); *cf.* Karen Cole Huttlinger, Opinion, *Too Soon to Hail Throwaway Diaper's Victory; Saving with Cotton*, N.Y. TIMES, Nov. 9, 1992, at A (including a letter to the editor disputing the analysis).

[158] Karine Vann, *Do Life-Cycle Assessments Tell the Whole Story About Disposables and Reusables?*, GREENBIZ (Nov. 13, 2020), https://www.greenbiz.com/article/do-life-cycle-assessments-tell-whole-story-about-disposables-and-reusables [https://perma.cc/LP88-XW5E] (stating "most perplexing is how researchers will calculate what it means to put a kilogram of plastic in the ocean").

[159] INTERNATIONAL ENERGY AGENCY, THE ROLE OF CRITICAL MINERALS IN CLEAN ENERGY TRANSITIONS 33 (2022), https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/executive-summary [https://perma.cc/ED54-72DY].

[160] Dionne Searcey, Michael Forsythe & Eric Lipton, *A Power Struggle over Cobalt Rattles the Clean Energy Revolution*, N.Y. TIMES, https://www.nytimes.com/2021/11/20/world/china-congo-cobalt.html (last updated Dec. 7, 2021) [https://perma.cc/9TLM-PX4A].

bioplastic bottle years in development.[161] But the emissions impacts of bioplastics have been argued over for decades and depend on an array of unpredictable and systemic factors, including whether they end up on a fossil-powered Garbage Barge.[162]

C. Discussion

Before the passage of the Inflation Reduction Act in 2022, the U.S. Congress's last serious attempt at passing sweeping climate legislation was a cap-and-trade bill in 2010.[163] At that time, opponents to climate regulation had long bemoaned the anticipated loss of U.S. competitiveness to unregulated foreign manufacturers. In 1997, the Senate went out of its way to unanimously pass a Resolution withholding support from any climate treaty without binding commitments on developing nations, killing any expectations of Kyoto Protocol ratification.[164] Ten years later, the same concerns about "significant job loss" remained, and it was deemed politically necessary to include "competitiveness measures" in any climate law.[165] The proposed measures took various forms of "border adjustments" imposing a fee based on the "embodied emissions" of imports.[166] While border carbon adjustment mechanisms were the subject of great debate, there was relatively little discussion of just how these

[161] Mario Grimau, *An Expert View on Coca-Cola's New 100% Plant-Based Bottle*, PACKAGING EUR. (Nov. 19, 2021), https://packagingeurope.com/features/an-expert-view-on-coca-colas-new-100-plant-based-bottle/7644.article [https://perma.cc/7P8L-XFQ4].

[162] *Id.* (explaining that the LCAs of bioplastics depend very much on their end-of life impacts, i.e. is it recycled, incinerated, disposed, etc.); George Bishop, David Styles & Piet N.L. Lens, *Environmental Performance Comparison of Bioplastics and Petrochemical Plastics: A Review of Life Cycle Assessment (LCA) Methodological Decisions*, 168 RES. CONSERVATION & RECYCLING 1, 1 (2021); Molly Taft, *What You Need to Know About Bioplastics*, GIZMODO (June 1, 2022), https://gizmodo.com/what-is-bioplastic-biodegradable-plant-based-plastic-1848999921 [https://perma.cc/MPW8-BW3S].

[163] Bryan Walsh, *Why the Climate Bill Died*, TIME (July 26, 2010), https://science.time.com/2010/07/26/why-the-climate-bill-died/ [https://perma.cc/2C9Z-XBN9].

[164] "Byrd-Hagel Resolution" S. Res. 98, 105th Cong. (1997) (a resolution expressing the sense of the Senate regarding the conditions for the United States becoming a signatory to any international agreement on greenhouse gas emissions under the United Nations Framework Convention on Climate Change).

[165] *Id.*; Stephen Kyo, Bernd G. Janzen & Holly M. Smith, *Border Adjustment Measures in Proposed U.S. Climate Change Legislation – "A New Chapter in America's Leadership on Change?"*, 9 SUSTAINABLE DEV. L. & POL'Y 12, 12 (2009).

[166] Niven Winchester, *The Impact of Border Carbon Adjustments Under Alternative Producer Responses*, 94 AM. J. AGRIC. ECON. 354, 354 (2011).

embodied emissions would be calculated.[167] The few authors that considered the practical aspects of designing a border adjustment concluded that the complexity of supply chains rendered "the massive task" of calculating embedded emissions administratively infeasible.[168]

Many have argued that "outsourced emissions" highlight a problem with the country-based accounting mechanisms of the Paris Agreement.[169] The embodied emissions of U.S. imports climbed throughout the 1990s and 2000s, as Americans consumed goods manufactured and shipped from China.[170] In the early 1980s the U.S. semiconductor industry dominated the world market, but for an array of reasons — Japanese industrial policy, free trade, shareholder primary, environmental regulations, government retreat, globalization, and neoliberalism in general — between 1990 and 2021 the U.S. share of semiconductor manufacturing fell from 37% to 12%.[171] Today the largest maker of semiconductors is Taiwan

[167] *Id.* at 365 ("[P]olicy discussions do not detail how GHG emissions embodied in traded goods will be calculated."). *But see* Kortum & Weisbach, *supra* note 135, at 17 (noting that "[d]etermining the embedded emissions would be a massive task"). Some commentators suggested adopting the GHG Protocol standards, requiring disclosure and third-party certification from importers. Most approaches suggested using country and sector-level average emissions factors.

[168] Kortum & Weisbach, *supra* note 135, at 17.

[169] *See* HEINZ SCHANDL, MARINA FISCHER-KOWALSKI, JAMES WEST, STEFAN GILJUM, MONIKA DITTRICH, NINA EISENMENGER, ARNE GESCHKE, MIRKO LIEBER, HANSPETER WIELAND & ANKE SCHAFFARTZIK ET AL., GLOBAL MATERIAL FLOWS AND RESOURCE PRODUCTIVITY: ASSESSMENT REPORT FOR THE UNEP INTERNATIONAL RESOURCE PANEL 24 (2016); Glen P. Peters, Jan C. Minx, Christopher L. Weber & Ottmar Edenhofer, *Growth in Emission Transfers via International Trade from 1990 to 2008*, 108 PROC. NATL. ACAD. SCI. 8903, 8907 (2011) ("Under the IPCC accounting rules of only reporting territorial emissions, many developed countries have reported stabilized emissions. However, our results show that the global emissions associated with consumption in many developed countries have increased with a large share of the emissions originating in developing countries.").

[170] *See* Welton, *supra* note 25, at 232-33 (raising the related question of whether developing countries lose territorial accounting claims when a corporation buys the rights of a large carbon offset within its borders).

[171] Makayla Ann Masse, Reshoring the Semiconductor Industry Supply Chain: Analysis of Risks and Capabilities (May 6, 2022) (undergraduate honors thesis, Butler University). *See generally* BARRY C. LYNN, END OF THE LINE: THE RISE AND COMING FALL OF THE GLOBAL CORPORATION 177-83 (2005) (discussing the trends leading to American outsourcing manufacturing abroad, and pointing to the semiconductor industry); Clair Brown & Greg Linden, *Offshoring in the Semiconductor Industry: A Historical Perspective* (Inst. for Rsch. on Lab. & Emp., Working Paper No. 120-05), https://irle.berkeley.edu/files/2005/Offshoring-in-the-Semiconductor-Industry.pdf [https://perma.cc/PG43-KWHM] (discussing corporate offshoring in semiconductor manufacturing); Alex Williams & Hassan Khan, *A Brief History of Semiconductors: How the US Cut Costs and Lost the*

Semiconductor Manufacturing Company ("TMSC"), controlling more than 50% of the global market.[172] As chips have become more sophisticated over time they require far more complicated and energy-intensive processes to make. The machine that produces the cutting-edge chip that powers the iPhone 12 requires an order of magnitude more power to run than the previous generation of machines used to make simpler chips. Both chip consumption and per-chip emissions have grown so rapidly that in 2022 Bloomberg described the chip industry as a "potentially significant stumbling block" to achieve the world's climate targets.[173] In 2020 TMSC used 6% of Taiwan's energy, a figure projected to grow to 12.5% by 2025.[174] TMSC's largest customer is Apple, the source of more than one quarter of total revenue in 2021.

It is darkly funny that U.S. politicians were so concerned with the Kyoto Protocol's effect on manufacturing jobs in 1997 — just three years after the North American Free Trade Agreement went into force and four years before China joined the World Trade Organization. The consensus free trade policies of the 90s were working to offshore emissions along with jobs without the help of climate activists.[175] In her book, *Direct*, Kate Judge recounts the story of Crown Crafts, a baby goods brand that closed down its U.S. manufacturing facilities in the early 2000s, after decades of operation.[176] The company switched to outsourcing, having been told by their primary customer, Walmart, that "unless we supply them out of

Leading Edge, EMP. AM. (Mar. 20, 2021), https://employamerica.medium.com/a-brief-history-of-semiconductors-how-the-us-cut-costs-and-lost-the-leading-edge-c21b96707cd2 [https://perma.cc/8F28-ZDX5] (using semiconductor production to discuss economics).

[172] Eric Chang, *Taiwan's TSMC Still Accounts for More than 50% of Global Chip Market Share*, TAIWAN NEWS (Mar. 16, 2022, 4:06 PM), https://www.taiwannews.com.tw/en/news/4475221 [https://perma.cc/UU6S-BN3M]; Betty Hou & Stephen Stapczynski, *Chipmaking's Next Big Thing Guzzles as Much Power as Entire Countries*, BLOOMBERG (Aug. 25, 2022, 3:00 PM PDT), https://www.bloomberg.com/news/articles/2022-08-25/energy-efficient-computer-chips-need-lots-of-power-to-make [https://perma.cc/BG5A-UJYK].

[173] Hou & Stapczynski, *supra* note 172.

[174] *Id.*

[175] *See also* LYNN, *supra* note 171, at 37-41 (referring to 1990s economic policy); Peters et al., *supra* note 169, at 8903-07. *See generally* SCHANDL ET AL., *supra* note 169, at 24 ("The growing complexity of international supply chains, driven by globalization of the world economy, has paired with a trend whereby high-income countries tend to outsource many materials-, energy- and emissions-intensive industrial processes to other parts of the world.").

[176] KATHRYN JUDGE, DIRECT: THE RISE OF THE MIDDLEMAN ECONOMY AND THE POWER OF GOING TO THE SOURCE 81-83 (2022).

China, we couldn't do business."[177] According to Judge, Crown Craft's shift from "maker to middleman," reflects the broader change in the American economy, represented by "attenuated global supply chains" and giant corporate intermediaries.[178] In Judge's telling, Walmart's size allows it exercise power over its suppliers and push for the efficiency measures that drive offshoring. The push for efficiency simultaneously drives specialization, whereby the only way to remain competitive is to become the largest supplier of a small component of a sprawling global supply chain.[179]

But battery-dependent superchip-driven technological growth has its own significant role to play in this hyperspecialization story, whether you label it the middleman economy or supply chain capitalism.[180] Asian manufacturers and the Financial Times openly mock the U.S. plan to furl these sprawling semiconductor production networks back within its borders.[181] An iPhone sold to a consumer in Argentina was likely assembled in China using a chip packaged in Malaysia, designed in the U.S. working with a team in India, manufactured in Taiwan with equipment from the Netherlands and chemicals from Germany, under IP licensed in the UK.[182] And this is only a description of the actors in the "real economy" — none of the insurers, banks, accountants, and shareholders that support and profit off making the production network run.

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[177] *Id.* at 92; *see also* David Moberg, *How Wal-Mart Shapes the World*, AM. PROSPECT (Apr. 19, 2011), https://prospect.org/power/wal-mart-shapes-world/ [https://perma.cc/3GZQ-G25D].

[178] JUDGE, *supra* note 176, at 83-84.

[179] *See id.* at pt. 2.

[180] *Compare id.* at ii ("This book explains the rise of the 'middleman economy' — characterized by powerful middlemen and long supply chains."), *with* Anna Tsing, *Supply Chains and the Human Condition*, 21 RETHINKING MARXISM 148, 148 (2009) ("Supply chain capitalism here refers to commodity chains based on subcontracting, outsourcing, and allied arrangements in which the autonomy of component enterprises is legally established even as the enterprises are disciplined within the chain as a whole.").

[181] *See* Cheng Ting-Fang & Lauly Li, *The Resilience Myth: Fatal Flaws in the Push to Secure Chip Supply Chains*, FIN. TIMES (Aug. 4, 2022), https://www.ft.com/content/f76534bf-b501-4cbf-9a46-80be9feb670c [https://perma.cc/7APG-REC8]; Cheng Ting-Fang & Lauly Li, *TSMC Founder Chides U.S. Plan for Full Chip Supply Chain Onshore*, NIKKEI ASIA (Oct. 27, 2021, 1:57 JST), https://asia.nikkei.com/Business/Tech/Semiconductors/TSMC-founder-chides-U.S.-plan-for-full-chip-supply-chain-onshore [https://perma.cc/VS2N-U3R4].

[182] *See* ACCENTURE, HARNESSING THE POWER OF THE SEMICONDUCTOR VALUE CHAIN 17 (2022), https://www.accenture.com/_acnmedia/PDF-172/Accenture-Semiconductor-Value-Chain-Report.pdf [https://perma.cc/UZ9F-4LV3].

Roughly a decade after the failure of Waxman-Markey, border adjustments have reentered the policy sphere. The European Union's new Carbon Border Adjustment Mechanism ("CBAM") solves the problem of calculating emissions by requiring importers to calculate their own embodied emissions subject to third-party certification.[183] In September 2022, the Biden Administration unveiled a new Federal Buy Clean Initiative to establish low-carbon standards for building materials purchased by the government.[184] The Department of Transportation formed an Embodied Carbon Working Group, and the General Services Administration is in the process of rolling out procurement standards for concrete and asphalt (unambitiously aimed at the lowest 80% of emitters).[185] The Federal Buy Clean procurement plan follows in the footsteps of several recent state-level purchasing laws, most prominently California's, that rely on Environmental Product Declarations ("EPDs"), or third-party certified LCAs.[186] A growing number of jurisdictions are

[183] KPMG, NEW CARBON BORDERS CHANGE THE GAME 3 (2021), https://kpmg.com/xx/en/home/insights/2021/07/new-carbon-borders-change-the-game.html [https://perma.cc/DGW2-57B4].

[184] *FACT SHEET: Biden-Harris Administration Announces New Buy Clean Actions to Ensure American Manufacturing Leads in the 21st Century*, WHITE HOUSE (Sept. 15, 2022), https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/15/fact-sheet-biden-harris-administration-announces-new-buy-clean-actions-to-ensure-american-manufacturing-leads-in-the-21st-century/ [https://perma.cc/P2QP-FY44] [hereinafter *FACT SHEET*].

[185] LOW EMBODIED CARBON CONCRETE STANDARDS FOR ALL GSA PROJECTS (2022), https://www.gsa.gov/cdnstatic/Low%20embodied%20carbon%20concrete%20SOW%20language-Sept%202022.pdf [https://perma.cc/VB95-CDD5]. These rules rely on Environmental Product Declarations ("EPDs"), or third-party certifications based on traditional life-cycle analysis methodologies. EPDs were developed in the late 1990s to standardize LCA methodological choices by product-type, driven mostly by European interest in ecolabeling. *See, e.g.*, Raffaella Manzini, Giuliano Noci, Massimiliano Ostinelli & Emanuele Pizzurno, *Assessing Environmental Product Declaration Opportunities: A Reference Framework*, 15 BUS. STRATEGY ENV'T 118 (2006) (looking at seventeen Italian firms to see when EPDs are useful tools); *see also* MALIN BOGESKÄR, ANTHEA CARTER, CARL-OTTO NEVÉN, ROBERT NUIJ, EVA SCHMINCKE & HEIDI K. STRANDDORF, FINAL REPORT: EVALUATION OF ENVIRONMENTAL PRODUCT DECLARATION SCHEMES 13-20 (2002), https://ec.europa.eu/environment/ipp/pdf/epdstudy.pdf [https://perma.cc/8JZ2-GFUC]. The International Standards Organization works with industry groups to establish "Product Category Rules" that standardize choices like system boundaries for producing EPDs within that category. BOGESKÄR ET AL., *supra*, at 185; John Brownie, *What PCR, EPD and LCA Mean to AI*, ASPHALT MAG., http://asphaltmagazine.com/pcr-epd-lca/ (last visited Jan. 29, 2023) [https://perma.cc/VNM4-94ZA].

[186] CAL. PUB. CONT. CODE §§ 3500-05 (2022). PDs entered the United States primarily through their inclusion in the popular "green building" certification, Leadership in Energy and Environmental Design (LEED)'s product standards in the 2010s. Don Marsh, *Federal*

contemplating laws establishing low-carbon product standards, including in local zoning laws.[187] In addition to Buy Clean, the Administration proposed the Federal Supplier Climate Risks and Resilience Rule, which would require major federal government contractors to disclose "relevant" Scope 3 emissions under the GHG Protocol and to adopt emissions targets certified by SBTi.[188] Under these initiatives EPA is tasked with working with third parties to "standardize and improve" EPD guidelines — with the goal of increasing "data transparency."[189] There appears, however, to be no effort to integrate these two methods of emissions reporting, i.e., to ensure that product-level EPDs are consistent with voluntarily reported corporate-level emissions.[190] The EPA itself has data on facility and parent-level greenhouse gas emissions from an array of self-reported and monitored sources, kept in various databases.[191]

Several scholars have suggested that many of the problems related to Scope 3 can be solved through the adoption of "accrual-based" accounting, wherein emissions get added to a product as it moves down the supply chain. Business professors Robert Kaplan and Karthik Ramanna propose such an "E-Liability" system that would track and add the per-product emissions accrued at each step of the supply-chain using blockchain

Agencies Trigger a Third Flourish for Environmental Product Declarations, CONCRETE PRODS. (Mar. 14, 2022), https://concreteproducts.com/index.php/2022/03/14/federal-agencies-trigger-a-third-flourish-for-environmental-product-declarations/ [https://perma.cc/SHY2-N3BJ].

187 H.R. 21-1303, 73rd Gen. Assemb., Reg. Sess. (Colo. 2021); S. 972, 92nd Sess. (Minn. 2021); H.R. 4139A, 81st Legis. Assemb., Reg. Sess. (Or. 2022); H.R. 1080, 67th Leg., Reg. Sess. (Wash. 2021); *see also* H.R. 5092, 67th Leg., Reg. Sess. (Wash. 2021) (creating a database to track building materials for tracing emissions); AUSTIN CLIMATE EQUITY PLAN STEERING COMM., AUSTIN CLIMATE EQUITY PLAN 6 (2021) (calling for the city to reach net-zero carbon emissions by 2040); Notice of New Requirements for Concrete from Lester Spitler, Chief Procurement Officer, to Citizens of Portland (May 15, 2019) (part of Portland's Low Carbon Concrete Initiative); Memorandum from the Climate & Stability Team to Councilor Deborah Crossley (Apr. 7, 2022) (on file with the author).

188 Federal Acquisition Regulation: Disclosure of Greenhouse Gas Emissions and Climate-Related Financial Risk, 87 Fed. Reg. 68,312, 68,312 (Nov. 14, 2022) (to be codified at 48 C.F.R. pts. 1, 4, 9, 23, 52). In the first compliance year, emissions would be reported to the governments System for Award Management website, but in subsequent years contractors are expected to submit to the nonprofit CDP.

189 *FACT SHEET*, *supra* note 184.

190 While product level and corporate level emissions cannot be compared, it is worth considering which elements of all these various reporting systems can be designed as a consistency cross-check.

191 ANGELA JONES, CONGR. RSCH. SERV., IF11754, EPA'S GREENHOUSE GAS REPORTING PROGRAM 2 (2021).

technology.[192] Under this proposed framework, emissions are passed along with the product — the steel company would no longer count emissions that are transferred to a car manufacturer as its own.[193] This method would leave out downstream emissions, including from product-use, entirely, with the reasoning that companies cannot control "how their end-consumers use the products they sell. . . . Apple, for instance, cannot demand that its consumers limit iPhone and iPad usage."[194]

But the point is Apple can in fact influence consumer emissions. It *could* design features limiting what the iPhone can do if it's been charged off a dirty grid. More impactfully, it could decide that perhaps all consumer handheld phones don't need to be able to carry out machine learning using the most advanced chip. Or that it was going to embrace the "right to repair" — and prioritize making equipment that easily disassembled for fixing and recycling.[195] The plain truth is that reaching net zero emissions by 2050 will take much more than simply switching all our factories to renewables.[196] The last time chip manufacturing was dominant in the U.S. it left behind toxic waste that is still being cleaned up forty years later — there are 23 active Superfund sites in Silicon Valley alone, one right next to Apple's headquarters.[197] The ongoing waste treatment process generates a supply chain of its own — investigative reporting traced the same toxic waste, generated in the 1970s, from California, to Kentucky, to Michigan,

[192] Robert S. Kaplan & Karthik Ramanna, *Accounting for Climate Change*, HARV. BUS. REV. (Nov. 1, 2021), https://hbr.org/2021/11/accounting-for-climate-change [https://perma.cc/6N72-AWQS].

[193] *Id.*

[194] Robert S. Kaplan & Karthik Ramanna, *We Need Better Carbon Accounting. Here's How to Get There*, HARV. BUS. REV. (Apr. 12, 2021), https://hbr.org/2022/04/we-need-better-carbon-accounting-heres-how-to-get-there [https://perma.cc/K2HJ-MKSA].

[195] *See* L.V. Anderson, *How Big Tech Rewrote the Nation's First Cell Phone Repair Law*, GRIST (Feb. 8, 2023), https://grist.org/technology/right-to-repair-new-york-hochul-big-tech-lobbying-law/ [https://perma.cc/8CWY-PQGF]; Clara Hernanz Lizarraga, *How Tech Firms Are Resisting the 'Right to Repair'*, WASH. POST (Jan. 20, 2023, 11:00 AM EST), https://www.washingtonpost.com/business/how-tech-firms-are-resisting-the-right-to-repair/2023/01/19/759b0da0-97f6-11ed-a173-61e055ec24ef_story.html [https://perma.cc/XQ2K-F7C2].

[196] *See* Tick Zero, *Film 3 – Techno-Optimism*, YOUTUBE (Oct. 4, 2022), https://www.youtube.com/watch?v=WGGTDdS5Yyo [https://perma.cc/YL2D-WS2N].

[197] Evelyn Nieves, *The Superfund Sites of Silicon Valley,* N.Y. TIMES (Mar. 26, 2018), https://www.nytimes.com/2018/03/26/lens/the-superfund-sites-of-silicon-valley.html [https://perma.cc/5K77-U682]; Susanne Rust & Matt Drange, *Cleanup of Silicon Valley Superfund Site Takes Environmental Toll*, REVEAL (Mar. 17, 2014), http://revealnews.org/article/cleanup-of-silicon-valley-superfund-site-takes-environmental-toll-2/ [https://perma.cc/FKG4-W6Y2].

to Wisconsin — at each step being in treated in ways that decreased its toxicity but often increased the total volume of waste, and accumulating emissions.[198]

CONCLUSION

While the GHG Protocol acknowledges many of the above-outlined caveats, these guidelines and qualifiers can get lost in the translation of emissions information to more complex financial assessments of climate progress or exposure.[199] This fact has relevance to the SEC in its investor protection mission of combatting greenwashing, as well as to the financial regulators investigating whether banks have proper climate risk oversight. The design of a disclosure and accounting regime is subject to its own set of tradeoffs. While increasingly specific and granular emissions data would serve some uses, the utility must be weighed against the realities of what it would actually take to produce and then evaluate the information reliably. Further, no accounting system can work without more detailed standardization of the various judgment calls that must be made when allocating "responsibility," "ownership," or "liability" for something as abstract as embodied emissions. Supply chain coalitions and technologies like blockchain-accounting have the potential to solve some of the above-discussed critiques, but not all of them. And the wide adoption of these systems will take time and resources to develop. In the meantime, it may be worth asking whether allocating the emissions of a cow between the milk distributor's insurer and the slaughterhouse's bank is really the problem that needs to be solved right now.[200] We know where the worst emissions are, we just need to stop consuming, selling, investing in, and insuring them. This seems more like a governance problem than one for index tilting.

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[198] Rust & Drange, *supra* note 197.

[199] *See, e.g.*, SIMMONS ET AL., *supra* note 78 (noting that carbon emissions data is a "key input" for other portfolio analytics tools and metrics).

[200] *See* Wheelan, *supra* note 15.