

IDENTIFYING AND DISCUSSING THE CHALLENGES FOR BOARDS TO MANAGE ESG MEASURES

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Abstract

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The major research question of this paper is what are the challenges for boards of directors to help their companies manage, assess, and track performance with environmental, social, and governance (ESG) measures? There are currently no global required ESG measures, just a variety of choices that make comparisons and analyses very challenging for various stakeholders (Waygood, 2021; Buffett, 2021). This paper studies the evolution of ESG measures and provides a comprehensive review of different types of ESG measures, including voluntary measures, those required in the EU and the UK, and those with the potential to be required in the U.S. and globally. Our findings suggest that management and boards of directors may employ a measurement theory perspective to assess and apply various ESG measures for specific benchmarks, targets, and reports. Future research could investigate these board challenges with case studies or empirical studies, especially to study how various ESG measures are used.

Keywords: ESG Measures, Climate Risk Disclosures, Boards of Directors

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1. INTRODUCTION

Every major activity in sustainability is above last year's trend lines through 2021. Corporations are making more pledges to procure clean energy, financial markets are issuing more sustainable debt, and investors are putting more money into environmental, social, and governance (ESG) exchange-traded funds (ETFs). Corporate Science-Based Targets (CSBT) commitments made in conjunction with the CSBT initiative to line up with Paris Agreement targets have set an annual record in 2021. More than 590 companies have aligned their emissions trajectory with this global agreement. Financial institutions, corporations, and governments have issued more than \$100 billion of green bonds per year since 2017 with \$248 billion

already in 2021. Investors put over \$80 billion in ESG ETFs funds in 2020, and 2021 flows have more than doubled 2020's pace (Bullard, 2021a).

In an interview on May 25, 2021, Janine Dow, a senior director for sustainable finance at Fitch Ratings, one of the Big Three U.S. credit rating services, along with Moody's and Standard & Poor's, emphasized the need for valid and reliable ESG measures. He said: "Because once you size a problem, then you identify the risk and as a regulator, you can't just leave an emerging risk exposed. Regulators haven't been more explicit yet because they don't have the data to justify a clear approach" (Schwartzkopff, 2021). Similarly, Jesper Berg, the director general of the Danish Financial Supervisory Authority, said: "The issue which concerns me most right now is whether

the non-financial sector can deliver the information to the financial sector which it demands, and which will have to have given the whole disclosure and taxonomy apparatus which is being implemented. The requirements for corporations to provide data have lagged behind disclosure demands being made on banks” (Schwartzkopff, 2021).

On July 11, 2021, Venice International Conference on Climate meeting of G-20 Finance Ministers, Larry Fink, CEO of BlackRock, the world’s largest asset management firm with \$9 trillion in assets, called for reform of the International Monetary Fund, the World Bank, and national governments to make them more suited to tackle the challenge of climate change. He called for a stronger long-term climate finance plan, especially with “first-loss” guarantors, to unlock the private capital needed to fund the transition to a low carbon economy. Without such a plan, current efforts, including corporate sustainability disclosures, risked being “nothing more than window dressing” (Jessop & Jones, 2021). BlackRock has built a similar guaranteed feature into its Climate Finance Partnership, formed with France, Germany, Japan, and two philanthropies. That partnership has raised more than \$250 million to invest in carbon reduction for emerging markets (Schatzker, 2021). Fink has long pushed for the corporate sector to take the lead on climate initiatives, doing more than most to put the environment on boardroom agendas. Now he is criticizing governments and other official institutions for not pulling their weight when it comes to climate change, saying that even the world’s largest multinationals and investment firms cannot tackle this problem on their own (Sorkin, 2021b).

On July 14, 2021, at U.S. Senate Banking Committee hearing, the U.S. Federal Reserve Bank Chairman Jerome Powell suggested U.S. banks will probably be required to conduct tests to judge their vulnerability to the effects of climate change. Some European central banks are already running climate stress scenario exercises for their banks to undergo, designed to ascertain the banks’ readiness and resiliency to extreme weather events, such as the July 2021 “100-year” floods in Germany and Belgium, and other long-term effects of a warming climate. Those stress exercises test how European banks would perform under adverse economic conditions and carry regulatory consequences depending on the results, with failing institutions required to shore up their capital (Miller, 2021).

On July 13-14, 2021, at Bloomberg Sustainability Business Summit Global, various experts commented on the need for common ESG measures as benchmarks to facilitate the comparability and consistency of company performance. Herve Duteil, chief sustainability officer, America for BNP Paribas, said: “Specific key performance indicators (KPIs) are needed, such as greenhouse gas (GHG) scope 3 emissions, not just general ESG disclosures. KPIs need benchmarks, standardized by business sectors. For example, companies could choose 3 to 5 benchmarks from 15 choices, especially to avoid greenwashing” (Bloomberg, 2021). Matt Christensen, managing director of global sustainability, Allianz Global Investors, said: “For carbon metrics, benchmarks are needed for target setting and target reduction goals”

(Bloomberg, 2021). Jules Kortenhorst, CEO of Rocky Mountain Institute, a non-profit organization dedicated to sustainability issues, said: “Companies manage what is measured. Scope 3 metrics are critical for cost effective management of supply chains, especially in the short-term, for zero emission goals. A carbon accounting system is needed now” (Bloomberg, 2021). Claire O’Neill, managing director of climate, the World Business Council for Sustainable Development, said: “Get on with using good ESG metrics, don’t wait for perfect metrics” (Bloomberg, 2021). Valerie Smith, chief sustainability officer, Citigroup, said: “Climate change and sustainability are not just trends, just like the internet was not a trend. Sustainability KPIs are needed, especially for company risk assessment” (Bloomberg, 2021).

By the end of July 2021, the G-20 Environmental Ministers had been unable to reach a full agreement on the key climate goals of phasing out coal or how much to limit global warming. These divisions among the G-20 nations bode badly for the United Nations climate talks set to start on October 31 in Glasgow. Governmental leaders and diplomats have repeatedly stressed that this meeting, known as COP26, may be the last chance to set international policies that would prevent the planet from warming more than 1.5 degrees Celsius by 2050, the Paris Climate Agreement goal, which scientists say is key to staving off the worst impacts of climate change. Patricia Espinosa, head of the UN’s climate change secretariat, said: “The G-20 nations account for 80% of all global emissions. There is no path to 1.5 degrees Celsius without the G-20” (Shankleman, Wade, & Nardelli, 2021). During the COP26 conference, IFRS released the prototype climate and general sustainability disclosure requirements. The U.S. SEC’s climate disclosure proposal might adopt certain elements of these prototype requirements. “This is especially true if the SEC intends to achieve Chair Gary Gensler’s stated goal of consistent and comparable climate disclosures” (Soter, 2021).

On August 9, 2021, the Intergovernmental Panel on Climate Change (IPCC) issued its United Nations Sixth Assessment Report on global warming. The IPCC consists of 195 governments and has emerged as one of the most credible sources of climate science. IPCC members agree to the best climate science available globally before publishing their report. This new report detailed how anthropogenic greenhouse gases are causing unprecedented damage and used the strongest language yet to rebuke skepticism of the link between human activities and global warming, stating that “it is unequivocal that human influence has warmed the atmosphere, ocean, and land”. It stated that temperatures are rising more quickly than we thought and increased CO2 will have dire long-term effects. This IPCC climate change report warned that we are dangerously close to breaching the Paris Accord goals of limiting average global temperatures rise to 1.5°C, but that 1.5°C is still within reach. This report said that to limit the worst consequences of climate change, we must aim for net-zero as soon as possible, and by 2050 at the very latest, and that we need rapid short-term decarbonization efforts this decade (Cooper, 2021).

Sebastian Mernild, one of the IPCC report's co-authors, said: "We are looking into 2060, 2100. Every time we increase the global mean temperature by half a degree, then we will face a more extreme climate. That will have severe consequences for us. It will be very costly" (Marsh, Schwartzkopff, & Kishan, 2021) ESG investors are consequently questioning their own methods after this grim IPCC climate report was issued. Chris Meyer, a Praxis Mutual Funds manager, said: "The IPCC report shows the need to move faster in the short-term. It changes the calculus. We will need to have a sharper focus. This report shows that investors aren't moving quickly enough" (Marsh et al., 2021). Andy Howard, a Schroders Global manager, said: "The adoption of net zero goals hasn't yet lowered emissions as the IPCC report makes clear. This is ultimately a question of every group making significant and sustained steps to cut emissions" (Marsh et al., 2021). Christopher Kaminker, a Lombard Odier Group manager, said: "Temperature alignment metrics can be helpful in evidencing what is a fair share that a given company needs to be doing to meet the carbon budget and how exposed companies may be to value impact from the transition". However, critics of temperature metrics say there is a lack of reliable emissions data to make the computations and the metrics rely on assumptions (Marsh et al., 2021).

The major research question of this paper is what are the challenges for boards of directors to help their companies manage, assess, and track performance with ESG measures which currently represent a variety of choices. Our study speaks to the emerging literature on ESG disclosure and makes three main contributions. First, this paper provides the updated trend and phenomenon on ESG reporting, aiming to advance our understanding of this fast-growing area. Second, this paper analyzes different types of ESG measures and identifies areas for future development. Third, we synthesize and assess the key strategic issues and challenges presented by ESG disclosure. Such an effort is important to prepare companies and their boards for ESG adaptation and integration.

The structure of this paper is as follows: Section 2 reviews the literature; Section 3 discusses the methodology; Section 4 outlines the voluntary ESG measures; Section 5 reviews the ESG measures and sustainable finance standards (SFS) currently required in the EU and the UK; Section 6 presents the ESG measures which are possibly to be required; Section 7 reviews the recent development on the global climate-related pledge; and Section 8 concludes the paper.

2. LITERATURE REVIEW

ESG measures were not specifically mentioned in corporate governance papers which focused on various corporate social responsibility (CSR) topics. There were many empirical and case studies on the impact of CSR, but not specific ESG measures, on company financial performance attributes or stock market performance in the following countries: Australia, Brazil, Egypt, France, Indonesia, Italy, Iran, Japan, Malaysia, Peru, Rwanda, Saudi Arabia, South Africa, Taiwan, Thailand, the United Kingdom, and Ukraine. Concerning more general CSR studies, one

research paper found no significant relationship between CSR and financial performance in a sample of international financial intermediaries (Soana, 2011). Another study of 131 firms in developing countries over a five-year period (2008–2012) found a positive and significant relationship between CSR and accounting measures of return on assets and equity but an insignificant relationship between CSR and the market-based Tobin's Q (Hossain, Chowdhury, Evans, & Lema, 2015).

Velte (2019) found that board independence and gender diversity were positively linked with CSR reporting and these variables were more strongly related to CSR reporting in countries with a higher range of shareholder protection and higher legal enforcement strength. Fatemi, Glaum, and Kaiser (2018) found that ESG disclosure mitigates the negative effect of a firm's weaknesses and enhances the positive effect of its strengths. Yeung (2018a) found the importance of including CSR quality indicators in blockchain technology. Sariannidis, Konteos, and Giannarakis (2015) examined the relationship between the extent of CSR disclosure and its determinants in 133 companies listed in the S&P Composite 1500 Index for the year 2011. Results indicated that the company's size, greenhouse gas emissions (GHG) emissions, Dow Jones Sustainability Index, and anti-bribery policy were significantly positively associated with the extent of CSR disclosure. Lopez-Perez, Perez-Lopez, and Rodríguez-Ariza (2009) examined whether the adoption of CSR policies constituted a strategic decision that may explain investment in research and development (R&D). The sample data of 95 European corporations for the period 1998–2006 found a relation between R&D expenditures and practices of CSR. Velte (2020) did a literature review and an empirical results evaluation of the relationship between CSR and earnings management for 33 studies. Most of the studies indicated that CSR is related to decreased earnings management.

Stecyk (2017) investigated whether the licensing and policy legislation of the Alberta province, the center of Canadian oil and gas operations, and the Canadian federal government ensured compliance to reduce and prevent environmental degradation. The research found that such legislation and policies failed to ensure such compliance because these governments preferred economic gain to environmental sustainability. The author stated that a failure in the rule of law occurred because oil corporations, due to their economic impact, were treated as above the law and the bias for the corporation over the environment hindered good governance. Other papers in this journal investigated the relationship between CSR and ethics in the following countries: Egypt, Greece, Nigeria, Saudi Arabia, and South Africa, as well as with the 38 countries in the Organization for Economic Co-operation and Development (OECD) around the world plus a Talmudic perspective study. The study by Yeung (2018b) explored the use of CSR/sustainable development concepts for quality training services of blockchain content-based distribution technology.

A few recent studies extend the literature to ESG disclosure and sustainability reporting. Mari, Terzani, and Turzo (2019) investigated the impact of

religiosity on ESG disclosure at the cross-country level. They found that religiosity as a country-level determinant related to general contextual factors may improve an ESG disclosure level. Saviano, Cosimato, Cucari, and Del Prete (2019) employed the Sustainability Helix Model and analyzed the ESG disclosure of a sample of Italian listed companies. They emphasized the importance of open dialogue and shared action to enhance companies' awareness about the sustainability and ESG disclosure. Leong and Hazelton (2019) argued that mandatory disclosure is most likely to drive change when information is provided to change the institutional mix of pressures on organizations. Shima and Fung (2019) showed that a firm's voluntary disclosure is positively related to the adjustments in environmental performance after the regulatory change. Wukich (2020) examined the impact of CEO power on E disclosure. Four measures were developed to capture the diverse nature of disclosure: 1) qualitative, 2) quantitative, 3) effectiveness, and 4) effort. The empirical findings based on a sample of over 2,200 U.S. publicly traded companies suggest a non-uniform relationship between CEO power and E disclosure. Powerful CEOs tend to refrain from the most comparable outcome-based E disclosures compared to other disclosures. Walsh, Singh, and Malinsky (2021) constructed a sustainability reporting index (SRI) measure of 234 large Canadian-based companies. They found that asset size and vulnerable industries had no significant association with the level of sustainability reporting.

3. METHODOLOGY

The development of ESG disclosure is rooted in the stakeholder theory, which holds companies accountable to all stakeholders. Freeman (1984) defines a stakeholder in an organization as "any group or individual who can affect or is affected by the achievement of the organization's objectives" (p. 22), including customers, employees, suppliers, and social communities. The rise of stakeholder capitalism and the shift of stakeholders' interest toward ESG has brought ESG disclosure into the spotlight. In consequence, there is an increased focus on ESG measures.

This paper studies the framework, regulatory changes, and both the academic and institutional perspectives relevant to ESG measures and sustainable finance standards. We outline the intellectual progression of the field by reviewing the scholarly articles and industry practices. In addition, we investigated different types of ESG measures and provided a critical evaluation of the ESG evolution.

4. VOLUNTARY ESG MEASURES

Boards of directors need to become knowledgeable about climate disclosure measures. Since there is no global oversight or requirement for reporting climate disclosure measures, numerous alternatives abound in practice. In 1997, the Greenhouse Gas Protocol was launched by the World Resources Institute and the World Business Council for Sustainable Development. In 2002, the Carbon Disclosure Project (CDP) was founded as a non-for-profit international organization, based in

the United Kingdom. It supports companies and cities in disclosing their environmental impacts and aims to make environmental reporting and risk management a business norm. CDP started its annual Global Climate Change reports in 2016. In 2011, the Sustainability Accounting Standards Board (SASB) was founded and started its annual Technical Climate Bulletin analyzing industries for climate risk in 2018. In 2015, the Taskforce on Climate-Related Financial Disclosures (TCFD) was created by the Financial Stability Board, based in Basel, Switzerland. In July 2018, the Technical Expert Group (TEG) on sustainable finance was established by the European Commission (EC). In July 2020, the EC adopted the TEG's final report which had new rules setting out minimum technical requirements for the methodology of EU Paris-aligned climate benchmarks and ESG climate disclosure requirements.

In February 2021, the European Supervisory Authorities (ESAs) published new rules called the Sustainable Finance Disclosure Regulation (SFDR), to set sustainable finance standards which required asset investment managers to disclose the ESG features of their funds. In March 2021, a framework for zero net investing was announced by the Institutional Investors Group on Climate Change. All these projects have the same problem, except the SFDR. They just advocate voluntary climate disclosure metrics, leaving the possibility for greenwashing (Mackenzie, 2021b).

In the CDP Global Climate Change report, there are 14 categories, and the first two categories have major subcategories: 1) governance with subcategories of board oversight, management responsibility, and employee incentives and 2) risk and opportunities with subcategories of time horizons, management processes, risk disclosures, opportunity disclosures, business impact assessment, and financial plan assessment. In the 2018 CDP report, 6,937 companies participated and were identified by region and industry, including 118 fossil fuel companies. In this CDP report, only half of the fossil fuel companies provided any financial figures for the second category of risk and opportunities, but these companies did report a positive, aggregate benefit/cost outcome of \$116 billion (CDP, 2019).

Powerful senior executives, like Larry Fink, CEO of BlackRock, Mike Younis, Vice President of State Street, and Jim Fitterling, CEO of Dow, have recommended the use of the SASB climate disclosure measures which aim to establish industry-specific disclosure standards across environmental, social, and governance topics (Bloomberg, 2021). The SASB goal is to facilitate communication between companies and investors about financially material, decision-useful information, like the general principle guided by Peter Drucker's well-known phrase, what gets measured gets managed. Hundreds of companies around the world and across 72 industry sectors are reporting with SASB standards and over one-third are based outside the United States ("Sustainability Accounting Standards Board", n.d.). Many of these companies are very well-known, such as BlackRock, Bloomberg, Clorox, Delta, Dow, Estee Lauder, General Mills, GM, Goldman Sachs, Ford, Hewlett Packard, Intel, Intuit, Kellogg's, Lowe's, Macy's, Marriott, Medtronic, Merck,

Moody's, Morgan Stanley, Motorola, Netflix, Philip Morris, Target, Thomson Reuters, Visa, and Wells Fargo (SASB, 2021).

The SASB's 2021 Technical Climate Bulletin analyzed 72 industries and over 4,000 companies for climate and systematic risk (SASB, 2021). There are 646 companies and 243 institutional investors around the world using SASB disclosures. An industry example is included in Appendix A to illustrate eleven required SASB disclosure topics with corresponding accounting measures for the extractives and minerals processing industry.

In 2019, researchers at the University of Chicago Booth School of Business collected 2017 and 2018 data to assess the environmental and social credentials of S&P 500 companies. A major goal was to clarify the murky world of metrics used to set ESG scores, an increasingly fraught arena for investors seeking greenwashing-free data. They gathered 69 measures to assess companies' social and environmental records. The environmental data were narrowed to five items: greenhouse gases, energy, waste, water, and accidents/fines. The social data included four subcategories: diversity, safety, community engagement, and suppliers. The research was somewhat limited as only 65% of the S&P 500 companies issued CSR reports. The researchers found that companies generally received higher marks from various ESG ratings, based not on performance, but rather on the number of metrics they disclosed. The lack of full transparency across industries made it difficult to review any company's ESG ranking in context. Shirley Lu, one of the researchers, summarized: "While the number of CSR reports has been increasing, there still isn't mandatory disclosures which makes comparing companies' performance difficult" (Quinson, 2021b). Having researchers look at CSR reports for actionable data is not a successful strategy for comparable and consistent ESG analysis.

Dimensional Fund Advisors, which has \$637 billion of assets under management, has been telling clients to use ESG ratings cautiously and just treat them like buy or sell ratings on a stock. It said investors are better off working out their sustainability priorities and picking through raw data, instead of relying on the myriad of ratings that have sprung up. Joseph Chi, head of Dimensional Fund Responsible Investment, said: "Investors should be aware that the more ESG issues they seek to address, the more challenging it will be to obtain both the desired investment outcome as well as the ESG result they're seeking" (Papuc, 2021). For some investors, too much raw information and too many ESG ratings make the data hard to navigate. Sarah Shaw, a manager in the BFM Group which has \$14 billion of assets under management, said: "If there was a more standardized concise set of performance measurements or metrics that every company had to at least measure against, we'd have something as a starting point". She prefers some sort of global standard, especially since there are at least 30 ESG data providers around the world (Papuc, 2021).

In this current situation of having numerous ESG measures and rating systems, artificial intelligence (AI) has the potential to help analyze all this information until (if) a set of standardized ESG measures are developed and required. "Artificial

intelligence is a very broad term that basically covers any computational algorithm that can perform some kind of complex task", said Priya Danti, a Carnegie Mellon University professor and a co-chair of the group Climate Change AI, which brings together academic and industry experts (Rathi, 2021a). She commented that there are five broad ways to think about AI's potential climate applications (Rathi, 2021a):

- distilling data into actionable insights;
- optimizing complicated systems;
- accelerating scientific discovery;
- making climate simulations quicker;
- improving predictions.

The ESG ratings, such as those provided by Bloomberg, MSCI, and Refinitiv, measure a company's ESG performance based on voluntary disclosure and play an important role in the ESG investing ecosystem. The ratings can vary greatly from one provider to another as different methodologies might be applied to compute the ESG score. For example, the Refinitiv ESG scores are estimated based on the verifiable publicly reported data and capture over 500 company-level ESG measures across 10 main themes, including community, CSR strategy, emissions, environmental product innovation, human rights, management, product responsibility, resource use, shareholders, and workforce. To further develop this rapidly growing and promising area and refine the methodology, several key issues should be considered: "(i) ensuring relevance and consistency in reporting frameworks for ESG disclosure; (ii) opacity of the subjective elements of ESG scoring; (iii) improving alignment with materiality and performance; (iv) overcoming the market bias; (v) transparency of ESG products alignment with investors' sustainable finance objectives related to financial and social returns; and, (vi) public and regulatory engagement" (Boffo & Patalano, 2020, p. 8).

5. CURRENTLY REQUIRED ESG MEASURES AND SUSTAINABLE FINANCE STANDARDS

On February 2, 2021, the ESAs published the Sustainable Finance Disclosure Regulation, to set sustainable finance standards which required ESG features of sustainable funds to be disclosed. In the race to net-zero emissions, the European Union (EU) has a head start in setting sustainable finance standards, given many years of investor interest in the EU (ESAs, 2019). The indicators applicable to investments in investee companies are included in Appendix B and the additional climate and other environmental-related indicators are included in Appendix C.

On April 20, 2021, the European Union agreed in principle on the European Climate Law which foresees a 55% reduction in net GHG emissions by 2030, compared with 1990 levels and zero net emissions by 2050. This deal would make its climate goals legally binding and there will be new rules and standards to overhaul the entire EU economy and impact industries ranging from transport to energy production. Boards of the EU companies could use this new law to help monitor their companies' climate strategies and activities. The main elements of the EU legislative package include:

- strengthening and expanding the EU carbon market and setting more ambitious national targets in sectors not covered by the emissions cap-and-trade program;
- restoring European forests;
- increasing renewable energy and energy efficiency targets;
- further development of alternative fuels infrastructure;
- higher taxation on most polluting fuels;
- full-fledged scheme for hydrogen certification;
- measure to impose a carbon price on some imported goods or use the Carbon Border Adjustment Mechanism;
- curtailing the import of products that drive deforestation or global forest degradation (Krukowska, 2021).

In 2025, the voluntary climate-related financial disclosures of the TCFD will become mandatory in the UK. Mandates have a way of begetting more mandates, further entrenching standards, but also creating networked value from shared expertise and hopefully lower accounting costs. TCFD now has more than 2,200 companies around the world using these disclosures (Bullard, 2021b). The TCFD's four recommended topics and eleven supporting disclosures (TCFD, 2017) are included in Appendix D, using the example of BlackRock's 2020 TCFD report to elaborate on the eleven disclosures (BlackRock, 2020). BlackRock was used here as a powerful TCFD report example since it has \$9 trillion of assets under management, 70 offices in 30 countries, and clients in over 100 countries, making it far and away from the largest such firm and arguably the world's most powerful investor. For the last several years, BlackRock CEO Larry Fink has sent his annual letter, recently focused on climate issues, to all major public company CEOs. In the January 21, 2021, letter, he asked these companies "to disclose a plan for how their business model will be compatible with a net-zero economy" which he defines as limiting global warming to 2 degrees Celsius above pre-industrial average and eliminating net greenhouse gas emissions by 2050. Also, he wrote: "We expect you to disclose how this plan is incorporated into your long-term strategy and reviewed by your board of directors" (Fink, 2021).

In its 2020 TCFD report, BlackRock also provided an exhibit showing progress to date, as of December 31, 2019, with a 2014 baseline, towards select environmental sustainability targets, as of December 31, 2020, as included in Appendix E (BlackRock, 2020).

6. POSSIBLE REQUIRED ESG MEASURES

There are many different climate disclosure frameworks around the world. For climate risk analysis, a consensus and a required framework are needed for consistency and comparability. Steve Waygood, Chief Responsible Investment Officer at Aviva Investors, commented: "Voluntary compliance is insufficient. Regulations and requirements are needed for companies to comply or explain why not. TCFD established good voluntary climate disclosures and now regulators can take the next step and mandate both short-term and long-term, science-

based targets and disclosures for net-zero to avoid green wishing" (Waygood, 2021).

Required ESG measures will help alleviate this emerging problem of ESG greenwashing or green wishing. Hopefully, they could become an addition to financial accounting reports as the language of business which was noted by Warren Buffett: "I've read a lot of annual reports and seen what people can do with accounting. As I've said before, if I don't understand it, I figure it's probably because the management doesn't want me to understand it, and if the management doesn't want me to understand it, there probably is something wrong going on. I mean, people don't obfuscate with numbers, usually, without a purpose" (Buffett, 2021). And a necessary first step to advocate an increased focus on ESG initiatives is to increase ESG disclosure (McBrayer, 2018).

In a July 2021 speech, newly confirmed U.S. Securities and Exchange Commission (SEC) Chairman Gary Gensler said that he has asked SEC agency staff to consider whether climate-related disclosures should be filed in companies' Form 10-K annual reports. That would require companies to provide such disclosures that are both complete and accurate, making it easier for SEC enforcement attorneys to investigate firms or their directors for fraud concerning disclosure failures, such as greenwashing, where companies just make commitments or pledges without any substantial subsequent performance. Gensler said: "While some companies currently provide some information on climate risks, those disclosures can be inconsistent and difficult to compare. Investors today are asking for the ability to compare companies with each other. Generally, I believe it's with mandatory disclosures that investors can benefit from that consistency and comparability" (Kiernan, 2021).

The SEC regulates U.S. stock markets, the world's largest public stock markets, and is focusing upon requiring climate risk disclosures for the public companies it regulates, rather than targeting investment managers, as the EU approach has done. Sonia Barros is a law firm partner and a prior veteran employee of the SEC's Division of Corporate Finance, which reviews corporate disclosures. Based upon the SEC's deliberations, Barros has predicted the likely components of the SEC's climate risk disclosures, as shown below (Quinson, 2021c):

1. Consistent and comparable disclosures that are mandatory and decision-useful for investors.

2. A possible requirement that such details be formally included in Form 10-K, the required annual report securities filing.

3. Qualitative disclosures, such as how company leaders manage climate-related risks and opportunities and how those feed into corporate strategy.

4. Quantitative disclosures, such as metrics related to greenhouse gas emissions, financial impacts of climate change and progress towards climate-related goals. These could include:

- scope 1 emissions (produced directly by a company);
- scope 2 emissions (associated with the purchase of electricity, steam, heat, or cooling);

- though less likely, scope 3 emissions (produced by a company's supply chain and customers).

5. Disclosures supporting forward-looking commitments, such as:

- Net-zero emission commitments or other climate pledges or commitments required by jurisdictions in which companies operate.

- Possible data or metrics companies might use to inform investors about how they meet those commitments.

Also, the SEC is likely to lay out requirements for industry-specific metrics, including scenario analyses on how a business might adapt to a range of possible physical, legal, market, and economic changes. Those would include physical risks associated with climate change, as well as transition risks associated with a company's stated climate commitments, and any related legal requirements in the jurisdictions in which they operate. Concerning investment funds that market themselves as green, sustainable, or low carbon, Gensler said that the SEC is considering ways to determine what information stands behind those claims and how the SEC can ensure that the public has the information they need to understand their investment choices among these types of funds (Quinson, 2021c).

The International Organization of Securities Commissions (IOSCO) is the leading international policy forum for securities regulators and is recognized as the global standard-setter for securities regulators. The organization's membership regulates more than 95% of the world's securities markets in some 130 jurisdictions. The IOSCO Board is the governing and standard-setting body and is made up of 34 securities regulators. The IOSCO is participating in a working group chaired by the International Financial Reporting Standards (IFRS) Foundation which issued an April 2021 exposure draft for the creation of the International Sustainability Standards Board (ISSB). The ISSB would set IFRS sustainability accounting standards under the IFRS Foundation's governance. Lee White, executive director of the IFRS Foundation, explained that such IFRS sustainability standards as developed by the ISSB will be optional for companies reporting under IFRS: "As with the IFRS accounting standards (and any IOSCO regulation standards), adoption of the standards and decisions about which companies will be required to apply them will be up to jurisdictional securities authorities" (Dzinkowski, 2021).

This IFRS working group will develop technical recommendations to refine the prototype climate-related disclosure standard being facilitated by the Impact Management Project, the World Economic Forum, and Deloitte. Prototypes are being developed for both a Sustainability-Related Financial Disclosure Presentation Standard and a Climate-Related Financial Disclosure Standard. Both prototypes are developing disclosure objectives for content elements of governance, strategy, including a business model and outlook, risk management, metrics and targets, including cross-industry and industry-specific sustainability-related and climate-related financial disclosures. Cross-industry metrics include:

- Scope 1, 2, and 3 emissions, including methodologies and emission factors used;

- expenditures for low-carbon alternatives, e.g., R&D, equipment, products, or services;

- investment in low-carbon alternatives, e.g., capital equipment or assets;

- revenues/savings from investments in low-carbon alternatives. e.g., R&D, equipment, products, or services;

- description of current carbon price or range of prices used and how your organization uses an internal price on carbon;

- key metrics and targets tied to executive remuneration policies and plans (World Economic Forum, 2020).

There is an upside to ESG metrics tardiness by major organizations, such as the ISSB and the U.S. SEC., which have just recently created working groups to establish sustainability and climate-related disclosure standards. These organizations can now draw lessons from other efforts, especially the European Union, which is several years into developing and deploying wide-ranging sustainability and climate-related agenda. Since numerous ESG methodologies already exist, the ISSB and the SEC should focus on improving existing systems, rather than wasting precious time in starting from scratch and trying to develop a perfect metric system (Mackenzie, 2021c). If the SEC and other countries' jurisdictional securities regulators do require sustainability and climate-related financial measures and disclosures, all the public companies they regulate would then have to follow and report such disclosures. Standard metrics are needed as benchmarks for investors, companies, boards, and other stakeholders to assess climate and financial risk, climate performance, sustainability for current and future business operations, and possible related legal liabilities (Ramani, 2021).

On February 26, 2021, the SEC issued a bulletin to educate investors about ESG funds that laid out key questions that should be asked before investing any money. On March 4, 2021, the SEC announced the creation of a climate and ESG task force to develop initiatives to proactively identify ESG-related misconduct, such as greenwashing. The initial focus is to uncover any material gaps or misstatements in issuers' disclosure of climate risks under existing rules. Allison Herren Lee, acting chair of the SEC, said that SEC staff will evaluate the SEC's rules toward facilitating the disclosure of consistent, comparable, and reliable information as investors' demand for specifics about climate change risks, impacts, and opportunities have grown dramatically since 2010. She also embraced the IFRS/IOSCO sustainable standards initiative and emphasized the need for creating a regime that is flexible enough to keep up with the science and the markets (Quinson, 2021a; van Steenis, 2021). James Hawley, vice president at Meridian Wealth Management which has \$1.5 billion in assets, commented: "Dual materiality considers both financial and environmental/social concerns for investors and impacts both risk and return. The SEC looking at ESG corporate disclosures is a big help for systematic risk assessment with dual materiality" (Lukomnik & Hawley, 2021).

On March 15, 2021, at a Center for American Progress conference, Allison Herren Lee said: "Acting in pursuit of the public interest and acting to maximize the bottom line are complimentary.

The demand for ESG information is not being met by the current voluntary framework. Human capital, human rights, climate change — these issues are fundamental to our markets, and investors want to and can help drive sustainable solutions to these issues. Securities laws require that companies disclose material information to investors, but it is simply not true that companies do not reveal ESG information unless it is specifically mandated. One of the biggest questions is going to be what is the right mix of ESG principles and metrics? How are we going to identify what metrics make the most sense and will apply in the broadest way to help investors choose the businesses they wish to invest in?” (Sorkin, 2021a).

On June 4, 2021, the Group of Seven (G-7) nations met in London. The Finance Ministers agreed for the first time to embed climate-change considerations into their decision-making. They stopped short of the UK ambition to get G-7 firmer backing for mandatory reporting of climate risks by companies, something central bankers have said will force investors to focus on how moves to curb fossil fuel use will impact their holdings. Instead, the Finance Ministers highlighted the UK’s efforts to spur disclosure and set up taskforces on climate-related risk and nature-related financial disclosures. The goal is to shed light on the activities of companies in the hope that the information will help policy makers, green groups, and investors bring pressure to bear on executives to clean up pollution and stop harmful practices (Migliaccio & Goodman, 2021).

7. RECENT DEVELOPMENT ON CLIMATE-RELATED PLEDGE

One of the most important agreements from the November United Nations Climate Summit (COP26) in Glasgow was the Global Methane Pledge. It is a collective commitment to cut methane emissions by 30% by 2030. It was signed by 105 nations, representing more than two-thirds of the global economy, but did not include the three largest global methane emitters per the Global Methane Initiative: China (15%), Russia (11%), and India (9%). The U.S. is fourth at 8% and did sign this pledge (Rathi, 2021c).

China and the U.S. did make a three-page declaration at COP26 to work together to cut CO2 emissions for slowing global warming, focusing on decarbonization, methane emissions, and illegal deforestation. They are establishing a working group to focus on concrete measures and action in this decade. Some 43% of the world’s carbon emissions in 2019 came from China and the U.S. In contrast to the European Union, the UK, South Korea, and Canada, which have all passed pollution reduction targets into law, ambitions from China and the U.S. remain more hopes than legally binding agreements. However, what is encouraging is that there is any cooperation at all between these two countries on global warming (Fickling, 2021).

Methane traps more than 80 times the heat than the same amount of carbon dioxide does in its first two decades in the atmosphere and it degrades rapidly, meaning that actions taken now have an almost immediate cooling effect on the earth’s atmosphere. Methane, according to

the Intergovernmental Panel on Climate Change, accounts for about a quarter of all the heat trapped in the atmosphere, making methane reduction an essential component of energy sector decarbonization (Ainger & Rathi, 2021). This Global Methane Pledge covers all major methane sources: oil and gas, coal, agriculture, and waste management. Cutting methane emissions can deliver the quickest climate win and give the world the kind of help it needs to stave off the worst impacts of climate change (Rathi, 2021c).

This new Global Methane Pledge is consistent with the ESG recommendations of the following organizations, discussed in this paper, that have advocated the reduction of type 1 GHG which includes methane: the SASB disclosure measures, the EU required SFS, the UK required TCFD and the SEC climate risk disclosures. A key short-term ESG measure would be methane, due to its short-term benefits for reducing global warming. All these major ESG disclosure approaches include GHG emissions and the SASB disclosure measures specifically include the percentage of methane in scope 1 emissions. The EU SFS could be expanded to include the percentage of methane in scope 1 emissions. The UK TCFD topic of metrics and targets could be expanded to include the percentage of methane as could the SEC climate risk disclosures of GHG emissions.

Following the passage of the U.S. Clean Air Act in 1970, it became necessary to determine the amount of gas leaked by the natural gas supply chain, which led to the development of national system estimates, i.e., emission inventories, and emissions field measurements. New measurement techniques were developed, such as the high-volume dilution sampler, which was designed to quantify, rather than just detect, a leak rate. This commercial product remains one of the only devices to directly quantify the rate of a found leak (ITRC, 2018).

The recommended disclosure of the methane percentage in scope 1 emissions can be facilitated by the emerging technologies to detect methane, from parsing satellite data to deploying drones and handheld infrared cameras. Once a leak is detected from energy extraction operations, plugging it isn’t that different from high-tech plumbing. Rapid advancements in methane detection technology enable more sites to be monitored (Warren & Rathi, 2021). Also, the good news is that methane emission problems have a cost-effective solution. Cheap technologies to mitigate coal mine emissions are widely available per the climate research group Ember while oil and gas companies can often profit from methane emissions reductions by selling the corralled methane as natural gas. Tackling methane emissions from fossil fuel operations represents one of the best near-term opportunities for limiting the worse effects of climate change per the International Energy Agency (Murtaugh, 2021).

Unfortunately, this Global Methane Pledge is non-binding and doesn’t include national targets. Nations are under no obligation to cut their own methane emissions to reach the collective goal of reducing global methane emissions by at least 30% by 2030. The EU and the U.S. officials, who created the Global Methane Pledge, expect to develop more accountability with annual efforts to assess progress toward the 2030 reduction target. Mark Brownstein,

senior vice president of energy at the Environmental Defense Fund, said: “Methane measurements by private groups and the UN’s new International Methane Emissions Observatory will be critical to holding signers accountable. That will provide us with the data we need to assess whether commitments and plans result in actual emissions reductions” (Dlouhy & Ainger, 2021).

Some COP26 participants have said that this Global Methane Pledge was toothless. Similarly, the COP26 pledges or agreements to phase out fossil fuels, eliminate coal, scale up clean energy, end deforestation, and end overseas fossil fuel funding were short on specific commitments to reduce heat-trapping gases and details remained vague without specific accountability. Also, no country is legally bound by these agreements. To be legally enforceable, countries must pass their own legislation (Milligan, 2021). The Swedish climate activist, Greta Thunberg, said the COP26 meeting was “sort of turning into a greenwash festival and a P.R. campaign for business leaders and politicians. Since we are so far from what we needed, I think what would be considered a success would be if people realize what a failure this COP is” (“Tricky talks on carbon markets”, 2021; Gross, 2021).

Rather than embedding plans in legally binding agreements among countries, unenforceable commitments were being made in press conferences at COP26 (Nicholson, 2021). The final COP26 Glasgow pact included new rules on transparency for emissions reporting with climate targets but no specific required measurement methods. This Glasgow pact, like its Paris predecessor, is non-binding and nothing in the text directly compels countries to implement specific policies. There are no sanctions or penalties if countries fail to follow any of the Glasgow Climate Pact commitments (Rathi, Shankleman, & Ainger, 2021).

However, the Glasgow Climate Pact is a message to investors, executives, boards of directors, and other stakeholders that the march to net-zero is accelerating. Nick Molho, executive director of Aldersgate Group, a \$740 billion asset management company, said: “Businesses are traveling in that direction whether or not governments back up their pledges with policies” (Rathi & Marsh, 2021). Similarly, John Kerry, the U.S. special presidential envoy for climate at COP26, said: “Not only are companies ahead of government, but companies understand that their future is tied to having a stable marketplace” (Rathi & Marsh, 2021).

The same country’s accountability issues have been raised for corporate commitments or pledges. A growing list of companies — 600 and counting — are promising net-zero emissions by 2050 (Marsh & Rathi, 2021). Such net-zero emissions goals set by many public corporations were analyzed as challenges for their boards of directors. For example, the advantages of carbon inserts and the disadvantages of carbon offsets were discussed (Grove & Clouse, 2021a). A COP26 panel on carbon offsets was interrupted by Greta Thunberg as she said: “no more greenwashing” and another climate activist, Teresa Anderson, climate policy coordinator at Action Aid International, said: “Carbon offsets mean climate sabotage” (Shankleman & Ainger, 2021). Also, recent renewable energy commitments versus greenwashing were analyzed for the board of

directors’ challenges and responsibilities (Grove & Clouse, 2021b).

To help boards and other stakeholders assess such corporate commitments, the Science Based Targets initiative (SBTi) is introducing a Net-Zero Standard to provide an independent assessment of corporate net-zero target setting. Albert Pineda, co-founder and managing director of SBTi, said: “I hope it will be included in regulatory frameworks because net-zero claims should be regulated” (Marsh & Rathi, 2021). The key requirements of the Net-Zero Standard are:

1. Focus on rapid, deep emission cuts, covering a company’s entire value chain emissions, including scopes 1, 2, and 3.

2. Set near- and long-term targets, making rapid emissions cuts now, halving emissions by 2030.

3. No net-zero claims until long-term targets are met, mainly emission reductions of at least 90–95% by 2050. Only then can a company use carbon offsets.

4. Go beyond the value chain, investing to mitigate emissions outside their value chains (SBTi, 2021).

8. CONCLUSION

The major research question in this paper concerns the challenges for boards of directors in helping their companies manage, assess, and track performance with ESG measures. Currently, there are no required ESG measures, just a variety of choices that make comparisons and analyses very challenging for boards, management, and other stakeholders. If ESG measures are eventually required by national, jurisdictional securities regulatory authorities, such as the U.S. SEC, then boards would have specific benchmarks, targets, and reports to meet the challenge of managing ESG pledges and measures. Meanwhile, as momentum builds for disclosure, we encourage management and boards to get ahead of disclosure regulation and be proactive in integrating ESG into the core of their businesses. Companies with deliberate intention to create long-term sustainable value and embrace the wider demands of people and the planet are more likely to thrive in the evolving ESG landscape.

A measurement theory perspective, which focuses upon valid, reliable, and operational measurement techniques, is advocated here for use by management and boards for applying and assessing various ESG measures, as discussed in Section 4–7. It focuses upon valid and reliable measurement techniques. Validity is the quality of being logically or factually sound and likely to correspond accurately to the real world. Reliability is the overall consistency of a measure. For example, an explicit strategy with procedures for analyzing human resource measurement systems was developed into a five-step measurement model (Grove, Mock, & Ehrenreich, 1977), as shown below:

1. Identify the decision context and related measurement needs.

2. Investigate the attribute of interest and corresponding theoretical relationships.

3. Investigate existing measurement techniques for possible application.

4. Investigate emerging measurement techniques for possible application (if necessary).

5. Analyze the relevance of each applied technique in the specific decision context.

A factual level perspective for ESG and human resource measures is summarized in the middle three steps. The related decision benefits are emphasized in the last, fifth step where there is an attempt to match the purposive level measurement needs introduced in the first step with the factual level measurements developed in steps two through four. For example, management and boards of directors could use this measurement theory perspective in deciding how to use and report human resources under the new amended SEC Regulation S-K rules (Grove, Clouse, & Xu, 2021). This measurement theory perspective of validity and reliability should be used by management, boards of directors, and other stakeholders to analyze and assess ESG pledges and measures. For example, this perspective could be used to help assess the SBTi Net-Zero Standard for use by companies.

Standard ESG measures, such as the SBTi Net-Zero Standard, are needed as benchmarks and targets for companies, boards, investors, and other stakeholders to assess climate and financial risk, climate performance, and sustainability for current and future business operations. Many companies

and countries have established 2050 zero net emissions goals in accordance with the Paris Climate Agreement goal to limit global temperatures to increase by no more than 1.5°C by 2050. Many of these countries recommitted to this Paris goal at the United Nations Climate Summit: COP26 in Glasgow in November 2021. One of the most important new commitments was the Global Methane Pledge. It is a collective commitment to cut methane emissions by 30% by 2030 and was signed by 105 nations. To avoid greenwashing by both countries and companies in their various climate commitments and pledges, valid and reliable ESG measures are needed for targets and benchmarks to assess climate progress in the short, mid, and long term. Other measures to include in an ESG disclosure framework are discussed in Appendix F.

Our paper is limited to the fundamental development of ESG disclosure and measures. Future research could investigate these board challenges with case studies or empirical studies, especially to study how various ESG measures are used. Another direction is to examine the conditional nature of ESG measures by considering the institutional background and industry characteristics.

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APPENDIX A: SASB DISCLOSURE MEASURES FOR THE EXTRACTIVES AND MINERALS PROCESSING INDUSTRY

1. Greenhouse gas emissions: in metric tons, gross global scope 1 emissions, percentage methane, hydrocarbons, other combustion, and other emissions. Also, discussion of long- and short-term strategies or plans to manage scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets.

2. Air quality: in metric tons, air emissions for the following pollutants: nitrogen oxide (NOx), sulfur dioxide (SOx), volatile organic compounds (VOCs), and particulate matter.

3. Water management: in thousand cubic meters: total fresh water withdrawn; total fresh water consumed; percentage of each in regions with high or extremely high baseline water stress; volume of produced water and flowback generated: 1) discharged, 2) injected, 3) recycled; hydrocarbon content in discharged water; percentage of hydraulic fractured wells for which there is public disclosure of all fracturing fluid chemicals and where ground or surface water quality deteriorated compared to a baseline.

4. Biodiversity impacts: description of environmental management policies and practices for active sites; number and aggregate volume of hydrocarbon spills, volume in arctic, volume impacting shorelines with Environmental Sensitivity Index (ESI) highest rankings of 8-10 for shoreline damage by oil, and volume recovered in number of barrels; percentage of proved and probable reserves in or near sites with protected conservation status or endangered species habitat.

5. Security, human rights, and rights of indigenous peoples: percentage of proved and probable reserves in or near areas of conflict and in or rear indigenous land; discussion of engagement processes and due diligence practices with respect to human rights, indigenous rights, and operation in areas of conflict.

6. Community relations: discussion of process to manage risks and opportunities associated with community rights and interests; number of days and duration of non-technical delays.

7. Workforce health & safety: total recordable incident rate (hours); fatality rate, near miss frequency rate; average hours of health, safety, and emergency response training for full-time, contract, and short-service employees; discussion of management systems used to integrate a culture of safety throughout the exploration and production cycle.

8. Business ethics & transparency: percentage of proved and probable reserves in countries that have the 20 lowest rankings in Transparency International's Corruption Perception Index; description of the management system for prevention of corruption and bribery throughout the value chain.

9. Reserves valuation & capital expenditures: sensitivity of hydrocarbon reserve levels to future price projection scenarios that account for a price on carbon emissions in million barrels or million standard cubic feet; estimated carbon dioxide emissions embedded in proved hydrocarbon reserves in metric tons; amount invested in renewable energy, revenue generated by renewable energy sales in reporting currency; discussion of how price and demand for hydrocarbons and/or climate regulation influence the capital expenditure strategy for exploration, acquisition, and development of assets.

10. Management of the legal & regulatory environment: discussion of corporate positions related to government regulation and/or policy proposals that address environmental and social factors affecting the industry.

11. Critical incident risk management: process safety event rates for loss of primary containment of greater consequence (Tier 1); description of management systems used to identify and mitigate catastrophic and tail-end risks.

Source: SASB (2021).

APPENDIX B: INDICATORS FOR INVESTMENTS IN INVESTEE COMPANIES AND ADVERSE SUSTAINABILITY INDICATOR/MEASURE

1. Greenhouse gas emissions: scope 1, 2, 3, and total.
2. Carbon footprint.
3. GHG intensity of investee companies.
4. Exposure to companies active in the fossil fuel sector.
5. Share of non-renewable energy consumption and production compared to renewable energy sources, expressed as a percentage.

6. Energy consumption intensity per high impact climate sector in GWh per million EUR of revenue of investee companies, per high impact climate sector.

7. Activities negatively affecting biodiversity-sensitive areas as share of investments in investee companies with sites/operations located in or near to biodiversity-sensitive areas.

8. Emissions of water in tonnes of emissions to water generated by investee companies per million EUR invested, expressed as a weighted average.

9. Hazardous waste ratio in tonnes of hazardous waste generated by investee companies per million EUR invested, expressed as a weighted average.

10. Violations of UN Global Compact principles and Organization for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises.

11. Lack of progress and compliance mechanisms to monitor compliance with UN Global Compact principles and OECD Guidelines for Multinational Enterprises.

12. Average unadjusted gender pay gap of investee companies.

13. Board gender diversity as average ratio of female to male board members in investee companies.

14. Exposure to controversial weapons (anti-personnel mines, cluster munitions, chemical weapons and biological weapons); share of investments in investee companies involved in the manufacture or selling of controversial weapons.

15. GHG intensity of investee companies.

16. Investee companies subject to social violations (absolute number and relative number divided by all investee countries), as referred to in international treaties and conventions, UN principles and, where applicable, national law.

17. Exposure to fossil fuels through real estate assets as share of investments in real estate assets involved in the extraction, storage, transport, or manufacture of fossil fuels.

18. Exposure to energy-inefficient real estate assets as share of investments in such assets.

Source: ESAs (2019).

APPENDIX C: ADDITIONAL CLIMATE AND OTHER ENVIRONMENTAL-RELATED INDICATORS/MEASURES. ADVERSE SUSTAINABILITY IMPACT: QUALITATIVE OR QUANTITATIVE

1. Emissions of inorganic pollutants as tonnes of inorganic pollutants per million EUR invested, expressed as a weighted average.

2. Emissions of air pollutants as tonnes of air pollutants equivalent per million EUR invested, expressed as a weighted average.

3. Emissions of ozone depletion substances as tonnes of ozone depletion substances equivalent per million EUR invested, expressed as a weighted average.

4. Investments in companies without carbon emission reduction initiatives as share of investments in investee companies without carbon emission reduction initiatives aimed at aligning with the Paris Agreement.

5. Breakdown of energy consumption by type of non-renewable sources of energy as share of energy from non-renewable sources used by investee companies broken down by each non-renewable energy source.

6. Water usage and recycling as 1) average amount of water consumed and reclaimed by the investee companies (in cubic meters) per million EUR of revenue of investee companies, 2) weighted average percentage of water recycled and reused by investee companies.

7. Share of investments in investee companies without water management policies.

8. Exposure to areas of high-water stress as share of investments in investee companies without water management policies.

9. Share of investments in investee companies producing chemicals which fall under Division 20.2 of Annex 1 to Regulation (EC) No. 1893/2006.

10. Share of investments in investee companies the activities of which cause land degradation, desertification, or soil sealing.

11. Share of investments in investee companies without sustainable land/agriculture practices or policies.

12. Share of investments in investee companies without sustainable oceans/seas practices or policies.

13. Non-recycled waste ratio as tonnes of non-recycled waste generated by investee companies per million EUR invested, expressed as a weighted average.

14. Natural species and protected areas as 1) share of investments in investee companies whose operations affect threatened species, 2) share of investments in investee companies without a biodiversity protection policy covering operational sites owned, leased, managed in, or adjacent to, a protected area or an area of high biodiversity value outside protected areas.

15. Deforestation as share of investment in companies without a policy to address deforestation.

16. Share of securities in investments not certified as green under the future EU legal act setting up the EU Green Bond Standard.

17. Share of bonds not certified as green under the future EU legal act setting up the EU Green Bond Standard.

18. Scope 1, 2, 3, and total GHG emissions generated by real estate assets.

19. Energy consumption in GWh of owner real estate assets per square meter.

20. Share of real estate assets not equipped with facilities for waste sorting and not covered by a waste recovery or recycling contract.

21. Share of raw building materials (excluding recovered, recycled and bio-sourced) compared to the total weight of building materials used in new construction and major renovations.

22. Share of non-vegetated surface area (surfaces that have not been vegetated in ground, as well as on roofs, terraces, and walls) compared to the total surface area of the plots of all assets.

Source: ESAs (2019).

APPENDIX D: TCFD 4 RECOMMENDED TOPICS AND 11 SUPPORTING DISCLOSURES: EXAMPLES FROM BLACKROCK TCFD REPORT

Governance: Disclose the organization's governance around climate-related risks and opportunities:

1. Describe the board's oversight of climate-related risks and opportunities:

- oversight of long-term strategy (including sustainability) by BlackRock's board of directors (the board);
- board risk committee assists the board in overseeing, identifying, and reviewing risks that could have a material impact on BlackRock, including ESG risks;

- board nominating & governance committee oversees investment stewardship and corporate sustainability.

2. Describe management's role in assessing and managing climate-related risks and opportunities:

- global executive committee (GEC) is actively involved in setting and executing on sustainability strategy;

- GEC investment sub-committee oversees the firm's investment processes including ESG integration.

Strategy: Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material:

3. Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term:

- opportunities: increased demand for sustainable investment products and Aladdin (end-to-end portfolio management), operating efficiencies;

- risks: market, regulatory, and reputational risks, as well as physical risks.

4. Describe the impact of climate-related risks and opportunities on the organization's business, strategy, and financial planning:

- Management of climate-related risks and opportunities is embedded across investment processes, business strategy, and operations.

5. Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2 degree Celsius or lower scenario:

- BlackRock conducted its first corporate climate-related scenario analysis exercise in 2020 in order to refine our understanding of the potential implications of climate-related transition risks to our business strategy.

Risk management: Disclose how the organization identifies, assesses, and manages climate-related risks:

6. Describe the organization's processes for identifying and assessing climate-related risk.

7. Describe the organization's processes for managing climate-related risks.

8. Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management (combined for supporting disclosures numbers 6-8):

- BlackRock employs a three-lines of defense approach to managing risks, including climate-related risks. For risks in client portfolios, investment teams are the primary risk owners, or first line of defense. BlackRock's risk management team, Risk & Quantitative Analysis (RQA), serves as a key part of the second line of defense. Internal Audit objectively assesses the adequacy and effectiveness of BlackRock's internal control environment as the third line of defense. RQA evaluates material ESG risks, including climate risk, during its regular reviews with portfolio managers to provide oversight of portfolio managers' consideration of these risks in their investment processes. This helps to ensure that such are understood, deliberate, and consistent with client objectives. BlackRock Sustainable Investing (BSI) partners with RQA to monitor and review ESG risk exposure at the portfolio level, providing rigor and consistency across our diverse investment platform, while seeking to ensure that risk-taking is deliberate, diversified, scaled, and in line with clients' objectives. ESG risks are evaluated in operational processes, including considering ESG risks in risk and control self-assessments, product development, and incident management. Risks associated with ESG investment and operational processes are presented in risk profiles shared with risk oversight committees.

Metrics and targets: Disclose the metrics used by the organization to assess climate-related risks and opportunities:

9. Disclose the measures used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process:

- BlackRock reports three main categories of metrics: business indicators, corporate GHG emissions, and product-level carbon footprint measures. As of November 2020, 100% of active portfolios and advisory strategies are ESG integrated meaning that portfolio managers are accountable for managing exposure to material ESG risks and documenting where in the investment process these risks are considered. ESG integration statements for our actively managed retail funds are published on product websites.

10. Disclose scope 1, scope 2, and, if appropriate, scope 3 greenhouse gas (GHG) emissions, and the related risks:

- We report scope 1, 2, and 3 emissions, where possible. We obtain third-party verification for our scopes 1 and 2 emissions, as well as for our scope 3 business travel, employee shuttles, Federal Emergency Relief Administration (FERA), and waste emissions data and collection process. As of October 2020, we are publicly reporting weighted-average carbon intensity for funds totaling \$2.1 trillion in assets under management (AUM), representing 76% of BlackRock's publicly offered funds (including ETFs and mutual funds). For separate account clients, we make this data available directly to the client upon request.

11. Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets:

- In January 2020, BlackRock announced commitments to establish sustainability as BlackRock's new standard for investing centered around three themes: 1) building sustainable, resilient, and transparent portfolios, 2) increasing access to sustainable investing, and 3) enhancing sustainability and transparency in investment stewardship.

Source: BlackRock (2020).

APPENDIX E: BLACKROCK PROGRESS TOWARDS SELECT ENVIRONMENTAL SUSTAINABILITY TARGETS**Table 1.** Environmental targets

<i>Category</i>	<i>Description</i>	<i>Progress</i>	<i>Target</i>
Emissions	Reduce facility location based GHG emissions (electricity, stationary combustion, and refrigerants) per full-time employee	44%	45%
Renewable energy	Match same amount of renewable electricity (in MWh) as the electricity that our global operations, including data centers, consume annually	100%	100%
Electricity	Reduce absolute global electricity consumption	1%	18%
Air travel	Reduce air travel per employee	21%	20%
Paper	Reduce global paper consumption	44%	25%
Waste	Increase global waste diversion from landfill	48%	75%

Source: BlackRock (2020).

APPENDIX F: ADDITIONAL POSSIBILITIES FOR ESG MEASURES

Commenters have argued that the ESA SFDR for investment managers is too onerous of a reporting obligation and that the EU taxonomy regulation, established to help market participants classify and describe environmentally sustainable activities, is “593 pages of green tape”. The EU is stubbornly striving to agree on a one-size-fits-all solution. The EU still has not agreed on the list of categories and definitions of what is green and what is not — known as the green taxonomy — that is supposed to underpin that effort to become a global standard. Instead, the EU should prioritize improving company climate-related disclosures by building on existing frameworks, not by creating new regulations. High-quality, comparable data that allows investors, consumers, pressure groups, regulators, and other stakeholders to assess risks and hold companies to account is a powerful tool (van Steenis, 2021).

Opposing commentators have argued that such criticisms misunderstand the purpose of the EU’s sustainable finance disclosure and taxonomy regulations. This purpose is to set a very high bar, based on what scientists have worked out is needed to avoid the worst effects of climate change. Instead of assessing sectors or companies as they are now, the SFDR identifies, at a granular level, what forms of activities, such as energy generation, building construction, and manufacturing will lead to a safer planet. The related measures can apply to all public reporting companies, not just to investee companies. This focus sets it apart from other frameworks, which seek to identify risks arising from climate change, such as the TCFD and SASB efforts and commercial sustainability ratings systems. These other ESG reporting approaches all seek to make incremental improvements to finance and industry as they currently are, rather than benchmarking them against where they should be if the world is to keep temperatures from rising more than 1.5 degrees Celsius from pre-industrial levels. It is “hardly surprising” that only a small fraction of today’s economic activities would pass a rigorous, science-based assessment for climate safety and sustainability (Mackenzie, 2021a).

This “hardly surprising” conclusion is supported by the August 9, 2021, United Nations Sixth Assessment Report on global warming by the Intergovernmental Panel on Climate Change (IPCC, 2021). This IPCC report stated that to limit the worst consequences of climate change, we must aim for net-zero emissions as soon as possible, and by 2050 at the very latest, and that we need rapid short-term decarbonization efforts this decade. To reach this net-zero goal with short-term efforts, there is a need for high-quality, comparable data which emphasizes the relevance of valid and reliable ESG measures.

This need for valid and reliable ESG measures has also been emphasized by the following two research studies that used artificial intelligence to investigate companies’ possible greenwashing, which encompasses everything from slightly disingenuous claims of being environmentally friendly to outright falsehoods. One study by University College Dublin researchers (Kishan, 2021) found the following likelihoods of greenwashing by companies in the following industries: 95% by the telecommunications and media business sectors, 80% by the industrials, materials, and consumer discretionary sectors but less than 50% by the energy sector. A second study by researchers at the University of Zurich and the University of Erlangen analyzed corporate disclosures of climate risk, such as those recommended by the TCFD, to see if companies were cherry-picking information they report. The researchers said their AI model: “comes to the sobering conclusion that the firms’ TCFD support is mostly cheap talk. From our analysis, we conclude that the only way out of this dilemma is to turn voluntary reporting into regulatory disclosures” (Kishan, 2021).

Investors and other stakeholders could defer to the joint IFRS/IOSCO working group to create sustainability and climate reporting standards when (if) it establishes them. If such standards are then required by national, jurisdictional securities regulatory authorities, 95% of the global public companies would have to follow such standards. The U.S. SEC is endorsing this IFRS/IOSCO effort. An initiative for a system-wide solution is also being considered by the European Financial Reporting Authority Group. Another major benefit would be the reduction of compliance costs. The International Federation of Accountants has estimated that the current fragmented regulations and divergent reporting ecosystems result in compliance costs of \$780 billion annually to the financial sector alone. Technology can accelerate such convergence with accessible machine-readable information, capable of rapid automatic updates. Technology can create the infrastructure to enable comparison, convergence, and better measurement of ESG performance measures, especially since 90% of the S&P 500 public companies reported some form of an ESG report in 2019, an all-time high (Littan, Watson, & Kaleta-Schraa, 2021).

By just mid-year 2021, multi-billion-dollar investments in both climate funds and in climate tech companies had set records for such annual investments. The challenge is how to create value for both companies and investors. The value of networks was advocated six years ago by venture capital investor

Chris Dixon: “A tool helps get critical mass. The network creates the long-term value for users and defensibility for the company” (Bullard, 2021b). The tool here is ESG measures and the value of expanding from tool to network comes from standardization and simplification of complex ESG methods to measure and manage risk. There are many ways to measure climate risk and many companies are using different ways to do so. However, the utility of such ESG methods and measures is uncertain if they are effectively competing. These ESG tools are not very useful unless they are really being a network (Bullard, 2021b).

An innovative number to possibly include in ESC measures and disclosures is the “carbon take-back obligation” (CTBO), developed by researchers at the University of Oxford. Companies that extract fossil fuels should be responsible for ensuring the same amount of CO₂ generated from using them is buried back deep underground. CTBO would be based on the principle that carbon removed from the geosphere should be returned to where it came from and remain there for thousands of years, using carbon-capture technology. CTBO is much more expensive than buying cheap carbon offsets but could be started on a small scale. Margriet Kuijper, an independent carbon management consultant, observed: “It’s a little bit like a carbon tax but more firmly backed by science. Carbon tax is when a polluter pays to pollute, whereas this is about making a polluter pay to clean up” (Rathi, 2021b).

Another innovative number to consider for ESG measures and disclosures is the social cost of carbon (SCC). As Michael Greenstone, the former chief economist of the U.S. Council of Economic Advisors, said: “This SCC number is the most important number you’ve never heard of” (Coy, 2021). The SCC is the sum of all climate damages caused by an additional ton of CO₂ emitted right now in today’s dollars. The dollar value for every ton of CO₂ avoided is the SCC (Wagner, 2021). The SCC has been used in cost-benefit analyses to inform climate policy. It puts a monetary value on the harms of climate change, by tallying all future damages incurred globally from the emission of one ton of carbon dioxide now. The Obama administration used a 3% discount rate to compute a SCC of \$50 per ton of CO₂ to set many policies from energy-efficient standards for refrigerators and fuel efficiency standards for cars to emissions targets for power plants. The Trump administration limited climate damages to just within the U.S. and used a higher 7% discount rate. Those changes slashed the SCC to \$4 per ton of CO₂, which was too low to influence climate policy. Climate economists viewed those steps as illegitimate and generally favor discount rates of 1% to 3% (Wagner et al., 2021).

An evolving U.S. climate change approach is to consider the SCC in every rule, regulation, and policy. The UK, Germany, Canada, and other countries have been incorporating SCC measures into their climate laws. The U.S. has an Interagency Working Group to determine a current SCC number. Plenty of scientific and economic judgements need to be made. A major challenge is how to deal with endemic uncertainties, including sudden and irreversible tipping points and the SCC is an essential and clarifying metric (Wagner et al., 2021).

Better costs are needed for surprises, especially major climate tipping points, to reappraise climate risks. Tipping points in the climate system are a principal reason for concern about climate change. An Oxford Martin School research study (Dietz, Rising, Stoerk, & Wagner, 2021) synthesized this emerging economic literature and provided estimates of the economic impacts of climate tipping points, using a meta-analysis integrated assessment model. Their model included national-level climate damages from rising temperatures and sea levels for 180 countries. Collectively, climate tipping points increased the SCC by 25% in the main specification. However, the model estimated a 10% probability of climate tipping points more than doubling the SCC. The model showed that tipping points increased economic losses almost everywhere. Among the eight major tipping points, the largest effects were thawing permafrost (8.4%) and ocean methane hydrates (13.1%). Expected SCCs were computed over 10,000 Monte Carlo simulations. The SCCs in 2020 US dollars and the related percentage increases, due to the eight tipping points, individually and collectively (24.5%), are shown below.

Table 2. Tipping points

<i>Tipping point (TP)</i>	<i>Expected SCC (US\$/ton CO₂)</i>	<i>Increase due (to TP, %)</i>
None	52.03	0
Permafrost carbon feedback	56.41	8.4
Ocean methane hydrates	58.85	13.1
Arctic sea ice/surface albedo feedback	51.14	-1.7
Amazon dieback	52.87	0.1
Greenland ice sheet	52.97	1.8
West Antarctic ice sheet	53.57	2.9
Atlantic meridional overturning circulation	51.28	-1.4
Indian summer monsoon	52.70	1.3
All TPs	64.80	24.5