



# MCSC Corporate Climate Finance Primer

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## Executive Summary

This corporate climate finance primer reviews MIT Climate and Sustainability Consortium (MCSC) climate finance work and provides context for current MCSC research. The primer provides context for a range of corporate climate finance decision-making and their financial and organizational implications. The main body of this primer is divided into context, bottlenecks, research questions and relevant MIT research that address the categories of corporate climate and sustainability disclosures, debt capital markets, equities, renewable energy certificates, and carbon credits.

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## Introduction

As a label, climate finance developed from a history of global climate diplomacy, multilateral development bank mechanisms, and private sector initiatives (Climate Policy Initiative 2021; UNFCCC 2015). At its core, climate finance refers to investment and financial products connected with infrastructure projects deemed climate solutions. These projects range from public transportation and water infrastructure to renewable energy and energy-efficient buildings. Climate finance falls under sustainable finance as labelled finance towards environmental benefits more broadly. Climate finance was first introduced around the 2000s for climate change solutions financing, primarily in the development sector (Stewart, Kingsbury, and Rudyk 2009). The term was refined and popularized by the 2015 Paris Agreement (UNFCCC 2015).

Article 2.1(c) of the Paris Agreement emphasizes the requirement to make “finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development” (UNFCCC 2015). Climate finance has become a central component of expanding several discourses and labeling projects around financing for purposes beyond financial return. The term mixes frequently with discussions of impact investing, sustainable finance, environmental, social, governance (ESG) and social finance, each with specific historical development trajectories (Eccles and Stroehle 2018).

The growth of climate finance markets has been a collaborative undertaking between public, private, and civil society entities (Kidney et al. 2015; Tripathy, Mok, and House 2020). The growth of financial markets labeled towards climate change action represents a furthering public policies through financial markets (Cerrato and Ferrando 2020; Tripathy 2022). By 2030, climate finance must increase by 590% to USD 4.35 trillion annually to meet climate adaptation and mitigation objectives (Climate Policy Initiative 2021). This is aligned with the current gap in financing to meet the Sustainable Development Goals (SDGs). As highlighted by researchers at the World Economic Forum, “if the 2030 deadline is to be met, more than \$30 trillion of additional investment must be found over the next eight years” (Zhan et al. 2023). Covering this gap requires both private and public investment to be geared towards climate and sustainability solutions.

Despite momentum in the growth of climate finance, many critical bottlenecks still prohibit financial markets from supporting corporate climate action at scale. Many of the gains made by the growth of climate finance labeling and data clarity in financial markets might be getting stuck in financial markets rather than ending up in the balance sheets of corporations to support their core business efforts towards climate alignment. This is a crucial concern if climate finance markets incentivize corporates to support climate action.

## Climate Finance at the MCSC

Since 2022, the MCSC has collaborated on climate finance with our member companies. There are a number of crucial corporate decision-making areas relevant to particular climate finance instruments and markets for equities, debt, and other forms of investment. In this primer, we outline this range and show how these different dimensions of corporate finance relate to each other to support corporate action on climate change.

[Climate finance](#) is a crosscutting theme at the MCSC that addresses financing bottlenecks in relevant pathways. For instance, member companies working on the carbon capture and storage (CCS) and nature-based solutions (NBS) MCSC pathways have highlighted financing gaps for these forms of climate action. The Intergovernmental Panel on Climate Change estimates that NBS could deliver one-third of the emissions reductions required by 2030 (Harrison, Partridge, and Tripathy 2020). Nevertheless, NBS receives only 3% of global climate finance annually for mitigation. Direct air capture CCS technologies often require nearly USD 1 billion to deploy even mature technologies. Voluntary carbon markets (VCM) are one avenue of climate finance that could provide needed financing toward CCS and NBS. To this end, MCSC climate finance work focused on analyzing VCM over 2022-2023. In 2023, we published the topic brief, [Establishing CO2 as an Asset Class in Voluntary Carbon Markets](#), out of a fall 2022 study group discussion hosted by Impact Fellow Sydney Sroka with Professors Janelle Knox-Hayes, Roberto Rigobon and Beatriz Roa of BBVA.

In June 2023 there was a climate finance outcome workshop involving IBM, BBVA, Liberty Mutual, and MIT researchers (Tripathy, Sroka, and Junor 2023). These discussions culminated in the white paper [Carbon Credits and Credibility](#) with BBVA and IBM on how to improve carbon credit transparency and assessment through the integration of geospatial and artificial intelligence (AI) tools in 2023 (Coleman et al. 2023). At the [MCSC's November 2023 meetings](#), a panel of MIT Sloan researchers with commentary from Jonah Smith, IBM vice president of ESG Strategy, addressed the impact of behavioral dynamics and data asymmetries in sustainable and climate finance.

Beyond VCM, MCSC climate finance research has now focused on corporate sustainability and climate disclosures. Making sure that market-driven corporate climate and sustainability disclosures and climate finance instrument impact reporting are transparent and comparable in measurement forms is critical for financial markets to incentivize legitimate corporate climate action. MCSC member companies employ sustainability and environmental, social, and governance (ESG) analysts to supply and clarify information for ESG rating agencies active in financial markets. This is a high cost to members, yet this work's financial or operational return is often uncertain (Berchicci and King 2022).

The Corporates and Climates qualitative research project between the MCSC and the [MIT Sloan Aggregate Confusion Project](#) (ACP) began in Fall 2023 and centers on gathering perspectives across MCSC members on the evolution of their sustainability and climate reporting towards

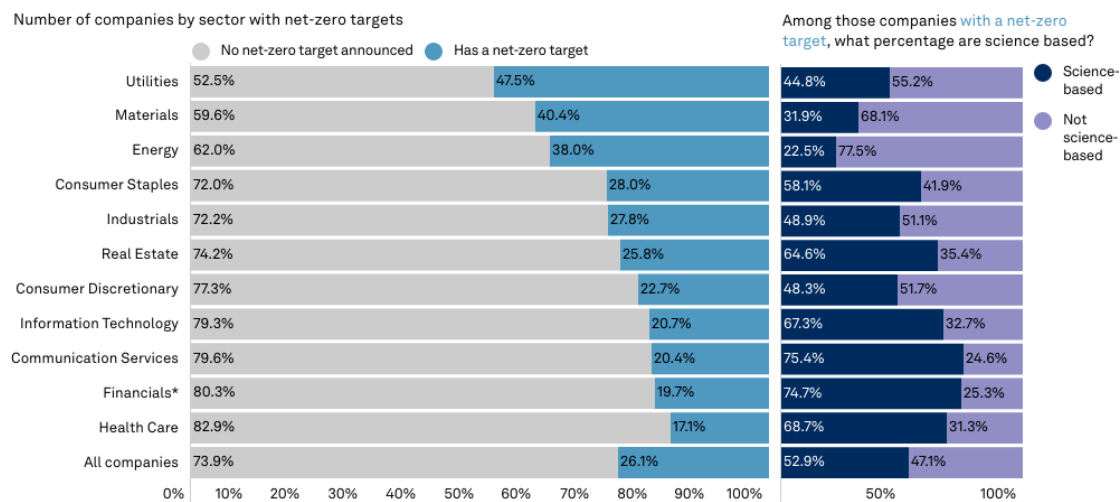
financial markets as well as how they utilize climate finance instruments to support transition and decarbonization activities. Climate finance instruments and markets have been one source of incentives for corporations to disclose more detailed assessments of the climate and sustainability impacts of corporate activity (Park et al. 2023).

## Corporate Climate and Sustainability Disclosures

### Context

Corporate climate and sustainability disclosures and targets are vital points through which climate scientific expertise can be translated into the production of data and standards that the financial industry can use to shift capital at scale, as well as allow policymakers to evaluate the allocation of finance to meet the goals of the Paris Agreement. Current academic research on corporate climate finance centers on the implications of company climate and sustainability disclosures, net zero targets and emissions goals (Bolton and Kacperczyk 2022). However, there is a lack of research that connects decision-making from these goals directly to shifting the pillars of corporate finance. A climate goal such as a net-zero target is often the starting point for corporations to act on climate and sustainability, ultimately leading to a range of decision-making that can impact corporate financing (Jamison, Ollagnier, and Bermúdez-Neubauer 2023).

### Net-zero targets are still rare among major companies



Data as of Jan. 25, 2023.  
 Results based on responses from 6,416 companies assessed in the 2022 S&P Global Corporate Sustainability Assessment.  
 Company responses counted as "science-based" include validation by the Science-Based Targets Initiative, or SBTi; a public commitment to seek SBTi validation; independent third-party verification by an organization other than the SBTi; and a company's affirmation that it considers its target to be science based. According to the SBTi, targets are considered "science based" if they are in line with what the latest climate science deems necessary to limit global warming to well below 2 degrees C above preindustrial levels and pursuing efforts to limit warming to 1.5 degrees C.  
 \*Assessments for companies in the Financials sector asked if they have set net-zero targets for their Scope 3 financed emissions.  
 Source: S&P Global Sustainable1



Figure 1: Percentage of Companies with Net-Zero Targets Across Sectors (Sourced from S&P Global Sustainable1).

A range of civil society organizations have put forward frameworks and guidelines for impactful corporate climate and sustainability disclosures. These include the Global Reporting Initiative (GRI), which provides templates for corporate disclosures, as well as CDP (formerly the Carbon Disclosure Project). The CDP incentivized corporations to disclose climate and sustainability impacts by issuing company ratings based on information provided. Alongside GRI and CDP, the Sustainability Accounting Standards Board (SASB) was formed in 2011 to tie ESG metrics and evaluations with financial materiality and disclosure (Lydenberg, Rogers, and Wood 2010; Tripathy, Wood, and Ferry 2024).

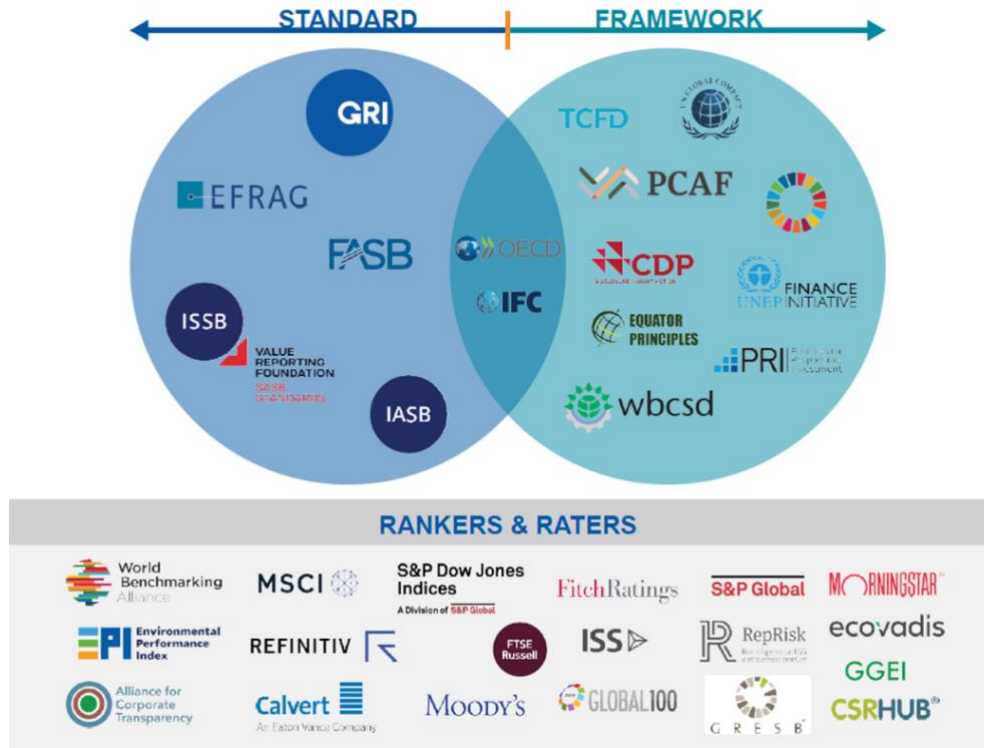


Figure 2: Climate and Sustainability Standards, Frameworks and Rating Agencies/Rankers (Sourced from the Global Reporting Initiative).

Building from these earlier reporting initiatives, new civil society groups now focus on providing guidance and assessments for corporate goalsetting. One such organization is the Science Based Targets Initiative (SBTi). SBTi was formed in 2015 by CDP, the World Resources Institute (WRI), the World Wild Fund for Nature (WWF) and the United Nations Global Compact. SBTi describes itself as a “corporate climate action organization that enables companies and financial institutions worldwide to play their part in combating the climate crisis” (Science Based Targets initiative 2024, 8). SBTi focuses on getting companies to register Various organizations have evolved to assess and evaluate the reporting required by these standards (Morse 2023).

Decarbonization pathways and corporate net zero goals have given rise to a range of standards auditors around emissions reporting and statements of target progress under the Greenhouse Gas (GHG) Protocol. This proliferation of standards results from pollination between public and private initiatives on climate action (Kaplan and Ramanna 2021; Cashore 2002). 2023 marked a

range of sustainability and climate disclosure standards integration efforts that were driven by policymakers and civil society groups. These included the International Sustainability Standards Board (ISSB) takeover of the remit of the Task Force for Climate-Related Disclosures (TCFD).

ISSB has released two International Sustainability Standards for investors, companies, and global markets in June 2023. The ISSB General Sustainability-related Disclosures (S1) and S2 Climate-related Disclosures (S2) are structured to be complimentary and comparable in order to support the standardization of corporate climate and sustainability disclosures. The climate-related disclosure standards in S2 expand on the TCFD and the Greenhouse Gas Protocol (GHG Protocol) recommendations with regards to greenhouse gas emissions reporting. Thus, ISSB S2 builds on the Greenhouse Gas Protocol's framework for companies to establish greenhouse gas emissions inventories by providing guidance on aligning this disclosure with financial reporting.

ISSB also includes Scope 3 accounting applicable to financial institutions, whose Scope 3 emissions include a share of the “financed emissions” of their portfolio companies, drawing from the Partnership for Carbon Accounting Financials (PCAF) methodology. In 2024, the ISSB and the GRI also released an overview of on the interoperability of GRI 3-4: Emissions 2016 (GRI 305) and IFRS S2 for Scope 1,2 and 3 emissions reporting. S1 directs preparers to consider SASB Standards for industry-specific metrics (Pierce 2024). While the SASB Standards are currently used by more than 2500 companies around the globe, the ISSB recognizes the need for more consistent application and reporting pursuant to the SASB standards. The ISSB is taking steps to integrate the SASB Standards into the lexicon in an inclusive way, paving the way for preparers and users to better benefit from the industry-based approach the SASB standards offer. Corporate goals from publicly traded companies end up being evaluated by investors. *Climate Action 100+* is an investor-led initiative to ensure the world's largest corporate greenhouse gas emitters take necessary action on climate change. This pressure directly connects corporate climate goals with equities markets (Rao and Krol 2022).

European Union regulations, such as the Corporate Sustainability Reporting Directive (CSRD), are structured to make voluntary corporate disclosures now mandatory. The CSRD mentions many of the aforementioned standards as guides that companies should follow to meet reporting requirements. These include GRI, SASB, the International Integrated Reporting Council, the International Accounting Standards Board (IASB), TCFD, and CDP.

Corporate climate and sustainability disclosures and goals should balance external and internal assessments of what markets and civil society expect from companies and what internal knowledge of corporate activity highlights as essential improvement areas. Corporations should use climate and transition risk assessments to support impactful decarbonization decision making (Isaacs et al. 2024).

## Bottlenecks

The lack of resource capacity of civil society organizations such as the Net Zero Alliance for the Insurance Industry (NZIA) the Greenhouse Gas Protocol, SBTi and others are a bottleneck for

corporate action for many MCSC members. This lag slows down corporate climate action. Reporting organizations with financial backing from revenue streams (such as Trucost in S&P Global Sustainable<sup>1</sup> and MSCI) have been able to scale up reporting and evaluation capacity.

## Research Questions

- What are the immediate implications of corporate climate goals?
- How should we evaluate corporate climate goals? What should be considered greenwash? What are feasible targets?
- How do investors assess corporate climate goals?

## Relevant Research

The Corporates and Climates interview project is reviewing MCSC member perspectives currently on the evolution of their reporting. MCSC Social Dimensions research has been coding relevant social sections of corporate ESG reports to analyze narrative themes and to see whether these themes have been changing with shifts in the requirements of disclosure programs such as GRI and developing regulations. The Aggregate Confusion Project is also conducting research on preferences decision-making and engagement around companies that disclose corporate and sustainability data.

## Debt

### Context

In the fixed-income space, labeled sustainable and climate finance products have grown rapidly in the green bond market (Tripathy 2021). With labeled debt markets beginning with development banks, these markets have long been used to track progress toward global climate policy goals (Kidney et al. 2015). However, within corporate green bond issuance there has been an inflated market effect from a small range of corporate issuers, underscoring the importance of new first time corporate green bond issuance (Flammer 2020).

Issuing sustainable debt can be an avenue to reinforce firm climate commitments (Lu 2021). In particular, sustainability-linked bonds are a tool that can potentially reinforce corporate climate and sustainability goals (ICMA 2021). MCSC members have issued these financial instruments, and several members are also considering issuing labeled debt instruments and have thought through the implications and benefits of doing so. The current range of labeled climate and sustainable debt includes the following categories.



## Green, social, sustainability (GSS) and transition bonds & loans

Each of these labels refers to different use of proceeds instruments that can only fund specific forms of infrastructure development or revenue-generating activities with sustainability or climate benefits. Issuers must identify a portfolio/pipeline of green, social, or transition assets or projects that add up to the total capital tied to one of these bond instruments.

## Sustainability-linked bonds and loans

Sustainability-linked labelled bonds are connected to corporate forward-looking, performance-based goals. These instruments link debt funding to broader sustainability targets (typically general corporate targets for emissions or other sustainability impact reductions) (Erlandsson and Richardson 2024). In issuing a sustainability-linked bond there are a range of choices corporates must make in terms of how bond use of proceeds are evaluated/tracked, and what the penalties are if the goals are not met (Kölbel and Lambillon 2023).

## MCSC Member Company Sustainable Debt

Several MCSC member companies have issued green bonds and sustainability-linked bonds.

**Dow** issued its first green bonds in Q1 2024. The offering included \$600 million of 5.150% notes due 2034 and \$650 million of 5.600% notes due 2054. One of the key projects funded by this green bond includes expenditures and investments related to the Alberta Path2Zero project, which heavily decarbonizes ethylene production.

**PepsiCo** has issued a total of \$2.25 billion. The use of proceeds for these bonds is geared towards financing circular economy activities that support virgin plastic waste reduction.

**Verizon** has issued four green bonds totaling \$4 billion. The focus of these bonds is renewable energy, energy efficiency, green buildings, sustainable water management, biodiversity, and conservation. Verizon also includes additionality considerations (an assessment of whether or not Verizon's investment has had a beyond business-as-usual impact on renewable energy generation) in renewable energy power purchase agreements (PPAs) that are attached to its green bonds. This includes quantifiable thresholds and regular updates to the green bond framework.

**Prologis** has been issuing green bonds since 2018 and in multiple currencies. These bonds fund green buildings, renewable energy, and energy storage. There are clear rules for categories, confirmed improvement thresholds and included detail in impact reporting data assured.

**BBVA** has several green bonds tied to lending towards green revenues. The bank has issued three green bonds. In 2018, BBVA became the first Spanish bank to issue a green bond, which

also was, at €1 billion, largest green bond issued within the euro area at the time. This was a non-preferred senior debt issue, with a 7-year maturity period.

**Apple** has issued bonds that have been particularly important in the development of the green bond market (Harrison, Partridge, and Tripathy 2020). By issuing a regular bond and a green bond with the same financial characteristics and, at the same time, it helped structure analysis of pricing differences between regular and green bonds. By 2024, Apple has issued a total of three green bonds totaling \$4.7 billion.

**Holcim** has issued standard green bonds as well as sustainability-linked green bonds. In November 2021, Holcim placed a ten-year USD 100 million sustainability-linked bond that was tied to the company's 2030 CO2 reduction target.

## Bottlenecks

While the above MCSC members have issued green bonds, others have looked into the potential for green bonds but have chosen not to issue them due to a lack of a clear incentive to do so in a low-interest rate and cash-rich economic environment. This is even after working to identify operations and forms of revenue tied to activities that could be deemed sustainable or green by financial markets.

These internal discussions also consider the issuance of standard green bonds in contrast to sustainability types in the market due to potential market risks is an essential consideration by corporations. There is also an issue of reputational risk from choosing the wrong label for a debt offering. Corporate issuance has been identified as a key bottleneck preventing green bond market growth since the start of the market in 2007 by development banks. Developing academic research highlights that the financial gain from these bonds might be mostly stuck amongst financial actors rather than supporting corporate finance (Kim and Pouget 2023).

## Research Questions

- What is the value of sustainability or climate labeled debt for companies trying to decarbonize?
- What are the goals for a company planning to issue a green bond?
- What prevents a company from issuing labelled debt?
- Where does data collection for green bond use of proceeds reports overlap with other reporting efforts? (ESG and regulatory reporting)
- How do you determine emission reductions from corporate sustainability initiatives against the impact of green bond(s)? Is this a useful question?

## Relevant Research

The Aggregate Confusion Project is applying heteroskedasticity techniques to estimate the relationship between the formation of internal corporate sustainable finance committees and

green bond issuance (Aswani and Rajgopal 2022; Rigobon 2003). This project furthers research on what types of beneficial corporate changes can be motivated by green bond issuance. It highlights the potential value for corporate climate and sustainability initiatives that go beyond solely issuing a green bond.

## Equities

### Context

In the equities space, the rise of rating agencies assessing the sustainability of publicly traded companies has resulted in a range of ESG ratings and a wave of ESG analyst hiring across companies. This is an expensive undertaking for corporates and one that thus far has uncertain returns and results. The effects of these equity ratings and their investor focus may hinder corporate focus on the climate bottlenecks they may be best at tackling. ESG rating agencies also have historically been inconsistent in rating factors (Florian Berg, Kölbel, and Rigobon 2022).

Companies' sustainability and climate ratings are tied to climate risk and governance assessments. Many entities have developed ESG and other climate-related ratings for publicly traded equity. LSEG Refinitiv, Morningstar Sustainalytics, CDP, and MSCI are key ratings agencies here. Publicly traded equity also opens corporations to the impacts of shareholder proposals and activism, which has been a growing avenue for investors to push for corporate climate action (Busch et al. 2023; Welker and Wood 2011). Similarly to the impacts of climate finance in the bond market, the impacts of shareholder activism might also be providing benefits more to investors rather than effectively shifting corporations towards climate-aligned revenue models.

Assessments of equities are both investor-and ESG-ratings-driven and result from an accumulation of responses to stakeholder activism against company operation impacts. Corporate social responsibility arose from mining-intensive industries (Smith 2021; Rajak 2011). ESG ratings are also weighted based on the cultural origins of rating agencies. For example, Vigeo-Eiris (now Moody's ESG Solution) ratings agency was formed in France and led by the president of a labor union, guiding its assessments of companies. As a result, ESG ratings have different weights on labor practices, climate change, and environmental impacts.

In the equities space, the rise of MSCI, Refinitiv and other ESG rating agencies has supported demand for ESG directed analyst hirings across corporations. ESG ratings of equity are tied to both climate risk as well as governance assessments. A range of entities have developed ESG and other climate-related ratings for listed publicly traded equity. Key ratings entities here are Refinitiv, Morningstar Sustainalytics, CDP.

However, the effects of these equity ratings and their investor focus may hinder corporate focus on the climate bottlenecks they may be best at tackling. ESG ratings agencies also have historically been inconsistent in rating factors (Florian Berg, Kölbel, and Rigobon 2022). Publicly traded equity also opens corporations to the impacts of shareholder proposals and activism, that has been a growing avenue for investors to push for corporate climate action (Busch et al. 2023; Welker and Wood 2011). Similarly to the impacts of climate finance in the bond market, the impacts of shareholder activism might also be providing benefits more to investors rather than to shifting corporations towards climate aligned revenue models.

Various financial data providers are deploying new green, sustainable, and climate corporate activity assessment forms. For example, the London Stock Exchange Group has recently constructed indices from green revenue corporate assessments. Similarly, Bloomberg ESG Disclosures scores attempt to rank transparency in nonfinancial disclosures amongst listed companies. These assessments seem more direct assessments of corporate sustainability and climate activity. They can be leveraged more than other ESG ratings to support material and corporate efforts in these areas.

## Bottlenecks

A lack of standardization in ESG ratings and policy uncertainty around equity reporting regulation in the future leaves companies in a difficult position to implement effective reporting. There are also uncertain equities returns resulting from ESG analyst work to communicate corporate sustainability and climate initiatives to financial markets.

## Research Questions

- What stakeholder group/audience are ESG analysts writing for?
- What impacts do ESG ratings have on corporate activity?
- Have ESG ratings helped or hindered companies with their decarbonization strategies?

## Relevant Research

The MIT Sloan Aggregate Confusion Project began its work with a focus on ESG ratings and the divergence between these ratings (Florian Berg, Kölbel, and Rigobon 2022). This research then analyzed the relationship between ratings and stock returns as well as the impact of changing base ESG scores by some raters (Florian Berg et al. 2023; Florian Berg, Heeb, and Kölbel 2022; F. Berg, Fabisik, and Sautner 2021). Currently, ACP researchers are testing a range of techniques to analyze CDP and GRI disclosures, to assess the current state of this data. ACP is also collaborating with the MIT Sustainable Urbanization Lab to understand the impact of ESG investor engagement in the real estate sector.

## Renewable Energy Certificates and Voluntary Carbon Markets

### Context

Corporations have made large purchases of carbon credits and renewable energy certificates (RECs) to support decarbonization efforts and act on climate in the immediate term (Bjørn et al. 2022). Carbon markets have grown rapidly over the last few years after a period of dormancy following the European Union's Trading Scheme price collapse (Lovell and MacKenzie 2011; MacKenzie 2009). These markets emerge across a range of contexts, from cap and trade government programs to voluntary carbon offsets to meet net zero corporate and government commitments (Knox-Hayes 2016). This growth has particularly escalated in response to corporate net zero commitments coming out of the United Nations' Conference of the Parties (COP) 26 in Glasgow.

The actual impact of voluntary carbon markets has already been contested by material assessments of physical carbon growth. For example, [a recent piece in \*The Conversation\*](#), cites a peer reviewed scientific assessment of the additional carbon sequestering benefits of California's forest carbon offsets (Coffield et al. 2022). Using satellite data, this assessment found that California forests connected to carbon offsets showed no additional carbon storage compared to similarly logged forests.

As the MCSC's 2022 study group on carbon markets highlighted, there are urgent needs to improve transparency around the actual carbon sequestration of existing carbon credits and also to clarify what carbon markets should and should not be used for by companies and other entities trying to decarbonize or act on climate (Tripathy, Sroka, and Junor 2023). The MCSC conducted a joint research project with BBVA and IBM on how to improve carbon credit transparency and assessment through the integration of geospatial and artificial intelligence (AI) tools in 2023 that resulted in the white paper *Credits and Credibility* (Coleman et al. 2023).

### Bottlenecks

Assessment transparency and how RECs and carbon offset purchases should be included in corporate decarbonization plans are key bottlenecks for both instruments. This topic continues to be debated by convening bodies such as SBTi.

### Research Questions

- What role should alternative markets play in corporate decarbonization plans?
- What is missing from current private sector initiatives in VCM?
- How will regulations transform VCM?

## Relevant Research

As aforementioned, from 2022 to 2023, The MCSC has sought to work through the confusion in voluntary carbon markets with a study group in 2022 and subsequent topic brief (Tripathy, Sroka, and Junor 2023). This work continued in a joint research project with IBM and BBVA that produced a white paper on how to integrate new forms of assessments into VCM (Coleman et al. 2023). There are also several governance and incentive issues in VCM that are currently being studied by researchers by the MIT Sloan Carbon Confusion Project.

Regarding RECs, in May 2022, the MCSC held a study group by postdoctoral associate Leela on REC purchases and accounting considerations. The study group explored several types of renewable energy purchases, current accounting methods for scope 2 emissions endorsed by the GHG Protocol, and potential alternative forms of accounting for impact. The MCSC study group also focused on the implications of RECs purchases for university in comparison to corporate decarbonization plans (Velautham, Gregory, and Newman 2024).

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