Ecosystem Marketplace
A FOREST TRENDS INITIATIVE

ALL IN ON CLIMATE:
THE ROLE OF CARBON CREDITS IN CORPORATE CLIMATE STRATEGIES

OCTOBER 2023

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About Ecosystem Marketplace

Ecosystem Marketplace (EM), a non-profit initiative of Forest Trends, is a leading global source of credible information on environmental finance, markets, and payments for ecosystem services. For nearly two decades, EM has run the world's first and only globally recognized and standardized reporting and transparency platform for voluntary carbon market (VCM) credit pricing data, news, and insights.

EM holds the world's largest repository of valuable carbon market insights and data disclosed by a growing international network of more than 270 "EM Respondents," including project developers, investors, and intermediaries with headquarters in over 40 countries. Respondents share over the counter and exchange/trading platform carbon credit sales on thousands of nature-based and technological carbon projects in over 100 countries.

EM's flagship State of the Voluntary Carbon Markets reports and other analyses on carbon credit market dynamics (e.g., prices, volumes, projects, corporate buyers, sellers, etc.) and carbon standards' issuance and retirement data have become anticipated industry staples. EM also provides a publicly accessible data intelligence dashboard and a news platform for breaking news and market coverage.

EM data on prices, regulation, science, and other relevant issues on environmental services markets and climate finance have been used extensively by companies, journalists, investors, practitioners, natural resource agencies and academics, and local and indigenous communities.

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The primary source of data for this report is the CDP 2022 Climate Change Response dataset. Except where otherwise specified, all data analyzed comes from this dataset. We thank CDP for their help in obtaining and using these data.

ALL IN ON CLIMATE:

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OCTOBER 2023

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FOREWORD

EM is pleased to publish this 2023 report, *All in on Climate: The Role of Carbon Credits in Corporate Climate Strategies,* which serves as the first major update since 2016 to its landmark "Taking Stock" report series. When initially launched in 2015, the report illuminated for the first time the realities of how companies are (and are not) using carbon credits to address their climate liabilities and to contribute to their comprehensive climate action and management strategies. We've revisited this analysis because our global network of carbon markets stakeholders have lately reported to EM an increase in "greenhushing." Whether in response to media coverage, environmental group criticism, or the challenges of navigating government policies (or all three), companies are publicly dialing back, delaying, or scrapping their carbon credit buying plans.

This report **is designed to look specifically at the climate-related behavior of companies that are involved in the voluntary carbon market (VCM) versus those who are not.** It should be noted that although we analyzed the data and wrote this report in in mid-2023, it has a retrospective lens and an eye on the future, as the CDP data used is from the 2022 Climate Change dataset, which mostly covers corporate activities in 2021.[1]

A set of clear implications emerge from the data. First, companies are purchasing voluntary carbon credits as a part of an integrated, comprehensive strategy to accelerate global climate action while also decarbonizing their own businesses. Second, the data do not broadly support the perception that credits are being used to delay or avoid meaningful action on climate.

It's important to remind ourselves of what we've seen in the market since the banner year of 2021, as it adds important context to the findings in this report. EM data show that in 2021 the market ticked up to an all-time high of $2.1 billion in sales, with global average prices at $4.03 per ton CO_2e. The following year, we saw a downturn in traded volumes, though an uptick in prices. In early 2023, EM ran a market sentiments survey that found corporate buyers were demonstrating stronger preferences for nature-based and community/household projects with beyond carbon benefits and a willingness to pay higher prices for them.[2] However, some buyers were also beginning to slow down, if not stop altogether, their engagement in the VCM until key guidance was finalized by the Voluntary Carbon Markets Integrity Initiative (VCMI) and the Integrity Council for the Volunta-ry Carbon Market ("the Integrity Council") (Box 1). Some respondents told us that the Science Based Targets Initiative (SBTi)'s position on how companies could claim their retirements of VCM credits for greenhouse gas (GHG) targets was also a factor.

As the months have rolled on from 2022 into 2023, there have been a string of media pieces critical of the VCM. Some charged well-known companies with greenwashing (e.g., Delta, Nestle, Kering, Shell, TotalEnergies, among others). Other articles questioned integrity on the supply side, in particular scrutinizing South Pole, one of the largest carbon project developers; Verra, the world's largest carbon crediting standard; and project types including REDD+,[3] which happens to be the largest source of new credit supply for the VCM. It's hard to precisely measure the impact of these critiques, but credit retirement data so far in 2023 show that VCM end users have retired a smaller volume of credits in 2023 than in any of the past seven years.

Still, as I write this foreword in September 2023, the general mood in the VCM is generally one of staying the course. For example, of the top 25 voluntary carbon market buyers per CDP (see page 11), the majority appear to have unchanged approaches related to their VCM activities. As we developed this analysis in summer 2023, we found just one organization, the British airline easyJet, that had since 2021 made a firm commitment to cease all VCM activities. Some others have either stated that they (a) will move away from using carbon credits for their GHG targets, but still plan to use them to make up for hard-to-abate emissions or (b) will move away from plans to purchase a defined volume of credits to address their emissions.

EM has been tracking the VCM since 2006 when EM's first carbon survey was issued. We are a non-profit initiative that does this work because we believe transparency is key to integrity, and, ultimately, a livable planet in the centuries to come. We do not have a financial stake in market growth.

Still, **I will step away from our usual position of neutrality for a moment to say this: *the findings in this report are good news.*** Companies are continuing to purchase and retire carbon credits, at the same time that they continue to do the hard, but necessary, work of investing in climate action throughout the value chain and decarbonizing their operations. It is an approach based on "and/and," not "either/or." Much work remains to be done to clarify and communicate the role carbon credits play in a science-based climate strategy, but the foundations we build on are solid indeed.

Stephen Donofrio

Managing Director, Ecosystem Marketplace

Forest Trends

[1] At the time of procuring data from CDP in mid-2023, the most current dataset available was the 2022 CDP Climate Change data, which mostly covers calendar year 2021 as the most recent year of data disclosed by companies.

[2] Ecosystem Marketplace. 2023. EM Insights Briefing: A VCM Status Check (Webinar). https://www.ecosystemmarketplace.com/articles/em-insights-briefings-vcm-status-check/

[3] "'REDD' stands for 'Reducing emissions from deforestation and forest degradation in developing countries. The '+' stands for additional forest-related activities that protect the climate, namely sustainable management of forests and the conservation and enhancement of forest carbon stocks." https://unfccc.int/topics/land-use/workstreams/redd/what-is-redd

EXECUTIVE SUMMARY

This report highlights how companies that participate in the voluntary carbon market (VCM) are leading on key climate transparency, ambition, and action efforts that are fundamental to ensuring the credibility of their climate claims.

Our findings result from Ecosystem Marketplace's (EM) analysis of corporate disclosures to CDP by 7,415 organizations reporting data covering at least six months of 2021, as well as of EM's own propriety voluntary carbon market dataset. We focus on a comparison between companies that purchased voluntary carbon credits versus companies that do not use carbon credits at all and companies that only buy or originate compliance credits. The 2022 CDP Climate Change information request that resulted in these corporate disclosures was sent on behalf of 590 institutional investor signatories with a combined US$110 trillion in assets, and 200+ major purchasers with over US$5.5 trillion in procurement spend.

We offer a series of comparative analyses across a variety of metrics for corporate action on climate sustainability, aligned with corporate best practice of first measuring greenhouse gas (GHG) emissions; then taking steps to reduce and avoid direct **and** indirect emissions on a target-based pathway; and finally buying carbon credits to address unavoidable emissions and those beyond the value chain.

Across the board, the evidence shows that participation in the VCM is a signal that a company is likely **already** addressing climate change in their direct operations and throughout their value chains. Far from "buying their way out of the problem", voluntary carbon buyers are taking advantage of the valuable role carbon credits play as one of the available solutions for value chain emissions that cannot be addressed by reducing Scope 1 and 2 emissions.

Companies engaged in the VCM outperform their peers in accelerated climate action. Fifty-nine percent of VCM buyers reported lower gross emissions year-on-year related to reduced emissions and/or renewable energy consumption, compared to 33 percent of companies not participating in the carbon markets. VCM buyers are also 1.3 times more likely to have supplier engagement strategies and spent three times more on emissions reductions activities than the typical non-buyer (see page 18).

Voluntary carbon buyers are more likely to have science-based targets to address climate change, and their targets are more ambitious. Voluntary carbon buyers are 3.4 times more likely to have an approved science-based climate target than companies that do not engage in carbon markets, and three times more likely include Scope 3 Emissions in their climate targets. As the old management adage says, you can't manage what you don't measure (see pages 16-17).

Voluntary carbon buyers lead the pack when it comes to emissions transparency and accountability. Compared to other companies, they are 1.2 times more likely to disclose their emissions to CDP, and the median voluntary credit buyer disclosed more than 2.5 times the volume of emissions with their Scope 3 reporting than companies not engaged in voluntary credits. Ninety-seven percent reported board-level oversight of climate-related activities (see page 13).

In fact, VCM carbon credits represent a very small share of overall corporate GHG emissions. Our data show that the credits companies are buying represent just over 2 percent of their total emissions on average.

Taken together, clear insights emerge from these analyses. Companies are purchasing voluntary carbon credits as a part of an integrated and comprehensive strategy to accelerate global climate action while also decarbonizing their own businesses. In other words, the data do not broadly support the perception that carbon credits are being used to delay or avoid meaningful action on climate. This is important, because intense public scrutiny, paired with a wait for greater clarity from the Voluntary Carbon Markets Integrity Initiative (VCMI) in the form of its forthcoming claims code, has had a dampening effect on the market in 2023. Since 2021, EM's own proprietary data show a decline in credit sale volumes, which has been accompanied by an uptick in EM's global average VCM credit prices, a signal of increasing buyer commitment toward higher quality credits (and a willingness to pay more for them).

Still, voluntary carbon buyer transparency is lagging. Our analysis indicates that only 8.2 percent of the total carbon buyers that confidentially reported to EM are disclosing carbon market engagement to CDP. EM welcomes the work of VCMI to create a standard approach for voluntary carbon buyers' climate ambition and action criteria, as well as how they should report their claims on project-based carbon credits through their soon-to-be-finalized Claims Code.

As the VCM continues to evolve, EM stands ready to continue to drive carbon market transparency, knowledge, and insights as a globally trusted, independent, and neutral non-profit initiative. To continue to do this effectively, we look forward to engaging with the entire carbon market value chain and stakeholder network who have a common vision for high-integrity and well-functioning global carbon markets that achieve results on the ground and in corporate boardrooms.

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ABOUT THE DATA

We used two data sources for this report. The primary data source for this report is the 2022 CDP Climate Change data for the subset of companies that **publicly**[4] disclosed to CDP. We also used EM voluntary carbon market transactions data to understand the extent of voluntary carbon credit purchases that were not disclosed to CDP. For more detailed information about how we used CDP data to compare the activities of voluntary carbon credit buyers with other organizations, please see the Methodology appendix.

CDP Data

CDP data are self-reported by a variety of organizations, including large corporations, small- and medium-sized enterprises, and quasi-governmental entities such as utilities and postal carriers. CDP's climate change questionnaire collects climate-related data from the world's largest companies and, in 2022, this was on behalf of over 590 institutional investor signatories with a combined US$110 trillion in assets and 200+ major purchasers with over US$5.5 trillion in procurement spend.

CDP data include information on greenhouse gas (GHG) emissions by Scopes 1, 2, and 3; emissions targets and progress towards those targets; project-based carbon credits purchased and originated; activities undertaken for the purpose of emissions reduction; and climate-related risks facing organizations, among other datasets. With respect to carbon credit use, these organizations tend to be purchasers of credits, though credit origination for insetting or sale is also disclosed to CDP.

Figure 1 provides a bird's eye view of the 2022 CDP dataset, which comprises:

- 7,415 total CDP Climate Change respondents for reporting year 2022;
- 6,538 CDP respondents did not buy or originate credits, or did not specify whether credits were used for voluntary or compliance reasons;
- 815 CDP respondents only engaged in voluntary credits as a buyer and/or an originator;
- 55 CDP respondents only engaged in compliance credits as a buyer and/or an originator; and
- Seven CDP respondents engaged in both compliance and voluntary credits as a buyer and/or an originator.

Ecosystem Marketplace Buyer Data

To understand the completeness of CDP data in terms of project-based carbon credit purchases, we used EM's voluntary carbon markets transactions data. EM data, which are reported directly and confidentially by carbon credit project developers and resellers, include names of corporate buyers who are end users.

We cross-checked EM's 2,477 known corporate buyers who were listed as end users of credits from 2020 to 2023[5] to determine whether they had publicly disclosed climate data to CDP and if they had disclosed purchasing or originating project-based carbon credits. Out of the 2,477 known credit buyers:

- 204 (8.2 percent) disclosed some climate data to CDP in 2022.
- 130 (5.2 percent) disclosed buying or originating project-based carbon credits to CDP in 2022.
- This translates to a 64 percent rate of credit use disclosure among the 204 known buyers responding to CDP in 2022, or conversely, an estimate that 36 percent of CDP respondents that are using carbon credits do not disclose their purchase or origination of credits.

[4] Not all respondents allow their CDP disclosure data to be reported publicly and used in analyses by external organizations. For the purposes of this report, we used the publicly available dataset only.

[5] We focused on transactions that occurred from 2020-2023 because of the lag between credit origination, sales, retirements, and public claims.

REPORT GUIDE

In **Part A** of this report, we provide an overview of the 7,415 organizations who disclosed data covering at least six months of 2021 to CDP, highlighting leading voluntary credit purchasers and the overall composition of the CDP dataset.

In **Parts B** and **C**, we focus on a comparison between organizations that purchase voluntary carbon credits and a group which we refer to as "non-voluntary carbon buyers," a combined group of companies that do not use carbon credits at all and companies that only buy or originate compliance credits. Companies that originate but do not purchase voluntary credits are excluded from these comparisons because of data inconsistencies and because the purpose of such origination is unclear (e.g., to retire for their own purposes vs. to sell into the market as a project developer).

Part D puts voluntary carbon credit purchases into the context of organizational emissions, showing that the typical voluntary buyer is purchasing credits that account for just over 2 percent of their annual disclosed emissions. This is a key finding that, taken together with the evidence in **Parts B** and **C** that voluntary credit buyers are already climate leaders, suggests that corporate buyers are not using carbon credits to avoid responsibility for their emissions, and that credits are mainly being used to offset hard-to-abate emissions.

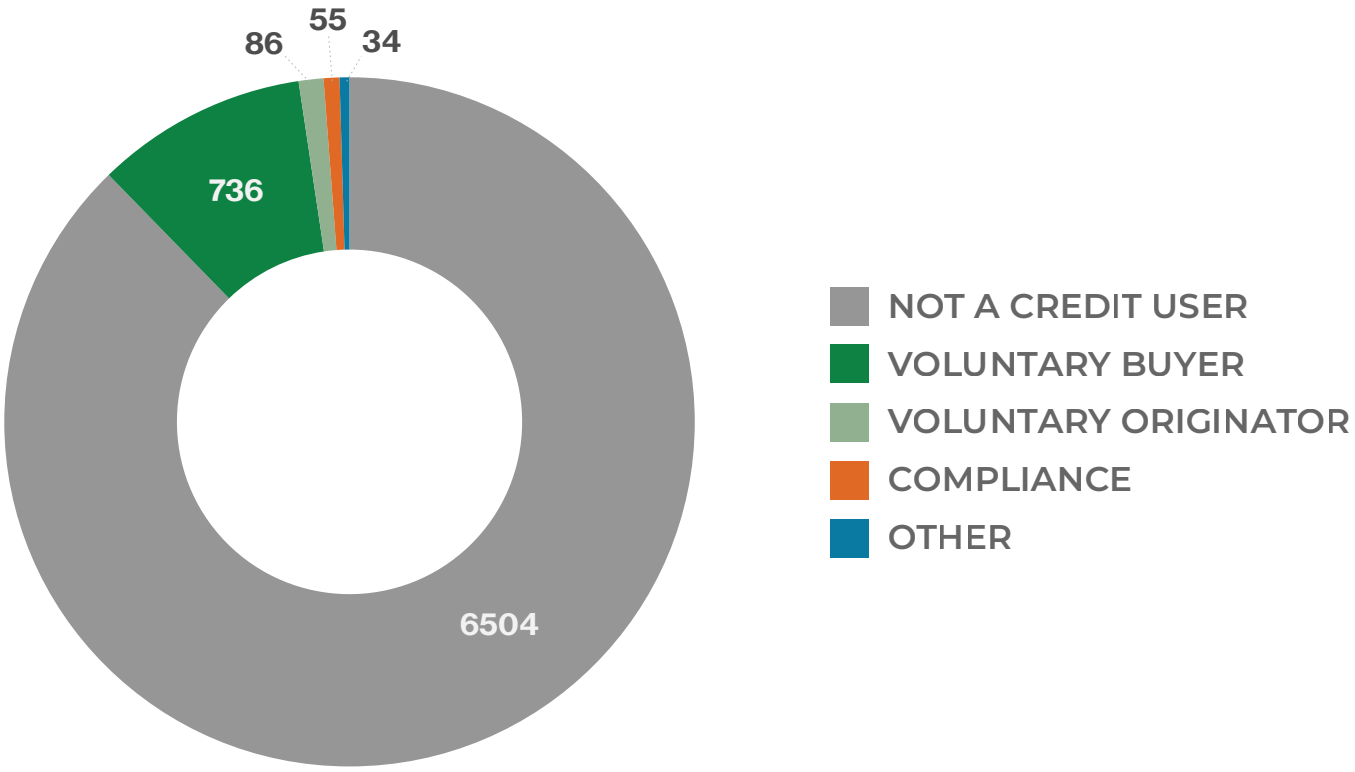
The **Appendix** features an in-depth discussion of the report's data analysis methodology and a selection of tables and figures describing the CDP data in more detail.

PART A
WHO IS BUYING CARBON CREDITS?

One in ten companies disclosed voluntary carbon market participation in 2021

For the reporting year 2022, largely covering activities in 2021,[6] 7,415 total companies publicly disclosed[7] to the CDP Climate Change program. Within this group, 822 companies (11 percent) engaged with voluntary project-based carbon credits as a buyer (736) or an originator (86), and 55 companies engaged with project-based carbon credits for compliance reasons only (Figure 1).

FIGURE 1. OVERVIEW OF CDP RESPONDENTS, BY PROJECT-BASED CARBON MARKET PARTICIPATION STATUS



Source: Ecosystem Marketplace, 2023

Note: Organizations are defined according to the highest level of their engagement with carbon markets. Any organization that purchases both voluntary and compliance credits is considered to be a voluntary market participant, and any organization that both purchases and originates voluntary credits is considered to be a voluntary carbon buyer. In 2021 there were seven companies engaged in both voluntary and compliance carbon; these are included in the 822 voluntary and 62 compliance companies, leaving 815 engaged in voluntary carbon markets only and 55 in compliance carbon markets only. In addition, eight companies were not included in the voluntary market participant totals because they did not provide a volume associated with their purchases and/or origination.

"Other" organizations disclosed originating or purchasing carbon credits but we were not able to definitively classify those credits as voluntary or compliance. The organizations in

[6] This report focuses on data published by CDP in 2022. Because CDP data is compiled for the previous calendar year, the focal period for the most recent data is calendar year 2021. Because companies may have reporting periods that do not match up with a calendar year, we included emissions and credit activities for a calendar year if at least six months (181 days) of the reporting period fell within that year.

[7] This analysis is exclusively focused on the subset of companies using carbon credits that publicly disclose to CDP, unless otherwise noted. As such, the information in this report offers a snapshot of corporate carbon credit use in the context of CDP disclosures, but it represents only a portion of total credit demand.

Led by the services sector and big buyers like Delta, CDP respondents purchased 121.1 $MtCO_2e$ of voluntary carbon credits in 2021

The 768 voluntary carbon buyers disclosing to CDP in 2022 purchased roughly 121.2 $MtCO_2e$ (million metric tons of CO_2) in 2021. The majority of this volume (72 percent) was represented by the top 25 voluntary carbon credit buyers (87.5 $MtCO_2e$) (Figure 2). Companies in the Services sector make up the largest share of voluntary carbon buyers (Figure 3).

FIGURE 2. TOP 25 BUYERS OF VOLUNTARY CARBON CREDITS, BY VOLUME

Source: Ecosystem Marketplace, 2023

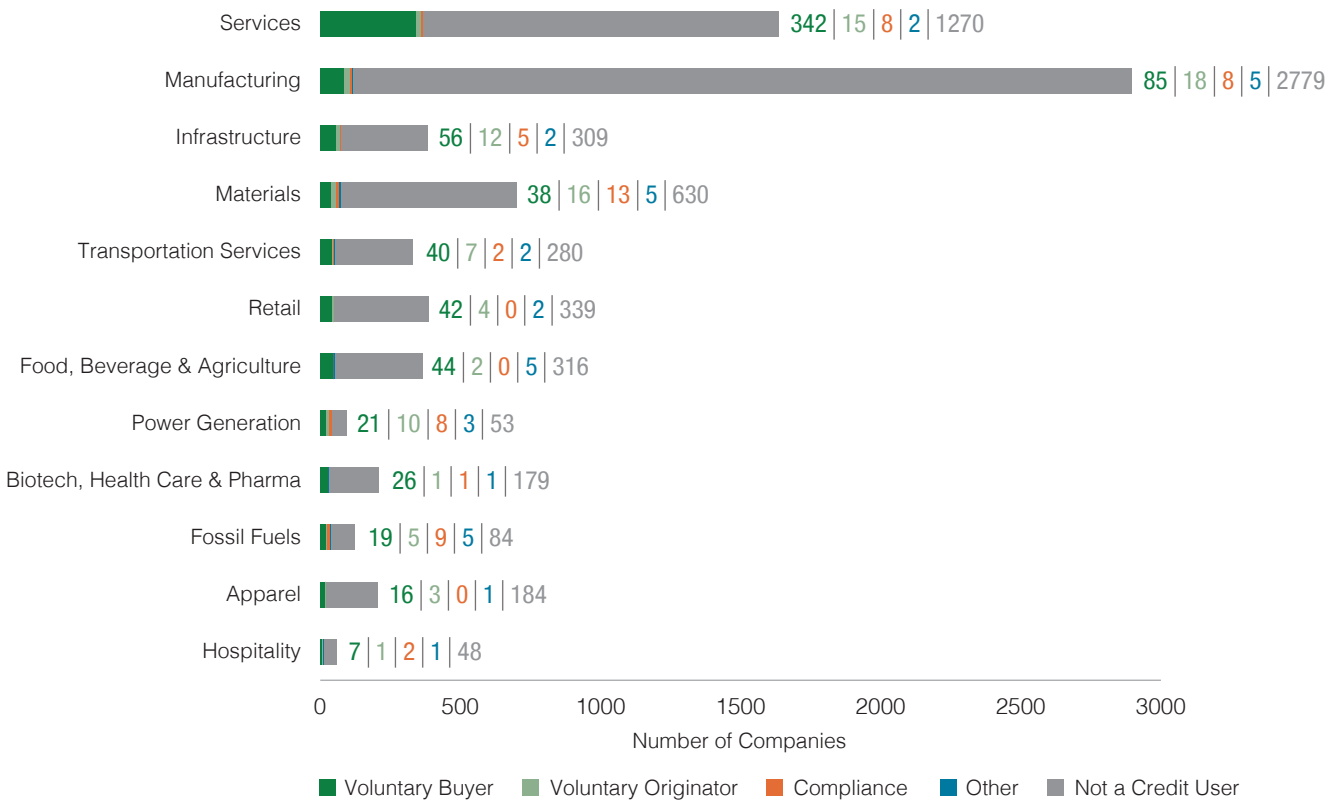
Note: Figure reflects volume of VCM credit purchases only. Companies included above may have also originated voluntary credits or purchased or originated compliance credits, but those volumes were excluded. Industry classifications used in this figure and throughout the report are taken directly from CDP and do not necessarily align with Global Industry Classification Standard (GICS) or other industry classification systems.

BOX 1. CORPORATES CONTINUING CARBON CREDIT PURCHASES, DESPITE INCREASED SCRUTINY

CDP's 2022 Climate Change disclosure data on voluntary project-based carbon credit purchasing focuses on activity in the 2021 calendar year. In 2022 and 2023, some of these corporate buyers began to face heavy scrutiny for their retirement of them to achieve carbon neutrality and net-zero targets. Some of the Top 50 (Appendix) purchasers of carbon credits have faced lawsuits, but most have been targeted with negative press around their carbon neutrality and/or net-zero climate claims. These included major airlines such as Delta, KLM/Air France, and Ryanair, and companies from Oil & Gas to Food and Beverage to Luxury Goods such as Shell, Nestle, and Kering (the parent company of Gucci and Balenciaga).

In most cases, we won't see this reflected in CDP data until 2024 when CDP calls for disclosures on 2023. In the meantime, we investigated the top 50 voluntary carbon credit purchasers in 2021 to understand if they had made a public commitment to stop using carbon credits in 2022 or 2023. While the majority appear to have unchanged approaches related to their VCM activities, we found that one organization, the British low-cost airline easyJet, made a firm commitment to cease all voluntary carbon market activities. Other organizations are changing their approaches to the VCM by stating that they (a) will move away from using carbon credits for their GHG targets, but still plan to use them to make up for hard-to-abate emissions (e.g., Delta, Kering), or (b) will move away from plans to purchase a defined volume of credits to address their emissions (e.g., Shell).

FIGURE 3. CORPORATE ENGAGEMENT WITH CARBON CREDITS, BY INDUSTRY



Source: Ecosystem Marketplace, 2023

Note: Above counts include companies that reported buying or originating credits with no associated volume. Compliance, Other, and Not a Credit User are combined in the "Non-Voluntary Carbon Buyers" category used in comparisons with Voluntary Buyers, and Voluntary Originators are excluded from the rest of the analysis (see Methodology appendix). Industry labels are taken directly from CDP industry classifications and do not necessarily align with GICS or other industry classification systems.

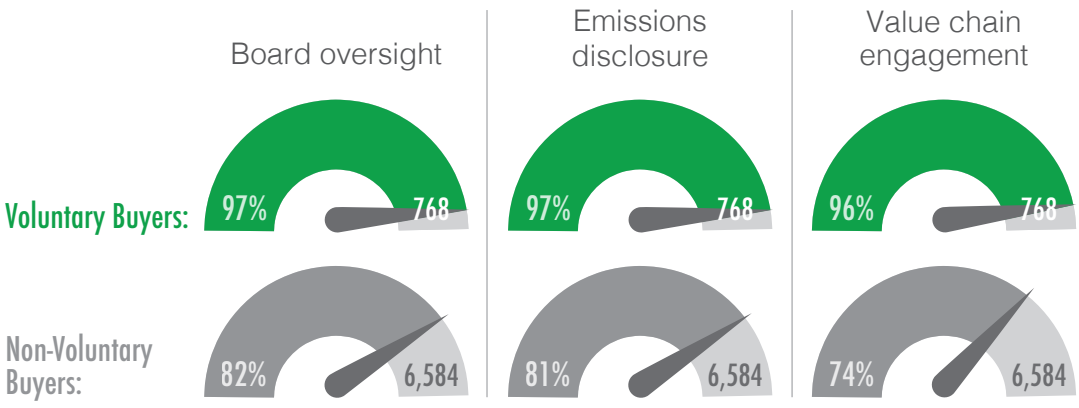
PART B
CORPORATE VOLUNTARY CARBON BUYERS LEAD ON TRANSPARENCY, ACCOUNTABILITY, AND AMBITION

Board Level Responsibility for Climate is the Norm for Carbon Buyers

A fundamental indicator of good company governance is how far up the corporate ladder climate change is managed. Governance by management level employees, including the C-suite, is tactical and focuses on the day-to-day management of the business, whereas board and/or board committees' oversight is the most strategic level of attention to climate issues.

Voluntary carbon buyers demonstrated strong leadership in this practice. Ninety-seven percent of these organizations have board-level oversight of climate-related activities (Figure 4). In other words, companies purchasing voluntary carbon credits are 1.2 times more likely to have board oversight of climate-related issues than companies not using voluntary carbon credits.

FIGURE 4. TRANSPARENCY, ACCOUNTABILITY, AND AMBITION INDICATORS: SHARE OF VOLUNTARY CARBON BUYERS VS. NON-VOLUNTARY CARBON BUYERS



Source: Ecosystem Marketplace, 2023

Note: Based on responses from 768 companies that purchased voluntary carbon credits in 2021 and 6,584 companies that either only purchased or originated compliance credits or did not participate in carbon credit markets in 2021 ("Non-Voluntary Carbon Buyers").

Nearly All Companies Engaging in the VCM Report GHG Emissions

Companies that report publicly on their emissions typically adhere to a widely accepted standard like the Greenhouse Gas Protocol's Corporate Accounting and Reporting Standard when national standards are not applicable.[8]

CDP disclosing companies that buy voluntary carbon credits were 1.2 times more likely to disclose their emissions to CDP than companies not engaged in voluntary credits. Furthermore, the typical voluntary credit buyer disclosed more than 2.5 times the volume of emissions with their Scope 3 reporting than companies not engaged in voluntary credits (Figure S1, Table S3).[9] Ninety-seven percent of voluntary carbon buyers disclosed at least one scope of emissions to CDP for 2021, compared with 80 percent of all other companies (Table 1).

TABLE 1. SHARE OF COMPANIES DISCLOSING GHG EMISSIONS, BY SCOPE

CDP COMPANY SEGMENTATION, BY CARBON MARKET PARTICIPATION STATUS	NUMBER OF COMPANIES	NON-ZERO SCOPE 1 EMISSIONS	NON-ZERO LOCATION-BASED SCOPE 2 EMISSIONS	NON-ZERO MARKET-BASED SCOPE 2 EMISSIONS	NON-ZERO SCOPE 3 EMISSIONS
ALL CDP COMPANY DISCLOSERS	7,415	94.7%	99.0%	97.1%	55.1%
VCM BUYERS AND ORIGINATORS	830	98.1%	99.8%	91.9%	95.7%
COMPLIANCE MARKET BUYERS AND ORIGINATORS	54	100.0%	96.3%	94.4%	94.4%
COMPANIES NOT BUYING/ORIGINATING CREDITS	6,476	94.1%	98.9%	97.8%	49.5%

Source: Ecosystem Marketplace, 2023

A total of 6,082 organizations disclosed some greenhouse gas emissions – an emissions liability equivalent to nearly 106 billion metric tons of CO_2 for 2021 (Scopes 1, 2, and 3 combined). Of these combined emissions, 754 voluntary carbon buyers accounted for 13.5 $GtCO_2e$ (billion metric tons of CO_2). The typical voluntary buyer disclosed a greater emissions liability, inclusive of all Scopes, at 531,819 tons CO_2e, versus the typical non-credit user of 320,554 tons CO_2e. Consistent with EM's previous analyses, most disclosed emissions for voluntary carbon buyers are in the Scope 3 category (value chain emissions), whereas Scope 1 emissions are the largest disclosed emissions liability for non-voluntary carbon buyers, including compliance buyers and originators as well as companies not engaged in project-based carbon credits.

Awareness leads to action. Breaking emissions disclosure down further, we found (consistent with past reports[10]) that the proportion of companies disclosing Scope 3 emissions is greater among those purchasing credits from the voluntary carbon market. Both voluntary (95.7 percent) and compliance (94.4 percent) market participants reported Scope 3 emissions at a higher rate than other CDP disclosing companies.

Because Scope 3 emissions constitute the majority of voluntary carbon buyers' emissions, engaging with their value chains on climate-related issues is essential to fully tackle these companies' climate liabilities. In fact, 91 percent of all voluntary carbon buyers' total GHG emissions in 2021 are in Scope 3 (and only 7 percent in Scope 1). In contrast, only 42 percent of other CDP respondents' disclosed emissions were in Scope 3 (and 56 percent of their emissions in Scope 1). The rate of disclosure of Scope 2 emissions is consistent between voluntary carbon buyers and all disclosing organizations, at 1 percent and 2 percent, respectively.

To normalize these data, we narrowed the sample of companies to the 3,925 companies that reported a non-zero emissions quantity for both Scopes 1 and 3, representing 65 percent of the total 6,082 companies that reported at least one scope of emissions. Demonstrating their transparency leadership, 94 percent (708 of 754) of voluntary carbon buyers reported both Scopes 1 and 3. The numbers change slightly but continue to demonstrate a consistent message: 91 percent of all voluntary carbon buyers' GHG emissions are represented by their Scope 3 (and only 7 percent by their scope 1) versus 85 percent of all CDP disclosers emissions represented by Scope 3 (and 12 percent of their emissions being scope 1). The rate of Scope 2 disclosure continues to be consistent between voluntary carbon

[8] The Corporate Standard is for all organizations to prepare a corporate-level GHG emissions invetnory https://ghgprotocol.org/corporate-standard. Additional standards and resources from Greenhouse Gas Protocol include the Scope 2 Guidance, Product Life Cycle Accounting and Reporting Standard, Corporate Value Chain (Scope 3) Accounting and Reporting Standard, among others.

[9] Typical here and throughout when describing a voluntary buyer and/or non-buyer is defined as the median.

[10] Forest Trends' Ecosystem Marketplace. 2015. The Bottom Line: Taking Stock of the Role of Carbon Offsets in Corporate Carbon Strategies. Washington DC: Forest Trends Association ; Forest Trends' Ecosystem Marketplace. 2016. Buying In: Taking Stock of the Role of Carbon Offsets in Corporate Carbon Strategies. Washington DC: Forest Trends Association.

buyers and all disclosers at 1 percent and 3 percent, respectively.

We recognize that one effect of this normalization is that certain sectors may be excluded. For example, high-emitting sectors are less likely to report Scope 3 emissions (e.g., manufacturers' downstream emissions from use of sold products), while companies with an immaterial Scope 1 footprint (e.g., retailers and services) would be less likely to report on Scope 1. For example, total disclosed Scope 1 emissions from all CDP respondents are just over 59.7 $GtCO_2e$, but this dropped 89 percent to 6.3 $GtCO_2e$ for the CDP respondents with non-zero Scope 1 and 3 emissions. Meanwhile, total disclosed Scope 3 emissions in the normalized sample declined by 72 percent, from 44.6 $GtCO_2e$ to

Voluntary Carbon Buyers Outpace on Value Chain Engagement

As the saying goes, what gets measured gets managed, and what can't be managed directly creates opportunities for value chain engagement and the use of carbon credits. Encouragingly, nearly all voluntary carbon buyers engage their value chain, an indicator that buying carbon credits does not occur without companies also working with suppliers, employees, and customers to address climate impacts. In fact, voluntary carbon buyers are 1.3 times more likely to be engaging their value chain than non-voluntary buyers. This best practice of working with upstream and downstream partners to reduce negative environmental impacts is a barometer for climate leadership.

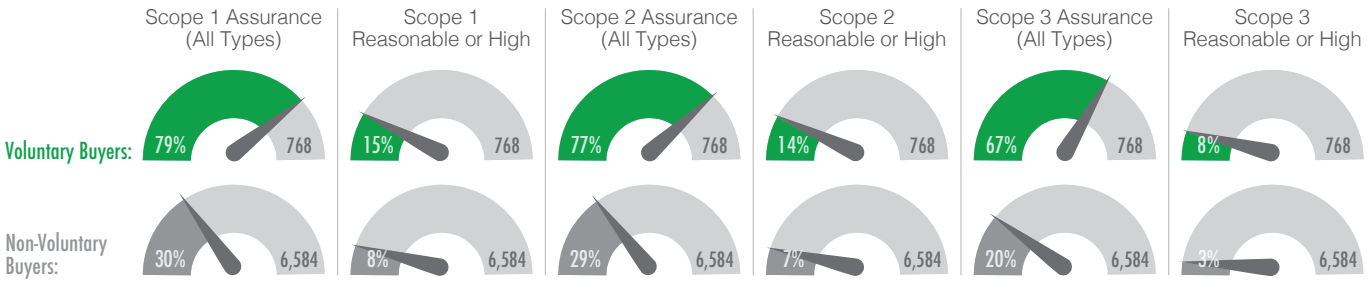
Voluntary Carbon Buyers Are More Likely to Verify their GHG Emissions Data

To instill confidence in stakeholders for the greenhouse gas emissions inventory that they report, companies may take the final step of hiring an independent and accredited third-party entity to perform a verification and assurance of their emissions data. This best practice in emissions reporting ensures the validity of both the calculation methods the company used in quantifying the emissions and the accuracy of disclosed data and processes.

Assurance of emissions, although considered best practice and endorsed by companies leading on climate change, is not a requirement for CDP disclosure, although it does factor into the scores that CDP reports to assess progress towards environmental stewardship. Emissions assurance is required for participation in the Science Based Targets initiative (SBTi), which is encouraged but not yet required by the Voluntary Carbon Markets Integrity Initiative (VCMI).

For Scopes 1, 2, and 3, voluntary carbon buyers are more likely to have assurance for their emissions inventories than all other organizations, inclusive of compliance market actors and non-carbon market participants (Figure 5).

FIGURE 5. VERIFICATION/ASSURANCE OF GHG EMISSIONS AND SHARE OF VOLUNTARY CARBON BUYERS VS. NON-VOLUNTARY CARBON BUYERS, BY SCOPE



Source: Ecosystem Marketplace, 2023

Note: Based on responses by 768 companies that purchased voluntary carbon credits in 2021 and 6,584 companies that either only purchased or originated compliance credits or did not participate in carbon credit markets in 2021 ("Non-Voluntary Carbon Buyers").

Companies disclosing to CDP are given the opportunity to report if any parts of their CDP Climate Change responses beyond their GHG emissions data are assured. Although the prevalence is very low, it is interesting to see that some companies are already starting to have their carbon credit claims assured (Table 2). In 2021, it was not a requirement to assure these claims for CDP, and the VCMI Claims Code was only just published in 2023. We will continue to watch this metric to see how companies progress in assuring their voluntary project-based carbon credit purchasing.

TABLE 2. VERIFICATION/ASSURANCE OF CARBON CREDIT DISCLOSURES, SHARE OF VOLUNTARY CARBON BUYERS VS. ALL CREDIT USERS

CDP COMPANY SEGMENTATION BY CARBON MARKET PARTICIPATION STATUS	VOLUNTARY CARBON BUYERS	ALL CREDIT USERS
ASSURANCE ON PROJECT-BASED CREDITS	1.8%	2.1%
TOTAL NUMBER OF COMPANIES	768	920

Source: Ecosystem Marketplace, 2023

Science is Driving the Climate Ambition of Voluntary Carbon Buyers

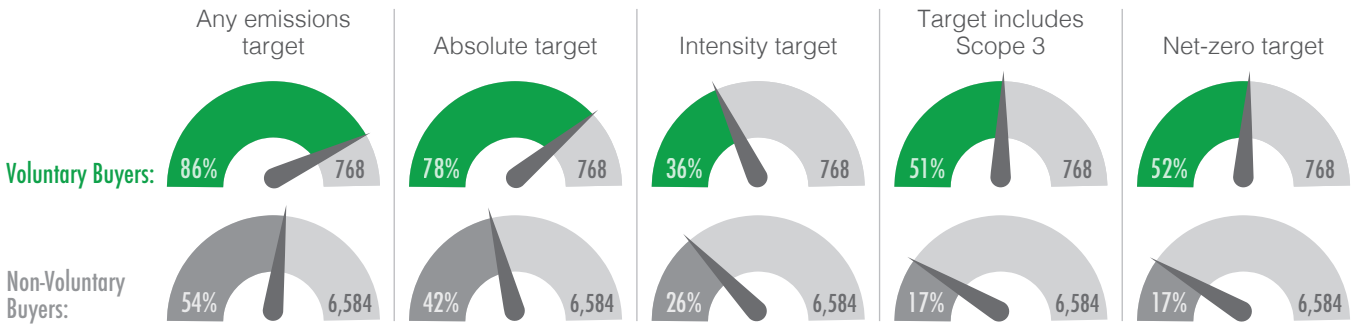
Establishing and publicly announcing a practical and achievable GHG emissions reduction target, especially one that is reported on regularly to gauge progress, is one of the most important steps a company can take towards achieving material climate benefits. Targets provide the basis for companies to strategize and identify investments they can make to achieve emissions reductions. If companies are setting their targets voluntarily (i.e., they are not obligated through a compliance mechanism), it is purely their decision how rigorous to make them, and whether to set an emissions reduction target in the first place.

While critics of voluntary carbon markets warn that buying credits for corporate use delays direct climate action like emissions reduction, EM has consistently found the opposite to be true. EM's analysis of CDP data suggests that buyers of voluntary carbon credits have higher levels of ambition for climate action than non-buyers.

By setting their ambition to address climate change, especially when the decision to make this goal is made at the C-suite or board level, companies set the wheels in motion for nearly every other action they will take to achieve climate sustainability. Without time-bound and quantifiable absolute and/or intensity targets, companies lack direction on the required quantity of emissions reductions and the necessary timeline. Targets have the greatest materiality if they are science-based and will put the company on the global pathway towards the Paris Agreement "stretch" target of limiting global warming to 1.5°C this century. Net-zero targets are an even more specific and prescriptive way to signal a commitment to achieving net-zero emissions by a specific date, ideally no later than 2050.

Voluntary carbon buyers were more likely to have targets to address climate change, and their targets were more ambitious. Most VCM buyers (78 percent of 768 companies) had at least one absolute target (Figure 6), while 52 percent had a net-zero target and 34 percent had a science-based target approved by SBTi (Figure 7), compared with non-buyers, where 42 percent had an absolute target, 17 percent had a net-zero target, and just 10 percent had an approved science-based target.

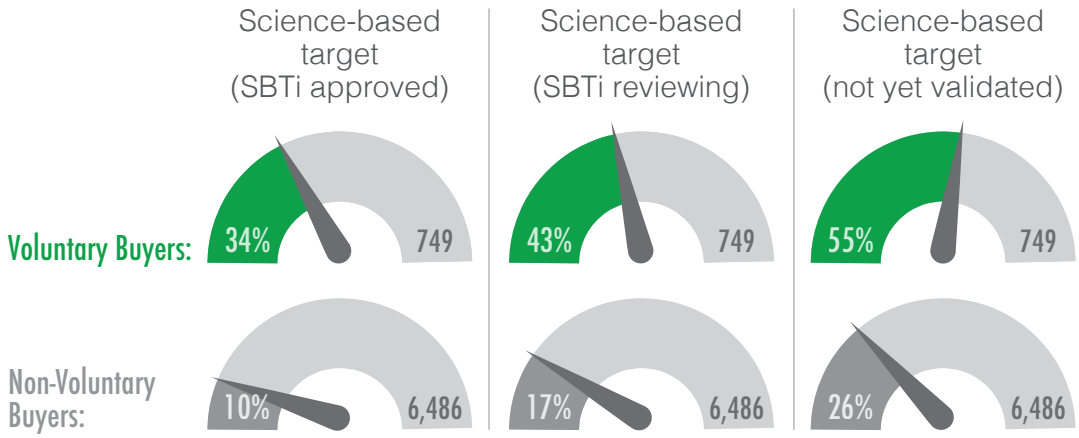
FIGURE 6. GHG TARGETS, SHARE OF VOLUNTARY CARBON BUYERS VS. NON-VOLUNTARY CARBON BUYERS



Source: Ecosystem Marketplace, 2023

Note: Based on responses by 768 companies that purchased voluntary carbon credits in 2021 and 6,584 companies that either only purchased or originated compliance credits or did not participate in carbon credit markets in 2021 ("Non-Voluntary Carbon Buyers").

FIGURE 7. SCIENCE-BASED TARGET STATUS, BY SHARE OF VOLUNTARY CARBON BUYERS VS. NON-VOLUNTARY CARBON BUYERS



Source: Ecosystem Marketplace, 2023

Note: This figure indicates the percentage of organizations that have reached at least the indicated level of science-based target. "SBTi reviewing" includes organizations with targets under review or approved by SBTi, and "not yet validated" includes those organizations as well as those whose science-based target(s) has not yet been validated but has been set. Figures are based on responses by 749 non-fossil fuel industry companies that purchased voluntary carbon credits in 2021 and 6,486 companies that either only purchased or originated compliance credits or did not participate in carbon credit markets in 2021 ("Non-Voluntary Carbon Buyers"). Fossil fuel organizations were excluded from this comparison

Providing further reassurance that voluntary carbon buyers have a comprehensive strategy in place and are not just buying carbon credits is the clear gap between voluntary carbon buyers (51 percent) and non-voluntary carbon buyers (17 percent) with targets that include Scope 3 emissions (Figure 6). As noted previously, the majority of voluntary carbon buyers' emissions reside in this scope.

PART C
CARBON BUYERS LEAD ON CLIMATE ACTION

There are investment options for companies to reduce their corporate GHG emissions or avoid them altogether. These options sit on a matrix of cost (to implement) and impact (in terms of GHG emissions reductions). Companies that have moved through the key climate transparency, accountability, and ambition criteria in the preceding section, most notably in reaching the point where they've set science-based targets, will be best positioned to make the most effective use of their funds for the short, medium, and long term.

Typically, companies beginning their climate action and decarbonization journeys will start with the no-cost and cheaper, easier methods that will have the greatest, quickest impact (i.e., the low-hanging fruit). Reducing Scope 1 and 2 emissions is relatively simple: wherever possible, companies can switch to cleaner fuels, install scrubbers to minimize direct emissions, source renewable electricity and/or purchase Renewable Energy Credits (or equivalent).[11] Scope 3 emissions are trickier. Since those emissions are generated by the company's suppliers (upstream), customers (downstream), and other companies and organizations, companies have limited control over Scope 3 unless they exert their influence to require these other parties to act on climate. This partly explains why companies typically purchase voluntary carbon credits to address Scope 3. However, an increasing awareness of unavoidable emissions in Scopes 1 and 2 provides an opportunity for companies as well.

Voluntary carbon buyers, while just 17 percent of all companies that disclosed investments into emissions reduction activities, accounted for 40 percent of total investment in emissions reduction activities (Table 3). Said another way, while there are 4.8 times as many non-buyers as companies that are

TABLE 3. INVESTMENT INTO EMISSIONS REDUCTION ACTIVITIES, SHARE OF VOLUNTARY CARBON BUYERS AND NON-VOLUNTARY CARBON BUYERS

CDP COMPANY SEGMENTATION BY CARBON MARKET PARTICIPATION STATUS	VOLUNTARY CARBON BUYERS	NON-CREDIT USERS[12]
TOTAL NUMBER OF COMPANIES	551 (17%)	2,672 (83%)
TOTAL INVESTMENT IN EMISSIONS REDUCTION	$49,490,406,826	$77,098,139,284
MEDIAN INVESTMENT IN EMISSIONS REDUCTION	$1,338,557	$447,220
MEDIAN INVESTMENT IN EMISSIONS REDUCTION PER TON CO_2e EMITTED (LOCATION-BASED)	$2.00	$1.55
MEDIAN INVESTMENT IN EMISSIONS REDUCTION PER TON CO_2e EMITTED (MARKET-BASED)	$2.30	$1.31
MEDIAN INVESTMENT IN EMISSIONS REDUCTION PER TON CO_2e EMITTED, SCOPE 1 + 2 (LOCATION-BASED)	$15.49	$9.70
MEDIAN INVESTMENT IN EMISSIONS REDUCTION PER TON CO_2e EMITTED, SCOPE 1 + 2 (MARKET-BASED)	$28.25	$13.48

Source: Ecosystem Marketplace, 2023

Note: Out of 5,537 organizations who disclosed some emissions reduction activities to CDP, 4,071 (74 percent) provided an estimate of the amount invested into these activities, and 3487 (63 percent) disclosed non-zero investment amounts. For comparison between average amounts invested into emissions reduction, we consider only the organizations that disclosed nonzero investment amounts. Of the 4,071 organizations providing an estimate of investments into emissions reduction, 2,990 (73 percent) provided an estimate of total emissions. For comparison between average amounts invested normalized by volume of CO_2e emitted, we consider only the organizations that disclosed both investment amounts and

11 e.g., Guarantee of Origin in the European Union

12 Non-credit users excludes voluntary originators, compliance originators, and compliance buyers as they are, by definition, those companies that emit enough greenhouse gases to be required to invest in emissions reduction activities to meet their carbon regulations.

voluntary buyers, those non-buyers made only 1.55 times as much investment than voluntary buyers.

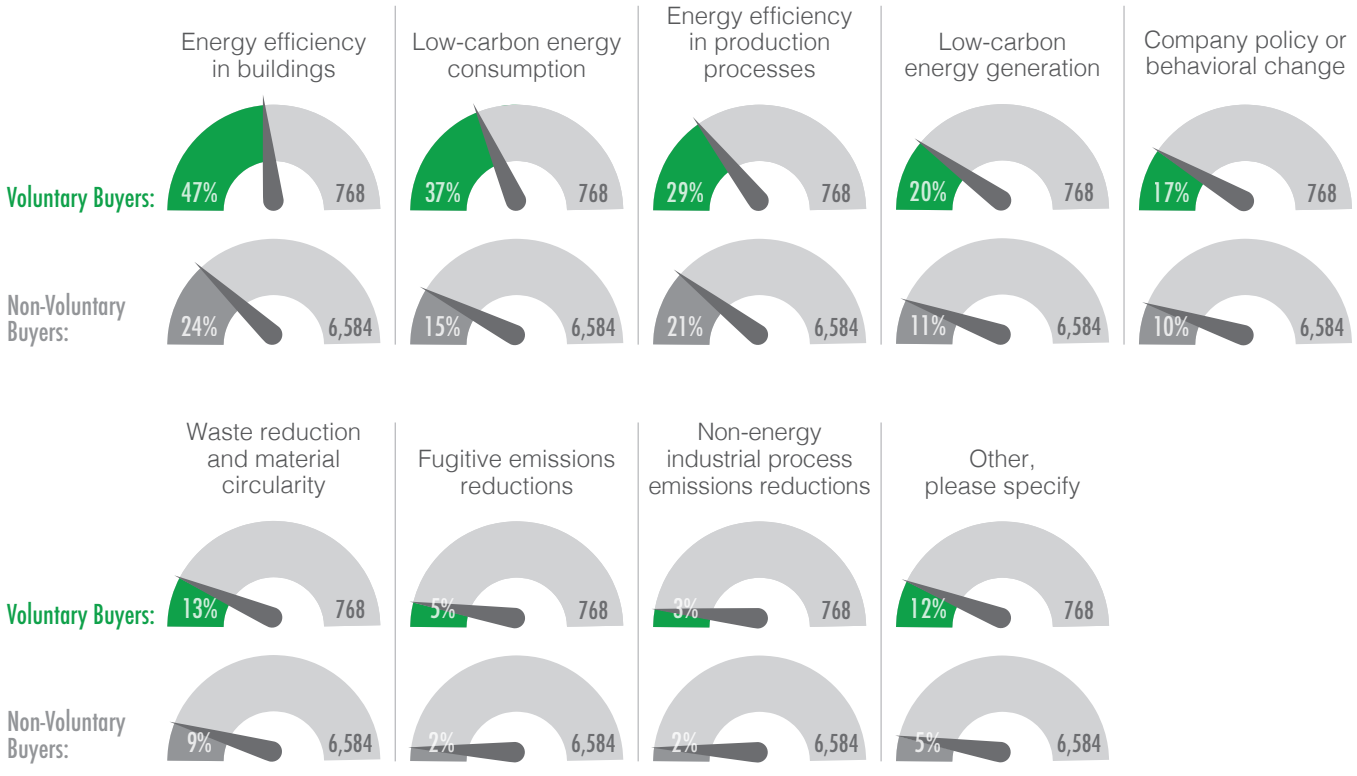
Further, the median voluntary buyer spent three times more on emissions reductions activities ($1,338,557 versus $447,220, respectively) and one and a half to two times more per ton of CO2e emitted (Scopes 1 and 2) than the typical non-buyer

Consistent with EM findings from our 2016 report on this topic, companies that buy credits still out-invest non-buyers. Though companies across the board stepped up their climate investments between 2014 and 2021, the gap in the amount of money spent on emissions reductions activities between buyers and non-buyers narrowed. EM's analysis of 2014 data found that voluntary carbon buyers were spending about ten times more on emissions reductions activities than non-buyers.

This makes sense; awareness of climate change in all levels of society has increased significantly over the past seven years, as has corporate recognition that governments alone cannot solve the climate crisis.

Looking closer at corporate claims of engagement in emissions reduction activities, we found that organizations disclosing to CDP participate in a wide range of initiatives to reduce their GHG emissions (Figure 8). The most prevalent individual activities disclosed to CDP are all in the category of energy efficiency improvements in buildings or production processes, including investments in improved efficiency of lighting (1,568 companies), process optimization (1,295), and HVAC systems (934). These are followed by low-carbon energy generation in the form of photovoltaic solar power (833) and electing to consume a low-carbon energy mix (587). While not all emissions reduction activities are applicable to all organizations (e.g., organizations that do not produce products cannot optimize production processes), looking across CDP activity groups gives a good picture of the most prevalent ways in which companies are seeking to reduce their emissions, particularly across Scope 1 and Scope 2.

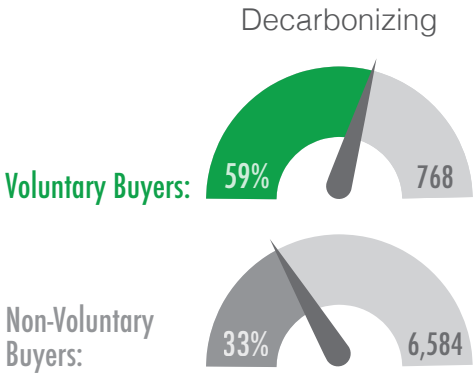
FIGURE 8. ENGAGEMENT IN EMISSIONS REDUCTION, BY ACTIVITY GROUP, SHARE OF VOLUNTARY CARBON BUYERS VS. NON-VOLUNTARY CARBON BUYERS



Source: Ecosystem Marketplace, 2023

Note: Based on responses by 768 companies that purchased voluntary carbon credits in 2021 and 6,584 companies that either only purchased or originated compliance credits or did not participate in carbon credit markets in 2021 ("Non-Voluntary Carbon Buyers"). Respondents could indicate that they were engaged in multiple types of emissions reduction activities. Emissions reduction activity groups are sourced directly from CDP.

FIGURE 9. YEAR-ON-YEAR DECARBONIZATION SUCCESS DISCLOSED BY COMPANIES, SHARE OF VOLUNTARY CARBON BUYERS VS. NON-VOLUNTARY CARBON BUYERS



Source: Ecosystem Marketplace, 2023

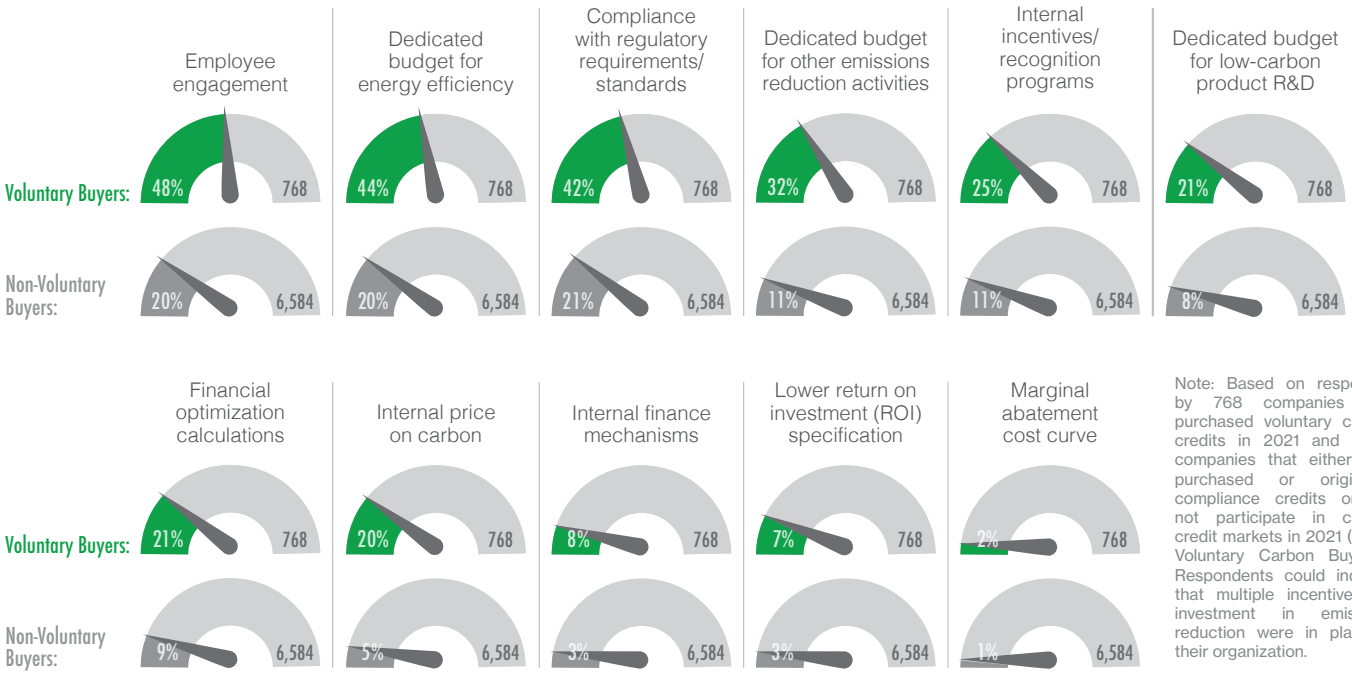
Note: Based on responses by 768 companies that purchased voluntary carbon credits in 2021 and 6,584 companies that either only purchased or originated compliance credits or did not participate in carbon credit markets in 2021 ("Non-Voluntary Carbon Buyers").

In fact, companies who voluntarily buy carbon credits are decarbonizing[13] faster than companies who do not by investing in emissions reduction activities for their business and operations, including renewable energy consumption and the purchase of Renewable Energy Certificates (RECs) (Figure 9).

What's Driving Investment in Climate Action?

Of the 7,352 companies that reported a method that drove their investments into emissions reduction activities in 2021, 463 cited an internal price on carbon: 20 percent (156) of voluntary carbon buyers versus 5 percent (307) of non-voluntary carbon buyers (Figure 10).

FIGURE 10. METHODS DRIVING INVESTMENT IN EMISSIONS REDUCTION ACTIVITIES, BY SHARE OF VOLUNTARY CARBON BUYERS VS. NON-VOLUNTARY CARBON BUYERS



Note: Based on responses by 768 companies that purchased voluntary carbon credits in 2021 and 6,584 companies that either only purchased or originated compliance credits or did not participate in carbon credit markets in 2021 ("Non-Voluntary Carbon Buyers"). Respondents could indicate that multiple incentives for investment in emissions reduction were in place in their organization.

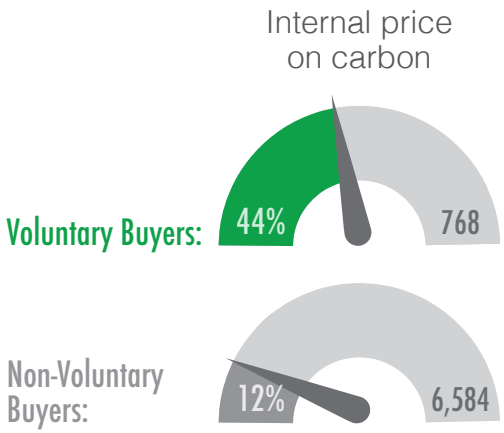
Source: Ecosystem Marketplace, 2023

[13] "Decarbonizing" is here defined as companies that reported lower gross emissions in 2021 than in 2020 and identified renewable energy consumption or other emissions reduction activities as a contributing cause.

The greatest motivator for the 3,352 companies that invested in emissions reduction activities was to comply with regulatory requirements and standards (1,814), followed by employee engagement (1,770) and a dedicated budget for energy efficiency (1,769).

Interestingly, independent of investments in emissions reduction activities, a total of 1,128 companies – 44 percent (338) of voluntary carbon buyers versus 12 percent (790) of non-buyers – reported separately that they had an internal price on carbon for their business strategies (Figure 11). An internal price in this sense could be used to manage climate-related risks, identify climate-related opportunities, transition to and invest in low-carbon activities, and change internal awareness and behavior within the company. In other words, less than half of all companies that had an internal price on carbon reported that the internal price was a factor in their investment into emissions reduction activities (483/1,128).

FIGURE 11. COMPANIES RELYING ON AN INTERNAL PRICE ON CARBON TO DRIVE THEIR BUSINESS STRATEGY, SHARE OF VOLUNTARY CARBON BUYERS VS. NON-VOLUNTARY CARBON BUYERS



Source: Ecosystem Marketplace, 2023

Note: Based on responses by 768 companies that purchased voluntary carbon credits in 2021 and 6,584 companies that either only purchased or originated compliance credits or did not participate in carbon credit markets in 2021 ("Non-Voluntary Carbon Buyers").

PART D
SCRATCHING THE SURFACE:
JUST OVER 2 PERCENT OF GHG EMISSIONS COVERED BY VOLUNTARY CARBON PURCHASES, VALUED AT $488 MILLION

The typical carbon market buyer in 2021 purchased credits representing less than two percent (1.85 percent) of its total emissions. This number increases slightly for the category of voluntary carbon buyers who purchased just over two percent (2.16 percent) of their total GHG emissions. This is a far cry from the negative perception that "companies are buying their way out of the problem" with the voluntary carbon market. Stated another way, the volume of voluntary carbon credits reported by CDP companies accounted for less than one percent (0.90 percent) of all voluntary carbon buyers' emissions – the total volume of voluntary carbon credits purchased (121.2 $MtCO_2e$) calculated against total emissions from voluntary carbon buyers of 13.5 $GtCO_2e$ (location-based). (Note that total emissions inherently exclude the 157.8 $MtCO_2e$ that were avoided through voluntary carbon buyers' emissions reduction activities.)

As stated previously, we recognize that the CDP dataset is an incomplete accounting of buyers, as EM recorded over 518.3 $MtCO_2e$ of transactions in 2021. Additionally, EM has received confidential reports of 2,477 known corporate buyers, of which 204 (8.2 percent) disclosed some climate data to CDP in 2022, and 130 (5.2 percent) also disclosed buying or originating project-based carbon credits (see the About the Data section).

Looking at this in the context of emissions reductions discussed in Part C, voluntary carbon buyers purchased 26 percent less carbon credit volume than the reductions they achieved through their emissions reduction activities (157.8 $MtCO_2e$). Meanwhile, all other companies achieved 112.2 $GtCO_2e$ of emissions reductions through their own activities. If we apply EM's 2021 Global Carbon Market price/ton of $4.03 to the volume of carbon credits purchased in 2021, CDP disclosing companies theoretically spent $488.4 million in the voluntary carbon market.

Returning to the "normalized" sample of 708 voluntary carbon buyers reporting non-zero Scope 1 and Scope 3 emissions (see Part A), the hypothetical total Scope 1 and 2 emissions of this sample of organizations were 1.1 $GtCO_2e$ (includes their reported emissions plus emissions reductions associated with their emissions reduction activities) and Scope 3 emissions were 1.2 $GtCO_2e$. If we understand that emissions reduction activities are for Scopes 1 and 2, and we assume that carbon credits are applied to Scope 3, which is an overstatement, then emissions reduction activities accounted for 14 percent of hypothetical Scope 1 and 2 emissions, whereas voluntary carbon credits accounts for just one percent of actual Scope 3 emissions.

CONCLUSIONS AND LOOKING FORWARD

Buying voluntary carbon market credits goes hand-in-hand with an integrated and comprehensive corporate strategy to accelerate global climate action and decarbonize their business

With corporate use of carbon credits increasing even as organizations face growing scrutiny of their use of credits in carbon neutrality claims, and with a record volume of carbon credit transactions taking place in 2021, it is more important than ever to understand the climate action and decarbonization behavior of companies who voluntarily purchase carbon credits. It's equally important to understand the behavior of companies that do not engage in the voluntary carbon market.

In 2021, voluntary carbon credit buyers outperformed other companies on transparency and accountability related to climate issues, and demonstrated stronger ambition to become climate leaders, including through actions already being taken to address their climate impacts. These findings are remarkably consistent with previous analyses by EM dating back to 2015. In other words, this report does not document so much of a recent shift toward integrity driven by new scrutiny as much as a trend of continued improvement.

Voluntary carbon market transparency needs investment to drive integrity

Since 2020, EM has invested in and increased its efforts to ensure supply- and sell-side transparency in the global voluntary carbon markets. One of the ways we have enhanced our efforts has been to request disclosure of buyer names, which we maintain confidentially in our secure database and our EM Respondents accounts on our Global Carbon Markets Hub.

With this increased focus on credit end users, our total count of carbon buyers for 2020-2023 year-to-date is nearly 2,500 unique names. However, only 8.2 percent of the total buyers reported to EM are disclosing to CDP, and more buyers' names were identified from our review of carbon standards' registries of credit retirements, indicating a clear gap in buyer transparency that needs to be addressed. Not just for the big corporates but for all of the small and medium sized businesses.

EM welcomes the work of VCMI to create a standard approach for voluntary carbon buyers' climate ambition and action criteria, as well as how companies should report their claims on project-based carbon credits. The VCMI Claims Code was only just published in 2023, with publication of the final version expected in November 2023 (after the publication of this report). Companies should be able to use this guidance to report on their carbon purchases within the context of the rest of their climate action strategies.

As the market continues to evolve, EM stands ready to continue to drive carbon market transparency, knowledge, and insights as a globally trusted, independent, and neutral non-profit initiative. To do this effectively, we look forward to engaging with the entire carbon market value chain and stakeholder network who have a common vision for high-integrity and well-functioning global carbon markets that achieve results on the ground and in corporate boardrooms.

APPENDIX 1: METHODOLOGY

Due to the self-reported nature of CDP data, it is difficult to know with certainty the boundaries and definitions that companies used in disclosure of emissions and engagement with project-based carbon credits. As a result, we took several approaches to standardize the data used for the insights in this report.

Criteria for Inclusion

The CDP Climate Change 2022 Public Disclosure Data captures the activity of organizations in calendar year 2021. Different organizations have different reporting years, so we focused on organizations whose reporting periods covered at least 6 months (181 days) of calendar year 2021. The total number of organizations meeting that criterion was 7,415.

Project-based Carbon Credit Data

Data on project-based carbon credits comes from CDP Climate Change module C11, "Carbon pricing", specifically questions C11.2 and C11.2a. While reviewing disclosed credit purchases and originations, we identified many irregularities in this self-reported data, likely due to confusion around types of credit schemes, project methodologies, and distinctions between credit purchases and origination.

Improperly reported project-based credits

While examining carbon credit disclosures, we found that several companiess misclassified RECs, RINs, and ETS participation as project-based carbon credit purchase or origination. We removed 21 companies that only reported these misclassified credits from the carbon credit data and reclassified them as non-participants in project-based carbon credits. For five other companies that did purchase or originate legitimate project-based credits, we removed any individual disclosures of these misclassified credits. Where credits were disclosed with a volume of zero tons CO_2e, we removed these credits from the carbon credit dataset.

Credit purposes and defining organizational use of credits

CDP respondents have the option to define their purpose in purchasing or originating project-based carbon credits as voluntary, compliance with local or industry requirements and regulations, or another purpose that they could specify. We categorized all credits by purpose into voluntary, compliance, or other by going through all self-specified credit purposes and making a determination as to whether the credit use was voluntary or for compliance. If it was not possible to determine the credit purpose from the description, if the future use of the credits could be either voluntary or compliance, or if voluntary and compliance credits were combined in a single disclosure, we classified the purpose as "other."

To compare voluntary and compliance users of credits, we defined a company as a voluntary credit user if they disclosed purchasing or originating any volume of voluntary credits, even if the majority of their credit use was for compliance purposes.

Voluntary credit origination

About 7.5 times as many respondents disclose purchasing credits as those who disclose originating credits. When we examined disclosures from 98 companies that reported originating voluntary credits and not purchasing any credits, we found that there was more inconsistency with disclosures about credit origination than credit purchases. In addition to identifying 5 companies that were originating RECs instead of project-based credits, we found 11 circumstances where credit purchases were clearly misidentified as credit origination. We also found 10 credit disclosures that represented credits originated by an external partner and financed through an offtake agreement with the company disclosing to CDP. We reclassified these offtake agreements as credit purchases, because they are originated by a third party and not by the disclosing company itself.

Because of the inconsistencies with credit reporting for organizations that disclosed originating voluntary credits but did not disclose buying any, we chose to focus our comparative analysis of CDP disclosers on voluntary credit buyers, with a control group combining compliance buyers and originators and project-based carbon credit non-users, referred to non-voluntary credit users. The voluntary originating companies are included in summary tables and charts of all CDP companies, but they are not the focus of the main analysis differentiating between engagement in emissions reduction activities and internal incentive programs, awareness of climate risks, board oversight of climate issues, assurance of emissions and carbon credit activities, target setting,

internal carbon prices, value chain engagement, and decarbonization.

Project methodologies

We found that the CDP typology of project methodologies was not well-aligned with EM's internal taxonomy of project methodologies. In particular, CDP does not distinguish between several forest-based project types such as REDD, ARR, and IFM, lumping these into the non-descriptive category of "Forests." Where it was possible to make a determination based on the project description, we identified REDD and ARR projects and split them into their own categories. We combined projects relating to industrial gas emission avoidance (CDP project types "HFCs," "N2O," and "PFCs and SF6") into an "Industrial/refrigerant gases" category. We combined five categories relating to energy distribution and energy efficiency in industry, power generation, service, and supply together with fuel switching projects to create the "Energy efficiency and fuel switching" category. We combined "Energy efficiency: households" with several self-reported projects relating to household and community devices, such as cookstoves, solar cookers, and clean water access, into the "Household devices" category. Respondents also had the option to specify their own project methodology, and we assigned every project with a respondent-specified methodology to its own category, including categories that CDP did not include such as "Blue carbon" and "IFM." Many of these self-specified entries referred to a combination of renewable energy projects, including biofuel energy generation, which we combined into a "Mixed renewables" category.

Emissions Data

Data on greenhouse gas emissions come from CDP Climate Change module C6, emissions data, specifically questions C6.1, C6.3, and C6.5.

Organizations responding to the CDP Climate Change 2022 Disclosure had the option to disclose Scope 1, Scope 2, and Scope 3 emissions in separate questions. Companies were under no obligation to disclose emissions data in any scope. Scope 2 emissions could be reported as a location-based estimate, a market-based estimate accounting for electricity supplier emissions factors and residual emissions factors, or both.

Disclosure of emissions varied both by scope and by company engagement with carbon credits:

- Among 830 voluntary credit buyers and originators, 98 percent reported non-zero Scope 1 emissions, 100 percent reported non-zero location-based Scope 2 emissions, 92 percent reported non-zero market-based Scope 2 emissions, and 96 percent reported non-zero Scope 3 emissions;
- For the 54 organizations that bought or originated compliance credits but no voluntary credits, 100 percent reported nonzero Scope 1 emissions, 96 percent reported non-zero location-based Scope 2 emissions, 94.4 percent reported non-zero market-based Scope 2 emissions, and 94 percent reported non-zero Scope 3 emissions; and
- Out of 6476 organizations not buying or originating credits, 94 percent reported non-zero Scope 1 emissions, 99 percent reported non-zero location-based Scope 2 emissions, 98 percent reported non-zero market-based Scope 2 emissions, and 49.5 percent reported nonzero Scope 3 emissions.

Because there was more variation between carbon credit users' and non-credit users' frequency of disclosing Scope 1 and Scope 3 emissions, and because companies may have zero Scope 2 emissions through purchases of clean energy or RECs, we restricted our analysis of emissions to 3,925 organizations that reported both non-zero Scope 1 and Scope 3 emissions. Tables showing distributions of emissions by scope and median investments in emissions reduction for all respondents are located in the appendix.

It was more common for a responding company to disclose location-based estimates of Scope 2 emissions than market-based estimates, due to unavailability of relevant data or for other reasons. Wherever possible, we report both location-based and market-based estimates for Scope 2 emissions and for total emissions for all scopes. When location-based or market-based estimates are not specified, such as in the table on credit purchase and origination as a proportion of total emissions, we have used location-based estimates of total emissions to include as many companies as possible.

Other CDP Data

In addition to the carbon credit data and emissions data described above, we used CDP Climate Change 2022 Disclosure Data from modules C0, C1, C4, C7, C10, C11, and C12.

From module C0, introduction, we used question C0.2 to define companies' reporting year as either in or out of bounds for inclusion. We used question C0.4 to obtain currency codes to convert reported investments into emissions reduction to dollars.

From module C1, governance, we used question C1.1 to answer whether there was board-level oversight of climate issues within companies.

From module C4, targets and performance, we used questions C4.1a and C4.1b for information on absolute and intensity emissions targets. We used question C4.2 to determine whether companies had net-zero targets. We used question C4.3b for information on emissions reduction initiatives and associated investments, and we used question C4.3c to understand internal organizational methods used to incentivize emissions reduction.

From module C7, emissions breakdown, we used questions C7.9 and C7.9a to define organizations that are decarbonizing.

From module C10, verification, we used questions C10.1a, C10.1b, and C10.1c to understand assurance for Scope 1, Scope 2, and Scope 3 emissions. We used question C10.2a to identify companies that undertook assurance on their use of project-based carbon credits.

From module C11, carbon pricing, we used question C11.3 to determine if companies had an internal carbon price.

From module C12, engagement, we used question C12.1 to determine whether companies engaged other members of their value chains.

APPENDIX 2: ADDITIONAL TABLES & FIGURES

TABLE S1. TOP 50 CORPORATE VOLUNTARY CARBON CREDIT BUYERS, BY VOLUME, 2021 (AS DISCLOSED TO CDP IN 2022)

COMPANY	INDUSTRY	EMISSIONS VOLUME
DELTA AIR LINES	TRANSPORTATION SERVICES	26,943,120
TOTALENERGIES	FOSSIL FUELS	7,000,000
SHELL PLC	FOSSIL FUELS	6,376,857
VOLKSWAGEN AG	MANUFACTURING	6,099,241
TAKEDA PHARMACEUTICAL COMPANY LIMITED	BIOTECH, HEALTH CARE, & PHARMA	4,657,868
COMCAST CORPORATION	SERVICES	3,116,077
DIAMONDBACK ENERGY INC	FOSSIL FUELS	3,000,000
LA POSTE	TRANSPORTATION SERVICES	2,638,202
TELSTRA CORPORATION	SERVICES	2,546,516
ENI SPA	FOSSIL FUELS	2,317,076
BP	FOSSIL FUELS	2,188,030
EASYJET	TRANSPORTATION SERVICES	2,123,278
AMBIPAR PARTICIPACOES E EMPREENDIMENTOS	SERVICES	1,811,578
NESTLÉ	FOOD, BEVERAGE & AGRICULTURE	1,803,273
KERING	APPAREL	1,779,888
VATTENFALL GROUP	POWER GENERATION	1,700,000
CPFL ENERGIA SA	INFRASTRUCTURE	1,624,215
MINERVA FOODS	FOOD, BEVERAGE, & AGRICULTURE	1,477,506
LOGITECH EUROPE S.A.	MANUFACTURING	1,402,370
EDF	POWER GENERATION	1,283,422
BOEING COMPANY	MANUFACTURING	1,207,500
ECOPETROL S.A.	FOSSIL FUELS	1,169,836
LEGRAND	MANUFACTURING	1,139,120
SALESFORCE.COM, INC.	SERVICES	1,096,000
INPEX CORPORATION	FOSSIL FUELS	1,000,000
BARILLA HOLDING SPA	FOOD, BEVERAGE, & AGRICULTURE	909,299
ROBERT BOSCH GMBH	MANUFACTURING	907,118
BMW AG	MANUFACTURING	864,630
THE WALT DISNEY COMPANY	SERVICES	818,500
AIR FRANCE - KLM	TRANSPORTATION SERVICES	764,000

COMPANY	INDUSTRY	EMISSIONS VOLUME
CHANEL	APPAREL	723,333
APPLE INC.	MANUFACTURING	667,000
REMY COINTREAU	FOOD, BEVERAGE, & AGRICULTURE	630,170
BAOSTEEL	MATERIALS	604,606
HERA	INFRASTRUCTURE	582,816
AVIANCA GROUP	TRANSPORTATION SERVICES	573,863
ERNST & YOUNG GLOBAL LTD	SERVICES	528,000
DMG MORI AKTIENGESELLSCHAFT	MANUFACTURING	515,176
ROYAL CARIBBEAN CRUISES LTD	TRANSPORTATION SERVICES	512,840
SAS	TRANSPORTATION SERVICES	507,000
DEUTSCHE POST DHL GROUP	TRANSPORTATION SERVICES	495,508
ETSY, INC.	SERVICES	482,898
ENERJISA ÜRETIM SANTRALLERI A.Ş.	POWER GENERATION	481,686
BHP	MATERIALS	469,984
CONTACT ENERGY	POWER GENERATION	458,100
ZALANDO SE	RETAIL	438,933
RYANAIR HOLDING PLC	TRANSPORTATION SERVICES	436,110
DANONE	FOOD, BEVERAGE, & AGRICULTURE	409,291
SHOPIFY INC	SERVICES	405,997
CENTRICA	INFRASTRUCTURE	399,193

Source: Ecosystem Marketplace, 2023

TABLE S2. TOP 50 NON-BUYERS OF CARBON CREDITS, BY GHG EMISSIONS

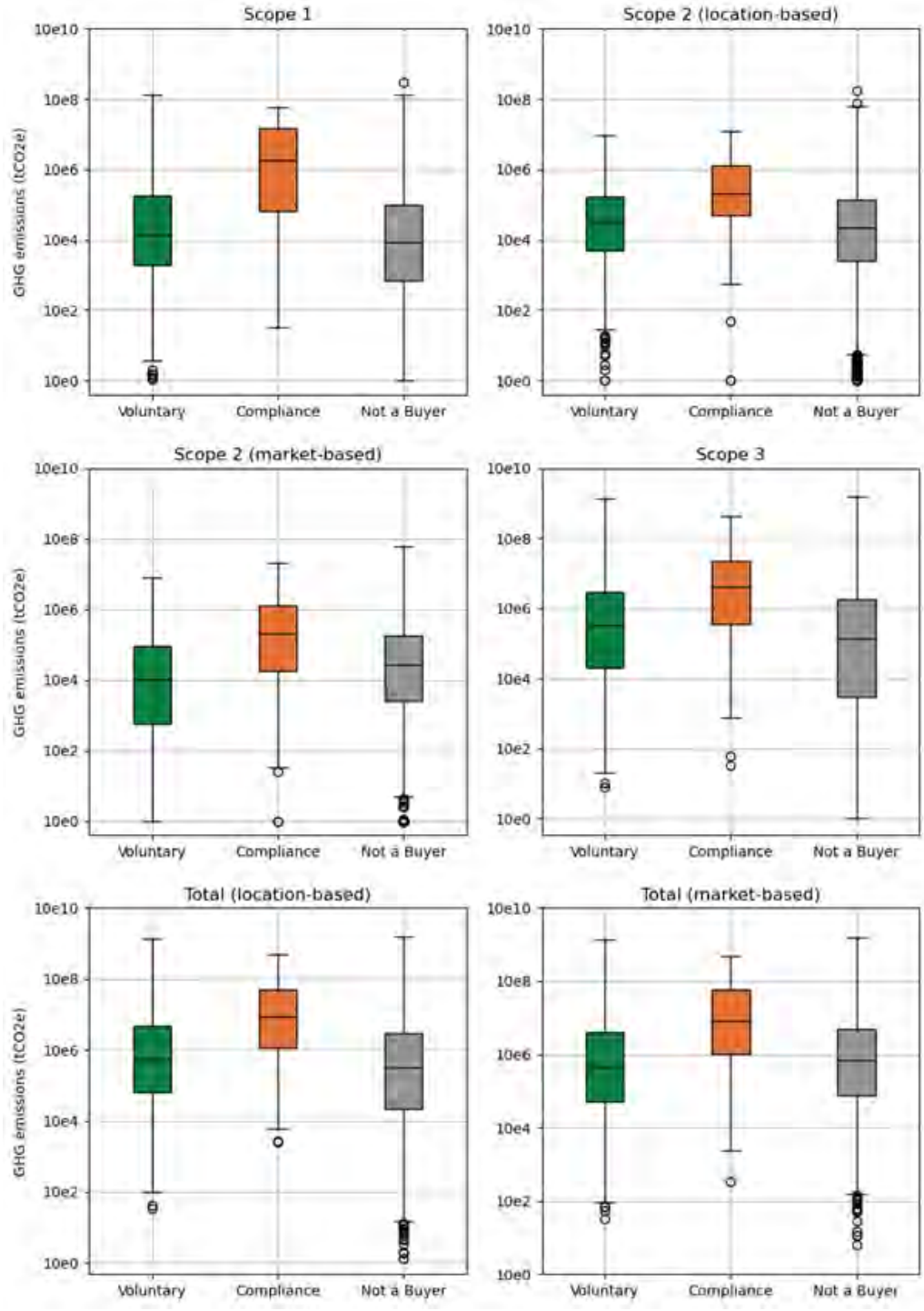
COMPANY	INDUSTRY	EMISSIONS VOLUME
T.ŞİŞE VE CAM FABRİKALARI A.Ş.	MATERIALS	3,025,967,906
MITSUBISHI HEAVY INDUSTRIES, LTD.	MANUFACTURING	1,580,886,336
HNI CORPORATION	MANUFACTURING	1,344,932,778
CUMMINS INC.	MANUFACTURING	1,170,640,962
GIRTEKA	TRANSPORTATION SERVICES	838,493,546
ATENTO BRASIL S/A	SERVICES	772,387,218
EMERSON ELECTRIC CO.	MANUFACTURING	592,095,630
RIO TINTO	MATERIALS	580,400,000
GINGER LOGISTICS INT`L CO.,LTD	TRANSPORTATION SERVICES	546,045,222
BERLIN PACKAGING LLC	RETAIL	544,439,674
VALE SA	MATERIALS	505,698,647
PETRÓLEO BRASILEIRO SA – PETROBRAS	FOSSIL FUELS	504,367,651
SIEMENS AG	MANUFACTURING	470,138,422
KONGSBERG AUTOMOTIVE HOLDING ASA	MANUFACTURING	457,845,076

COMPANY	INDUSTRY	EMISSIONS VOLUME
TOYOTA MOTOR CORPORATION	MANUFACTURING	421,325,452
TRANE TECHNOLOGIES	MANUFACTURING	403,062,084
PJSC LUKOIL	FOSSIL FUELS	393,032,247
DAIKIN INDUSTRIES, LTD.	MANUFACTURING	308,133,874
DANIELI & C OFFICINE MECCANICHE S.P.A.	MANUFACTURING	306,922,490
NTPC LTD	POWER GENERATION	305,264,310
FORD MOTOR COMPANY	MANUFACTURING	303,231,648
PRYSMIAN SPA	MANUFACTURING	285,342,559
HONDA MOTOR CO., LTD.	MANUFACTURING	280,076,640
EBARA CORPORATION	MANUFACTURING	256,447,126
HELLENIC CABLES S.A.	MANUFACTURING	247,414,458
TOSHIBA CORPORATION	INFRASTRUCTURE	243,911,554
CONOCOPHILLIPS	FOSSIL FUELS	243,320,000
BAKER HUGHES COMPANY	SERVICES	237,633,772
FLOREMPAQUE CIA LTDA	MANUFACTURING	237,093,669
GENERAL MOTORS COMPANY	MANUFACTURING	236,937,012
EQUITRANS MIDSTREAM	FOSSIL FUELS	214,998,966
FLSMIDTH & CO. A/S	MANUFACTURING	212,446,346
THE HOME DEPOT, INC.	RETAIL	202,640,892
PROCTER & GAMBLE COMPANY	MATERIALS	199,332,130
WOLFSPEED, INC.	MANUFACTURING	197,204,102
FORTUM OYJ	POWER GENERATION	190,056,500
IHI CORPORATION	MANUFACTURING	184,729,491
FUJI ELECTRIC CO., LTD.	MANUFACTURING	179,937,277
SHYA HSIN PACKAGING INDUSTRY(CHINA)CO.,LTD.	MANUFACTURING	178,629,059
OI S.A	SERVICES	174,820,671
NEXANS	MANUFACTURING	171,848,618
SABIC	MATERIALS	167,625,581
ENGIE	POWER GENERATION	167,114,576
MITSUBISHI ELECTRIC CORPORATION	MANUFACTURING	160,838,562
UNIPER SE	INFRASTRUCTURE	158,349,024
THE GOODYEAR TIRE & RUBBER COMPANY	MANUFACTURING	158,303,743
JERA CO., INC.	INFRASTRUCTURE	153,644,598
KOREA SHIPBUILDING AND OFFSHORE ENGINEERING	MANUFACTURING	151,715,219
PTT	FOSSIL FUELS	145,996,748
CARREFOUR	RETAIL	138,531,036

Source: Ecosystem Marketplace, 2023

Note: Some of these companies may engage in voluntary or compliance carbon credits and not disclose that engagement to CDP. Industry classifications used in this table are taken directly from CDP and do not necessarily align with GICS or other industry classification systems.

FIGURE S1. SCALE AND DISTRIBUTION OF VOLUNTARY, COMPLIANCE, AND NON-BUYER EMISSIONS



Source: Ecosystem Marketplace, 2023

TABLE S3. SCALE AND DISTRIBUTION OF VOLUNTARY/COMPLIANCE/NON-BUYER EMISSIONS

SCOPE	QUARTILE	COMPLIANCE	NON-BUYER	VOLUNTARY
SCOPE 1	MIN	31.00	0.02	0.08
	25%	67,805	705	1,952
	50%	1,870,261	8,545	13,292
	75%	14,719,360	99,356	186,526
	MAX	60,013,220	304,146,024	131,088,288
SCOPE 2 (LOCATION-BASED)	MIN	0	0	0
	25%	50,139	2,446	5,027
	50%	210,820	22,092	33,369
	75%	1,300,000	142,057	163,846
	MAX	12,566,000	174,746,546	9,196,964
SCOPE 2 (MARKET-BASED)	MIN	0	0	0
	25%	21,764	2,544	566
	50%	213,171	26,599	10,178
	75%	1,247,694	180,828	91,301
	MAX	20,829,000	61,350,688	8,152,497
SCOPE 3	MIN	32	0.01	6.8
	25%	364,354	3,093	20,655
	50%	4,263,685	134,035	338,525
	75%	22,931,150	1,789,850	3,000,420
	MAX	438,000,000	1,580,346,107	1,373,897,000
TOTAL EMISSIONS (LOCATION-BASED)	MIN	2,544	0.36	32
	25%	1,173,258	21,464	62,762
	50%	8,646,130	320,554	531,819
	75%	50,700,151	2,869,874	4,778,116
	MAX	477,900,000	1,580,910,810	1,397,890,000
TOTAL EMISSIONS (MARKET-BASED)	MIN	341	5.5	31
	25%	1,034,359	78,338	51,126
	50%	8,336,125	706,925	460,430
	75%	59,089,000	4,998,664	4,168,204
	MAX	477,900,000	1,580,861,861	1,396,890,000

Source: Ecosystem Marketplace, 2023

TABLE S4. ALL CDP ORGANIZATION SECTOR PARTICIPANTS CLUSTERED BY INDUSTRY

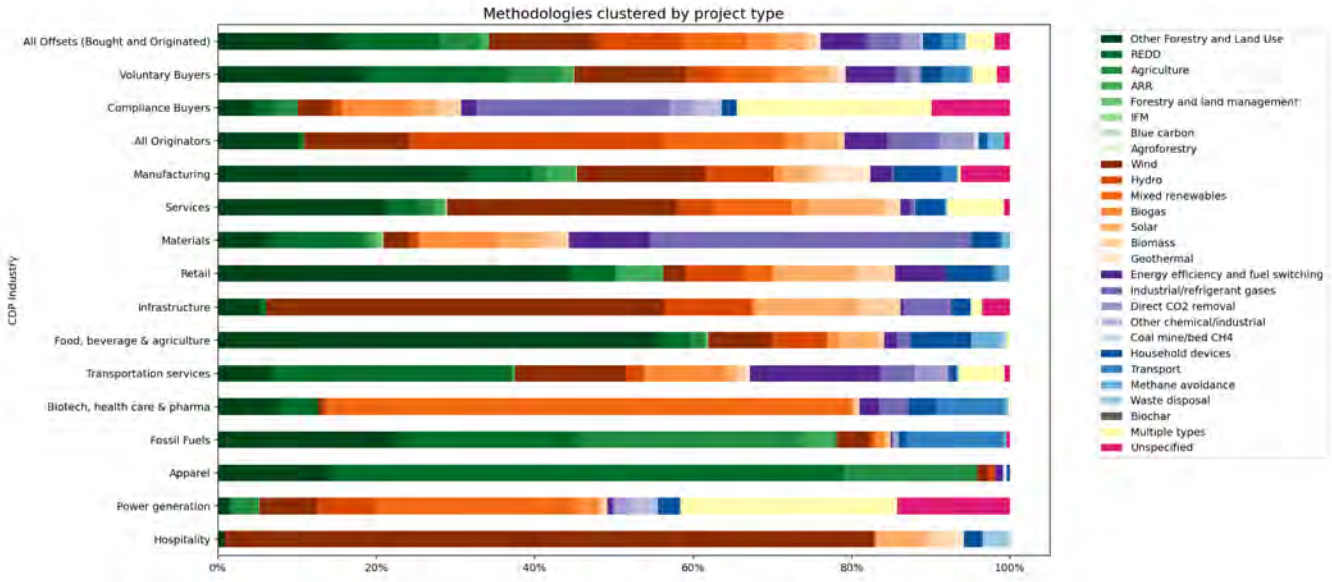
INDUSTRY	SECTOR	NO. OF ORGS.	PROPORTION OF SECTOR BY EMISSIONS	PROPORTION OF SECTOR BY VOLUME OF CARBON CREDITS BOUGHT/ ORIGINATED
APPAREL	TEXTILE & FABRIC GOODS	204	100%	100%
BIOTECH, HEALTH CARE, & PHARMACEAUTICALS	BIOTECH & PHARMA	118	64.8%	97.2%
	HEALTH CARE PROVISION	17	5.3%	0%
	MEDICAL EQUIPMENT & SUPPLIES	74	29.9%	2.8%
FOOD, BEVERAGE, & AGRICULTURE	CROP FARMING	23	3.6%	2.84%
	FISH & ANIMAL FARMING	15	3.3%	0.03%
	FOOD & BEVERAGE PROCESSING	314	90.6%	94.5%
	LOGGING & RUBBER TAPPING	2	0.9%	0%
	TOBACCO	15	1.7%	2.7%
FOSSIL FUELS	COAL MINING	6	2.1%	0.9%
	OIL & GAS EXTRACTION, & PRODUCTION	54	18.1%	23.3%
	OIL & GAS PROCESSING	28	70.1%	74.6%
	OIL & GAS RETAILING	19	4.7%	0.5%
	OIL & GAS STORAGE, & TRANSPORTATION	19	4.9%	0.7%
HOSPITALITY	BARS, HOTELS, & RESTAURANTS	41	96.6%	32.6%
	ENTERTAINMENT FACILITIES	18	3.4%	67.4%
INFRASTRUCTURE	CONSTRUCTION	209	24.1%	18.9%
	ENERGY UTILITY NETWORKS	85	70.1%	58.6%
	LAND & PROPERTY OWNERSHIP & DEVELOPMENT	61	1.6%	18.7%
	NON-ENERGY UTILITIES	30	4.2%	3.8%
MANUFACTURING	ELECTRICAL & ELECTRONIC EQUIPMENT	955	22%	38.1%
	LEISURE & HOME MANUFACTURING	108	6.5%	1.2%
	LIGHT MANUFACTURING	129	5.3%	1.3%
	METAL PRODUCTS MANUFACTURING	693	7.5%	5.3%
	PAPER PRODUCTS & PACKAGING	175	0.7%	0.4%
	PLASTIC PRODUCT MANUFACTURING	341	1.7%	0.1%
	POWERED MACHINERY	274	38.1%	6.7%
	RENEWABLE ENERGY EQUIPMENT	27	0.2%	0.2%
	TRANSPORTATION EQUIPMENT	146	18%	46.8%
	WOOD & RUBBER PRODUCTS	51	0.1%	0.01%

INDUSTRY	SECTOR	NO. OF ORGS.	PROPORTION OF SECTOR BY EMISSIONS	PROPORTION OF SECTOR BY VOLUME OF CARBON CREDITS BOUGHT/ ORIGINATED
MATERIALS	CEMENT & CONCRETE	31	10.8%	1.5%
	CHEMICALS	394	39.2%	34%
	METAL SMELTING, REFINING, & FORMING	121	18.5%	58.7%
	METALLIC MINERAL MINING	40	27.9%	4.9%
	OTHER MATERIALS	77	2.5%	0.7%
	OTHER MINERAL MINING	10	0.13%	0.01%
	WOOD & PAPER MATERIALS	30	1.1%	0.3%
POWER GENERATION	NUCLEAR POWER GENERATION	1	4.6%	4.3%
	RENEWABLE POWER GENERATION	39	8.3%	30.6%
	THERMAL POWER GENERATION	56	87.1%	65.1%
RETAIL	CONVENIENCE RETAIL	53	33.9%	20.4%
	DISCRETIONARY RETAIL	116	19.8%	53.7%
	TRADING, WHOLESALE, DISTRIBUTION, RENTAL & LEASING	219	46.3%	25.9%
SERVICES	COMMERCIAL & CONSUMER SERVICES	100	2.8%	2.4%
	FINANCIAL SERVICES	456	54.5%	19.4%
	IT & SOFTWARE DEVELOPMENT	269	3.5%	11.8%
	INDUSTRIAL SUPPORT SERVICES	118	11.3%	0.03%
	MEDIA, TELECOMMUNICATIONS, & DATA CENTER SERVICES	160	16.18%	34.3%
	OTHER SERVICES	58	5.4%	0.2%
	PRINT & PUBLISHING SERVICES	45	0.6%	0.1%
	SPECIALIZED PROFESSIONAL SERVICES	342	3.8%	25.8%
	WEB & MARKETING SERVICES	91	1.9%	6.06%
TRANSPORTATION SERVICES	AIR TRANSPORT	32	21%	84.3%
	INTERMODAL TRANSPORT & LOGISTICS	119	60.9%	12.5%
	MARINE TRANSPORT	32	12.6%	2.8%
	RAIL TRANSPORT	20	4.9%	0.1%
	ROAD TRANSPORT	130	0.7%	0.3%

Source: Ecosystem Marketplace, 2023

Voluntary Carbon Market Companies Prefer Nature-based and Renewables Credits

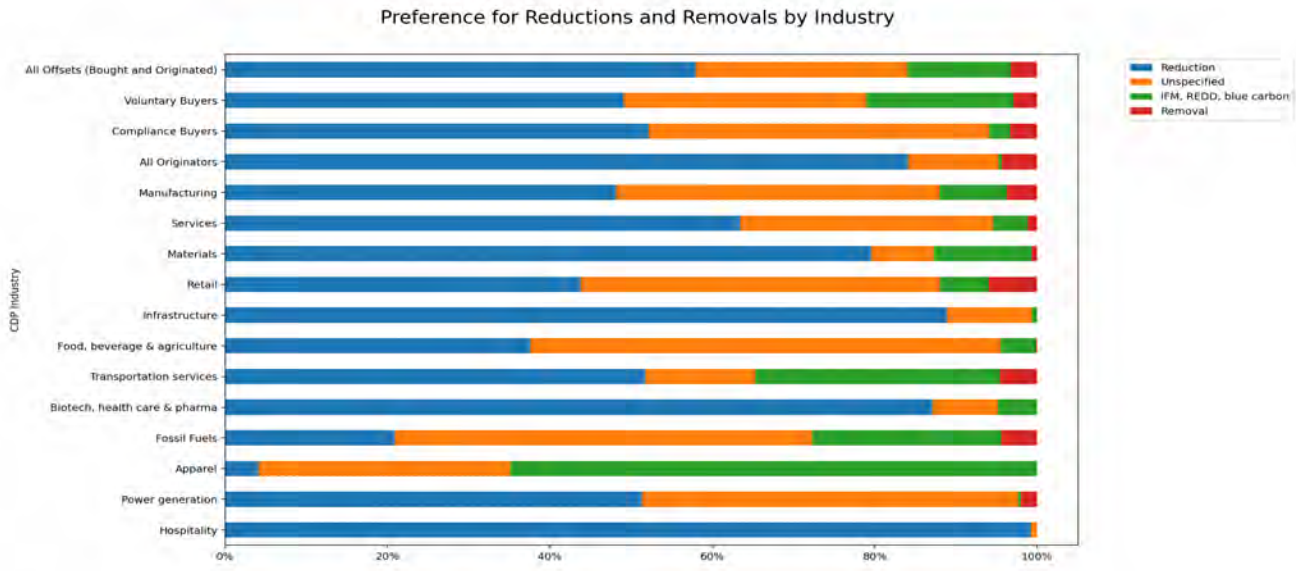
FIGURE S2. BUYER PREFERENCES BY PROJECT METHODOLOGY AND BUYER INDUSTRY (BY VOLUME CO_2e)



Source: Ecosystem Marketplace, 2023

Note: "Multiple types" refers to disclosures that included multiple unrelated project types in a single disclosure (e.g., REDD and solar power installation). Unspecified indicates that the company did not sufficiently specify the project methodology in order for EM to classify it. Project methodologies are clustered by type: green indicates nature-based solutions, orange indicates renewable energy projects, purple indicates industrial process emissions reduction, and blue indicates household efficiency, transportation, and other community emissions reduction projects. Industry classifications used in this table are taken directly from CDP and do not necessarily align with GICS or other industry classification systems.

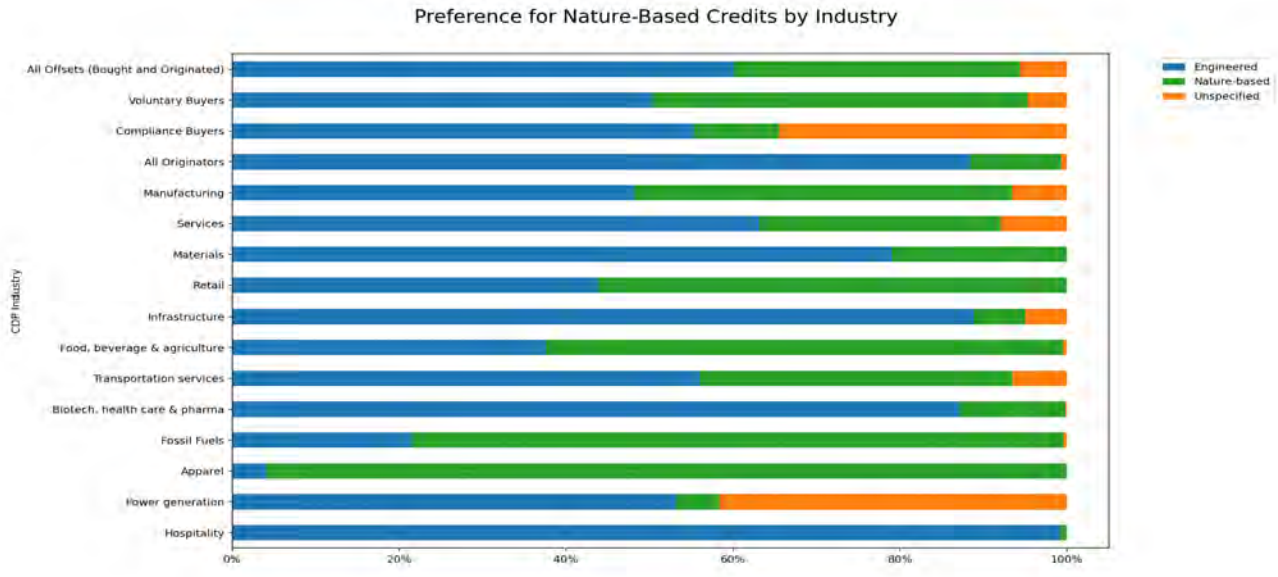
FIGURE S3. PREFERENCES FOR REDUCTIONS VS. REMOVALS, BY BUYER SECTOR (BY VOLUME CO_2e)



Source: Ecosystem Marketplace, 2023

Note: Unspecified indicates that the company did not sufficiently specify the project methodology in order for EM to classify it as a removal or a reduction. IFM, REDD, and blue carbon projects are identified separately because they may include emissions reduction, carbon removals, or both. Industry classifications used in this table are taken directly from CDP and do not necessarily align with GICS or other industry classification systems.

FIGURE S4. PREFERENCES FOR NATURE-BASED AND ENGINEERED PROJECT CREDITS, BY SECTOR (BY VOLUME CO_2e)



Source: Ecosystem Marketplace, 2023

Note: Unspecified indicates that the company did not sufficiently specify the project methodology in order for EM to classify it as nature-based or engineered. Industry classifications used in this table are taken directly from CDP and do not necessarily align with GICS or other industry classification systems.

FOREST TRENDS

The Family of Forest Trends Initiatives

Biodiversity Initiative

Promoting development of sound, science-based, and economically sustainable mitigation and no net loss of biodiversity impacts

Coastal and Marine Initiative

Demonstrating the value of coastal and marine ecosystem services

Communities and Territorial Governance Initiative

Strengthening local communities' capacity to secure their rights, manage and conserve their forests, and improve their livelihoods

Ecosystem Marketplace

A global platform for transparent information on environmental finance and markets, and payments for ecosystem services

Forest Policy, Trade, and Finance Initiative

Supporting the transformation toward legal and sustainable markets for timber and agricultural commodities

Public-Private Finance Initiative

Creating mechanisms that increase the amount of public and pirvate capital for practices that reduce emissions from forests, agriculture, and other land uses

Water Initiative

Promoting the use of incentives and market-based instruments to protect and sustainably manage watershed services

Learn more about our programs at www.forest-trends.org