Ecosystem Marketplace
A FOREST TRENDS INITIATIVE

State of the Voluntary Carbon Market 2024

On the Path to Maturity

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

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

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Data on project registrations, credit issuances, and retirements come from the following project registries: ACR, CAR, CDM, City Forest Credits, Global Carbon Council, Gold Standard, Plan Vivo, and VCS.

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Introduction

Ecosystem Marketplace (EM) publishes our annual *State of the Voluntary Carbon Market (SOVCM)* report – a series now approaching the two-decade mark – to provide a comprehensive overview of the global supply and demand of voluntary carbon credits. We interview and collect annual disclosures from market participants representing the majority of project developers and credit resellers, and combine this with registry data from the largest carbon credit standards and certifications. While *SOVCM* reports are always retrospective, capturing the previous full year of market activity, we also take a forward-looking lens to understand the most important developments shaping the future of the voluntary carbon market (VCM).

2023 was an unusual year for the market. Along with being the hottest year on record, it was also the year that the debate about the voluntary carbon market reached a fever pitch. Galvanized by widely read media coverage spotlighting cases of unethical or ineffective carbon projects and standards, public perception of carbon credits took a sharp turn toward the negative.

At the same time, 2023 was the fourth year in an upswing in the value of the VCM, which began in earnest in 2020, hit a peak in 2021 when over $2 billion United States dollar (USD) of credits were traded, and continued into 2022 and 2023 as higher average credit prices have partially offset declining transaction volumes. Altogether, 49 percent of the total VCM value reported to EM since the beginning of the *SOVCM* report series in 2005 was transacted between 2020 and 2023, and the total 2023 market value of $723 million USD was greater than the annual value for any year from 2009 to 2020.

There are a couple of key questions being asked about the future of the VCM. First, if given a cheaper alternative to reducing their greenhouse gas (GHG) emissions in-house, will companies seize the opportunity to "buy their way out" of responsibility and continue with business as usual? 2023 gave us an answer: our analysis of corporate disclosures submitted to CDP (*All In on Climate*, published October 2023) shows quite clearly that in terms of climate action and ambition, companies engaged in the VCM outperform their peers who don't utilize carbon credits, rather than lagging behind them.

Second, carbon credit watchdogs have questioned whether carbon methodologies are accurately accounting for projects' actual emissions reductions. 2023 was the year of repeat volleys between market observers alarmed by a series of papers contending that baselines for the majority of REDD+ projects were vastly overinflated, followed by equally sharp rebuttals detailing problems with those papers' methodologies, and suggesting that the critical studies relied on cherry-picked negative findings and misrepresented results. A new consolidated methodology from the Verra standard addresses the issues raised, but is unlikely to completely end the controversy over methodological assumptions inherent in nature-based projects' estimations of GHG mitigation and removal benefits.

In response to these concerns, a set of integrity initiatives (see Box 3 on page 19) have stepped in to play a market governance role and set clear, high standards for quality both on the supply and demand sides. But much of 2023 was spent in a kind of limbo waiting on signals from these initiatives–without a doubt sacrificing some short-term market activity to the long-term project of integrity. Unresolved questions about how Article 6 of the Paris Agreement will apply to voluntary carbon credits added further uncertainty to the market (see Box 2 on page 16).

The VCM faced all of these headwinds in 2023. In response, the overall volume of the market dropped by 56 percent from 2022. REDD+ project developers in Asia, Latin America, and the Caribbean bore the brunt of this market contraction. Over the past year, many buyers have preferentially sought out credits representing emissions removals, not reductions (we dig into this distinction later in the report), and credits that are generated closer to home.

Prices were more supported, with the market average price dropping to $6.53/ton, down 11 percent from $7.37 in 2022, but over 60 percent higher than average prices in 2021.

These are the headline figures, but frankly they're of limited use in understanding the VCM today. Every credit represents a ton of carbon emissions removed or reduced, but beyond that, there is enormous differentiation in terms of pricing and market share, depending on credit type, geographic provenance, standard, vintage, and certification of additional benefits such as sustainable development or biodiversity.

In other words, nuance is needed, and so is taking time to understand what the data are really telling us. That applies also to debates about carbon markets. We see good intentions on both sides of the VCM controversies. Difference, debate, and course-correction are a sign of a healthy system, not a broken one. We are honored to bring you the latest *State of the Voluntary Carbon Market*, and contribute in our own way to market integrity: through transparency and evidence.

Key Findings

1. **In 2023, the volume and value of the voluntary carbon market (VCM) contracted** for the second year in a row from its 2021 peak, with a 56 percent year-on-year decline in the volume of reported transactions.
    - **The total reported transaction value of the VCM was $723M USD, down 61 percent from last year.**

2. **On average, buyers paid $6.53 per ton CO_2e for carbon credits in 2023, a slight decrease from 2022.** Average credit prices in 2023 were higher than in any year before 2022. As of early 2024, prices appear to be rebounding from this dip.

3. **Market participants reported a clear negative impact from media scrutiny of the VCM.** Negative press questioning the additionality and governance of carbon credit projects and potential corporate buyer greenwashing overshadowed many positive market developments in 2023. This translated to both a direct pullback in buyer investment, and increased complexity for project developers, whether due to changing requirements from credit issuing standards or greater demand for due diligence from credit buyers.

4. **The publication of the ICVCM's Core Carbon Principles and the launch of VCMI's Claims Code contributed to buyer confidence in market quality and integrity.** But delays in implementation of these initiatives and a lack of guidance from the Science Based Targets Initiative (SBTi) on the use of carbon offsets to meet corporate net-zero goals was cited by many respondents as a prime factor keeping buyers on the sidelines for much of late 2023.

5. **The data suggest a growing bifurcation in the market between buyers seeking pure carbon removal projects and those committed to projects that deliver social and environmental co-benefits.** Co-benefits are a core motive for some buyers, an interesting trend pointing to the possibility of greater convergence with emerging markets for nature-positive and biodiversity credits.
    - **In 2023, buyers preferentially sought out credits representing emissions removals and clearly demonstrated project additionality**.
    - While the share of credits traded from projects certifying "beyond carbon" co-benefits through Sustainable Development Goals (SDGs) or individual certifications grew, the premium that buyers paid for these credits declined from 2022 values, suggesting a growing supply of projects providing local co-benefits.

6. **Although total market value fell for all VCM credit categories, different categories had distinct trajectories in terms of traded volumes and average price.**
    - The biggest gross declines in volume occurred among Forestry and Land Use and Renewable Energy credits, which remain the most popular project types, but faced intense scrutiny, particularly around project additionality calculations.
    - The volume of transactions in the Energy Efficiency/Fuel Switching, Agriculture, and Household/Community Devices categories all *increased* from 2022.
    - **Within the Forestry and Land Use credit category, REDD+ credits, the most popular nature-based project type, lost 62 percent of their value year-over-year**, with transaction volume falling 51 percent and price falling 23 percent. Prices for Afforestation-Reforestation and Revegetation (ARR) and Improved Forest Management (IFM) credits both increased. The 2023 pullback from REDD+ projects affected transaction volume of projects in Asia, Latin America, and the Caribbean, where the majority of these projects are located. EM survey respondents shared that many buyers in higher income countries are seeking credits from projects closer to home.

Market Overview

Total Volume, Value, and Price

In 2023, the volume and value of the voluntary carbon market (VCM) contracted to a total of 111 million tons CO_2e ($MtCO_2e$) transacted - a 56 percent drop from 2022 levels (Figure 2; Table 1). Credit prices also fell, but by less. The average price per ton CO_2e of VCM credits declined by 11 percent from record highs in 2022, to $6.53 USD per ton CO_2e in 2023. Early data on 2024 prices to date suggest they are holding at or above this level. The combination of a decrease in volume and a pullback from last year's peak prices translated to a 61 percent decline in total market value year-over-year, for a total reported value of $723 million USD (Figure 1; Table 1).

These figures are based on market data received from 90 EM Respondents with transactions in 2023, compared to 115 Respondents in 2022. The number of Respondents declined year-over-year due to mergers between some Respondents and others temporarily pausing credit sales in 2023 while they waited for the VCM to establish stronger integrity and quality norms. It is not surprising that fewer Respondents shared transaction data in a year of lower volume. EM analysts confirmed that this effect did not skew the estimate of the decline in transaction volume from 2022 by comparing a core group of 80 Respondents who submitted data for both 2022 and 2023, including the highest-volume Respondents. The relative decline in transaction

Table 1. Annual Total Voluntary Carbon Market Transaction Volume, Value, and Price per tCO_2e for All Projects, 2022-2023

2022			2023			Percent Change		
Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume	Value	Price
253.8	$1.87 B	$7.37	110.8	$723 M	$6.53	-56%	-61%	-11%

Figure 1. Voluntary Carbon Market Size, by Value of Traded Carbon Credits, pre-2005 to 2023

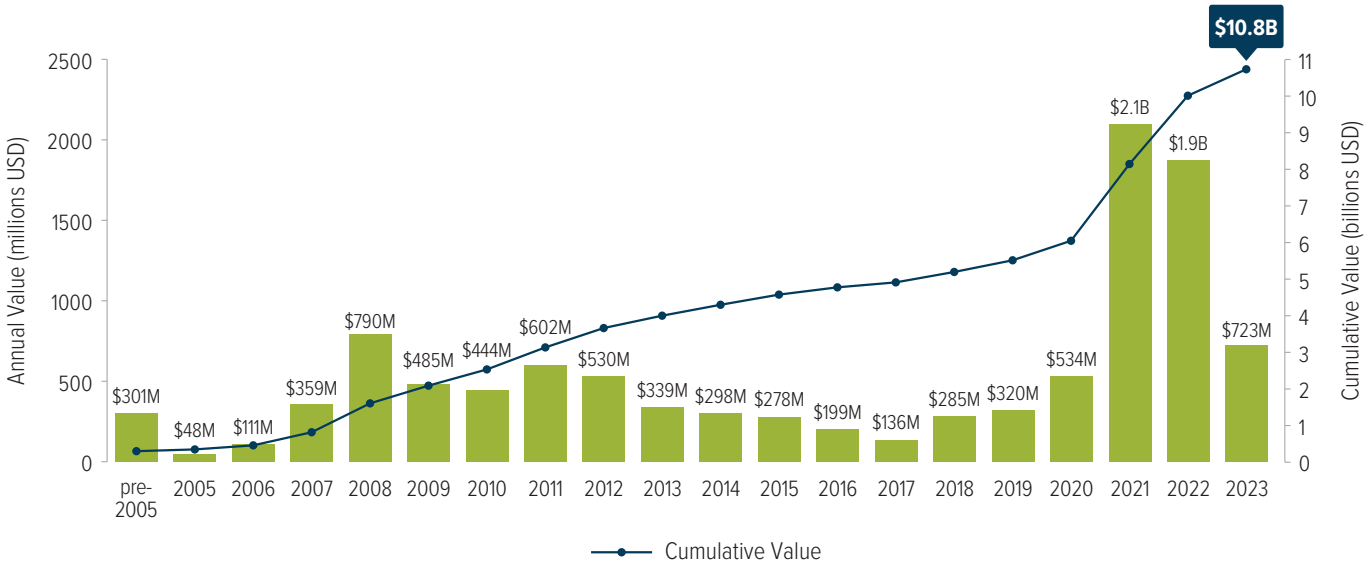
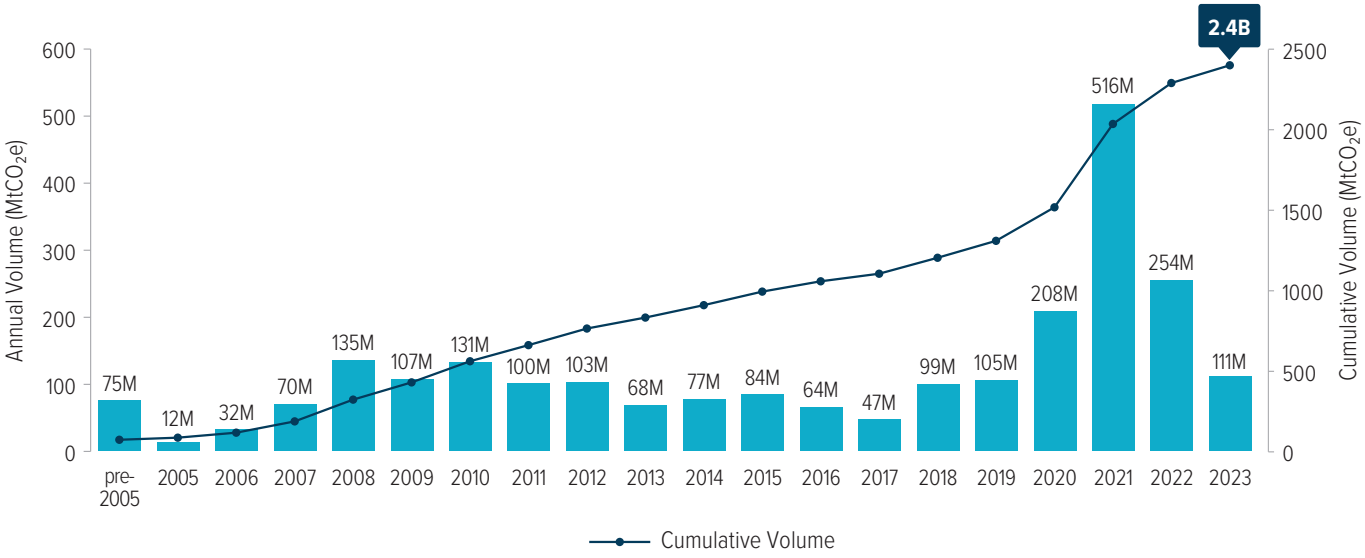


Figure 2. Voluntary Carbon Market Size, by Volume of Traded Carbon Credits, pre-2005 to 2023



volume for this group was 54 percent from 2022, indicating that the finding of a 56 percent decline in the total VCM volume in 2023 is robust.

Qualitative feedback from EM Respondents indicated disparate trends among sub-sectors of the market that help explain why credit volumes dropped so steeply, while value declined relatively less. Market participants expressed increasing buyer preference for credits from nature-based and community-focused project types that offer environmental and social co-benefits in addition to emissions reductions, as opposed to credits generated by carbon removal, most frequently through Afforestation-Reforestation and Revegetation (ARR) projects.

Carbon Credit Price, by Buyer Type

In 2023, VCM credit sales to end users[1] had a 33 percent price premium over sales to intermediaries, consistent with 2022 (Table 2). Intermediaries who take ownership of credits for speculative purposes are typically more price-sensitive, though the magnitude of this effect varies by project category and carbon credit standard.

[1] "End users" include transactions where the buyer was identified as an end user as well as those where the buyer was an intermediary who does not take delivery of credits, but instead purchases on behalf of an end user.

Energy Efficiency/Fuel Switching and Renewable Energy credit transactions had the largest premium for end users, and the majority of sales in these categories were to intermediaries. This suggests that buyers in these sectors rely more on intermediary brokers and resellers to parse project quality, and that credit resellers can take advantage of the relatively low prices of credits from Energy Efficiency and Renewable Energy projects to make a greater profit when selling to end users. The majority of transactions in the Chemical Processes and Industrial Manufacturing, Forestry and Land Use, and Agriculture categories were sales to end users, and premiums for these end-user sales were smaller than for other categories because these credits changed hands fewer times.

Table 2. Annual Voluntary Carbon Market Transaction Price (USD), by Buyer Type, 2022-2023

	2022	2023
Buyer Type	Price (USD)	Price (USD)
Total VCM	$7.37	$6.53
End User	$8.74	$7.79
Intermediary	$6.40	$5.87

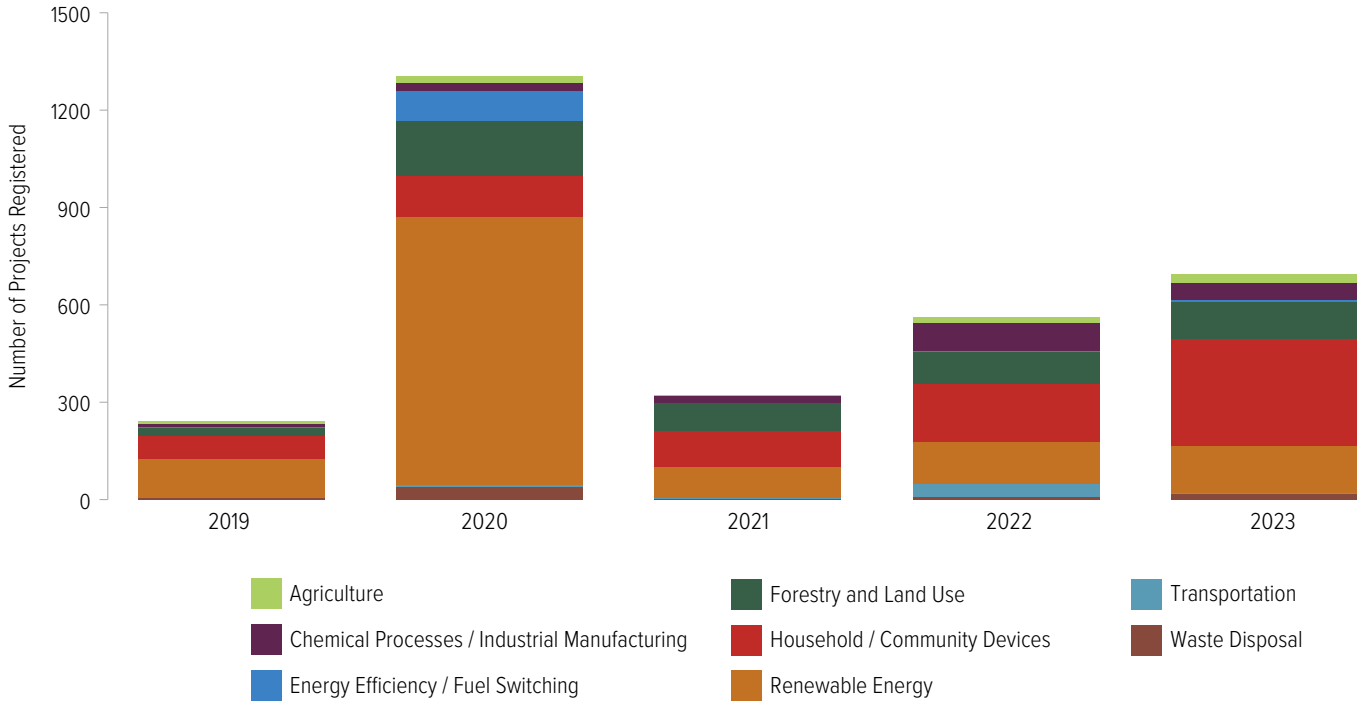
Gold Standard credits had the greatest premium for end-user sales among credit standards, amounting to a 140 percent premium in 2023, up from 83 percent in 2022. The premium for end-user sales of Clean Development Mechanism (CDM) and Verified Carbon Standard (VCS) credits also increased substantially, with a premium of 58 percent for CDM in 2023 versus 18 percent in 2022. End users paid a 47 percent premium for VCS credits in 2023 versus 30 percent in 2022. This may indicate that credit buyers are increasingly turning to trusted intermediaries to vet project quality for the largest carbon credit standards. Credit resellers played a large role in CDM credit transactions, in particular, with the proportion of CDM credit sales to intermediaries increasing to 73 percent in 2023, versus 54 percent in 2022. This growth in credits sold to intermediaries and the gradual decline in CDM credit issuances now that CDM is no longer registering new projects is likely the result of market uncertainty around the transition of CDM projects to a future Article 6 mechanism for transnational carbon trading under the Paris Agreement.

Registry Data – Project Registrations, Issuances, and Retirements

EM analysis of publicly available data from credit standard registries of projects and credit issuances and retirements illuminates the underlying supply and demand of carbon credits underpinning VCM transactions. Despite market headwinds, the total number of new registered projects grew to 694 in 2023, led by 329 Household/Community Devices projects. Forestry and Land Use, Renewable Energy, Agriculture, and Waste Disposal project registrations also grew year-on-year, while the greatest decline in new registrations was for Chemical Processes/Industrial Manufacturing (Figure 3).

New project registrations represent the end of a long process involving a project proposal, public comment period, and methodological validation. Credit issuances by projects often occur close to the time of initial credit sale by the project developer, while end users may wait one or

Figure 3. Carbon Credit Project Registrations, by Category, 2019-2023



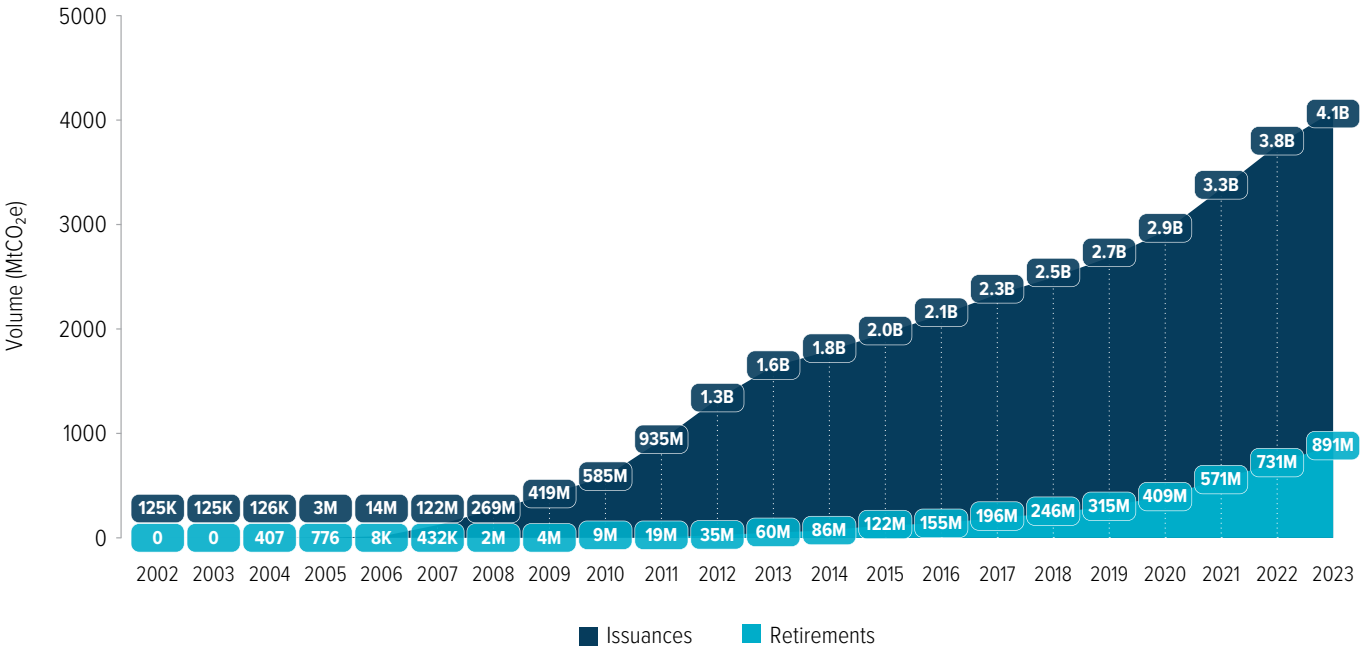
Note: Includes data on project registrations from ACR, CAR, CDM, City Forest Credits, Global Carbon Council, Gold Standard, Plan Vivo, and VCS registries.

more years to retire credits that they purchase from the VCM. Therefore, recent market trends reflect the rate of registrations, issuances, and retirements, in combination with the volume of transactions that do not result in credit retirement.

Compared to 2022, there was a 93 $MtCO_2e$ decrease in credit issuances in 2023 and a 2.6 $MtCO_2e$ increase in retirements, indicating that the surplus supply of carbon credits is tightening, but still substantial (Figure 4). The categories contributing the most to the decline in issuances were Chemical Processes/Industrial Manufacturing and Energy Efficiency/Fuel Switching. Meanwhile, issuances of Household/Community Devices and Transportation credits increased, with Household/Community Devices projects more than doubling the volume of credits issued in 2022 with an increase of 31 $MtCO_2e$ (Figure 5). Issuances of Transportation credits increased in 2023, which is a natural result of an increase in Transportation projects registered in 2022; the annual transaction volume for this category remains low.

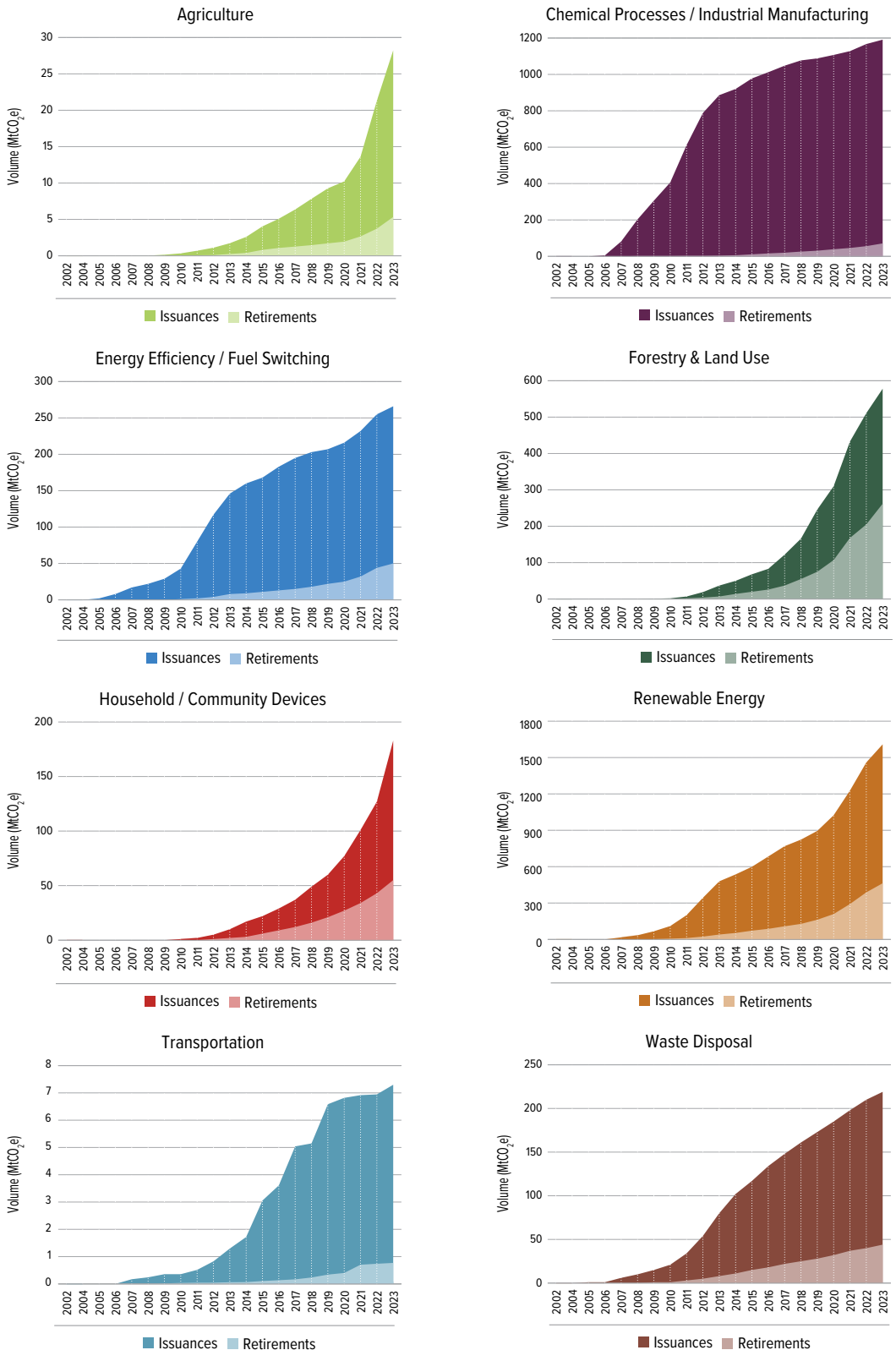
The categories with the greatest growth in retirements were Forestry and Land Use and Chemical Processes/Industrial Manufacturing, while retirements of Renewable Energy, Waste Disposal, and Transportation credits decreased (Figure 5). This suggests that credit buyers are moving away from projects with weaker additionality, such as international clean infrastructure financing, and embracing projects that deliver clear carbon removals and emissions reductions in the Forestry and Land Use and Chemical Processes/Industrial Manufacturing categories. Total annual credit retirements have hovered around 170 $MtCO_2e$ for the past three years, indicating that the fundamental demand from end users has remained steady, with more upside for the rate of retirements if corporate buyers are permitted to claim credits as offsets against their Scope 3 emissions targets (see Box 3, page 19).

Figure 4. Cumulative VCM Issuances and Retirements, 2002-2023



Note: Includes data on credit issuances and retirements from ACR, CAR, CDM, City Forest Credits, Global Carbon Council, Gold Standard, Plan Vivo, and VCS registries.

Figure 5. Cumulative VCM Issuances and Retirements, by Project Category, 2002-2023



Note: Includes data on credit issuances and retirements from ACR, CAR, CDM, City Forest Credits, Global Carbon Council, Gold Standard, Plan Vivo, and VCS registries.

Box 1: Connections Between Voluntary and Compliance Carbon Credit Markets

The reduction or removal of one ton of carbon emissions is equivalent no matter where in the world it takes place, which is the basis of carbon credits as a fungible instrument to finance climate change mitigation. Depending on the circumstances of the credit's generation, or the circumstances of its use as an offset for greenhouse gas emissions, a transaction can be considered part of the VCM or a compliance carbon market, or–due to increasing linkages between the VCM and compliance carbon markets–a part of both market types.

Voluntary and compliance carbon markets can be differentiated based on the source of supply for carbon credits or the ultimate type of demand for emissions offsetting. Credits may be issued through one of three processes: international crediting mechanisms administered by an international organization (e.g., the Clean Development Mechanism (CDM), national or sub-national governmental crediting mechanisms (e.g., the California Compliance Offset Program, the Australian Carbon Credit Unit Scheme, or the Japanese J-Credit Scheme), or independent crediting mechanisms (e.g., Verified Carbon Standard (VCS) and Gold Standard).

Carbon credits can be used as emissions offsets within international or domestic compliance mechanisms or for voluntary purposes. As established in the Paris Agreement, credits traded for international compliance purposes can contribute to the buyer country's Nationally Determined Contributions (NDCs), and must include a "corresponding adjustment," which is an additional agreement that prevents the project's host country from "double-counting" the traded emissions reductions/removals against their own NDCs (see Box 2, Implementation of Article 6 of the Paris Agreement). Domestic compliance schemes are established within a country, subnational jurisdiction, or an industry (e.g., automobile manufacturing), and often include a credit issuance mechanism to facilitate emissions reduction trading. Finally, there is the voluntary segment of demand, which consists of private entities such as corporations purchasing and retiring carbon credits to meet their own self-imposed emissions reduction goals.

The boundaries between the VCM and international and domestic compliance markets have become blurred as compliance systems, such as the California Cap-and-Trade Program and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), have allowed participants to use credits from independent crediting mechanisms that would otherwise be considered voluntary credits. International mechanisms, the most prominent example being CDM, are meant to drive investment in climate solutions in countries with the greatest potential for greenhouse gas mitigation. However, because participation in these systems by project proponents and credit buyers is entirely voluntary, they can also be considered voluntary mechanisms, even when used to achieve internationally mandated outcomes.

EM believes that our Respondents, who are typically sell-side market participants, are best-placed to determine whether their credit transactions were within the voluntary or compliance carbon markets. The VCM transactions discussed in this report originate from independent crediting mechanisms as well as the international, UN-administered CDM.

Volume, Value, and Price, by Project Attributes

Project Category and Type

Although total market value fell for all categories of VCM credits, the causes of this decline in value varied between categories. Volume and/or average transaction price increased in some categories (Table 3). The Energy Efficiency/Fuel Switching, Agriculture, and Household/Community Devices categories all grew in volume, up 43 percent, 24 percent, and 10 percent, respectively. Forestry and Land Use and Renewable Energy credits had the largest gross declines in volume, though they remain the most popular project types.

Respondents cited delays in issuing new Forestry and Land Use credits related to two major factors last year: 1) waiting for Verra to release their updated consolidated methodology for Reduced Emissions from Deforestation and Degradation in Developing Countries (REDD+) projects, and 2) increased buyer due diligence in the face of recent media scrutiny of these projects.

The decline in Renewable Energy credit transaction volume may be a natural consequence of a decline in the supply of these credits. Issuances in this category have trailed off following a peak in new Renewable Energy projects registered in 2020.

Within the Forestry and Land Use category, REDD+ credit prices fell 23 percent, but REDD+ remained the most popular project type within the category. Prices for ARR credits rose 31 percent and prices for Improved Forest Management (IFM) rose 11 percent, even though these credits make up a smaller share of the Forestry and Land Use category in 2023 by volume. This trend supports qualitative data from Respondents indicating more interest and investment in project types that generate nature-based carbon removal credits. The volume of Blue Carbon credit transactions reported to EM fell by 88 percent from 2022. In 2023, a much larger proportion of Blue Carbon credits traded were less expensive credits from

Table 3. VCM Transaction Volumes, Values, and Prices, by Project Category, 2022-2023

	2022			2023			Percent Change		
CATEGORY	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume	Value	Price
Forestry & Land Use	113.0	$1.1 B	$10.14	36.2	$351.3 M	$9.72	-68%	-69%	-4%
Renewable Energy	92.7	$386.1 M	$4.16	28.6	$111.1 M	$3.88	-69%	-71%	-7%
Chemical Processes/ Industrial Manufacturing	13.3	$68.5 M	$5.14	12.2	$50.2 M	$4.10	-8%	-27%	-20%
Household/ Community Devices	9.1	$77.6 M	$8.55	9.9	$76.6 M	$7.70	+10%	-1%	-10%
Energy Efficiency/ Fuel Switching	6.6	$35.6 M	$5.39	9.4	$34.4 M	$3.65	+43%	-3%	-32%
Agriculture	3.8	$41.7 M	$11.02	4.7	$30.6 M	$6.51	+24%	-26%	-41%
Waste Disposal	6.2	$44.9 M	$7.23	1.5	$10.9 M	$7.48	-77%	-76%	+3%
Transportation	0.18	$770 K	$4.37	-	-	-	-	-	-

Note: EM cannot report an average price for Transportation credits in 2023 because of the confidentiality of individual EM respondent data.

Table 4. VCM Transaction Volumes, Values, and Prices, by Forestry and Land Use Project Types, 2022-2023

	2022			2023		
Project Cluster	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume ($MtCO_2e$)	Value (USD)	Price (USD)
REDD+ (ALL)	57.4	$584.2 M	$10.19	28.2	$222.3 M	$7.87
Afforestation-Reforestation and Revegetation (ARR)	10.8	$129.8 M	$12.05	4.1	$64.8 M	$15.74
Improved Forest Management (IFM)	4.5	$66.2 M	$14.67	2.4	$38.9 M	$16.21
Blue Carbon	3.4	$39.3 M	$11.58	0.38	$3.2 M	$8.33

Wetland Restoration/Management projects without associated Afforestation, Reforestation, and Revegetation (ARR) activities, driving prices down for this cluster of project types (Table 4).

Waste Disposal credit volume fell 77 percent, but average credit price for this category increased slightly. The largest decreases in price were in the Agriculture, Energy Efficiency/Fuel Switching, and Chemical Processes/Industrial Manufacturing categories, where price fell by 41 percent, 32 percent, and 20 percent, respectively. The increasing volume and decreasing price for Energy Efficiency/Fuel Switching and Agriculture credits suggests that new sources of credits have come into these segments of the markets. The decline in the price of Chemical Processes/Industrial Manufacturing credits can be attributed to a large increase in the volume of North American industrial process efficiency credit transactions reported to EM in 2023 priced at less than $5 per ton of CO_2e.

Details of Project Categories

AGRICULTURE

2023 EM data consist of:
19 projects 8 types 7 standards 19 countries

The Agriculture category includes project types focused on the sustainable management of farmland and pasture, including soil carbon sequestration through sustainable farmland or pasture management, livestock waste methane management, conservation of grassland habitats, and avoidance of methane production in rice cultivation. The volume of Agriculture credit transactions reported to EM continued to grow in 2023, marking a fourth consecutive year of growth since 2019. Although respondents reported trading credits issued by seven different standards, credits from VCS projects made up the largest proportion by far, representing 95 percent of total traded volume. Projects in Asia contributed 42 percent of the volume of Agriculture credits traded in 2023, followed by Latin America and the Caribbean, which contributed 38 percent.

CHEMICAL PROCESSES/ INDUSTRIAL MANUFACTURING

2023 EM data consist of:
21 projects 13 types 4 standards 6 countries

Chemical Processes/Industrial Manufacturing is the category with the third largest volume of transactions in 2023. These projects focus on eliminating greenhouse gas production or reducing the volume of greenhouse gases used in industrial applications. Representative project types in 2023 include nitrous oxide destruction in chemical production; reclamation and replacement of hydrofluorocarbons in applications, including refrigerants and foam production; fugitive emissions capture and destruction, including methane from coal mines; and other industrial process emissions reduction activities. Respondents reported trading credits from the American Carbon Registry (ACR) in 47 percent of transactions in 2023, followed

by Climate Action Reserve (CAR), which made up 18 percent of transactions, and VCS, at 8 percent. North America grew to become the largest source for Chemical Processes/Industrial Manufacturing credits traded in 2023, making up 66 percent of transaction volume in this category. Asia was a distant second, at 8 percent.

ENERGY EFFICIENCY/ FUEL SWITCHING

2023 EM data consist of:
15 projects 11 types 5 standards 24 countries

Projects in the Energy Efficiency/Fuel Switching category reduce consumption of fossil fuels by increasing the efficiency of industrial processes and residential and commercial heating and lighting and by switching power and heat generation from fossil fuels to biomass or less carbon-intensive fuels, such as natural gas. This category grew the most in 2023, with transaction volume up 43 percent from 2022, mostly driven by an increase in the volume of industrial energy efficiency credits. The largest share of credits traded originated from projects in North America (39 percent), followed by Asia (17 percent). The most prevalent standard was ACR (39 percent), followed by VCS (23 percent).

FORESTRY AND LAND USE

2023 EM data consist of:
194 projects 22 types 16 standards 38 countries

Forestry and Land Use remains the largest category of carbon credits by transaction volume, despite 2023 volumes declining 66 percent from 2022. REDD+ project types made up the majority of credits traded in this category (78 percent), while ARR and IFM credits made up 11 percent and 7 percent, respectively. Credits from projects in Latin America and the Caribbean constituted 36 percent of transaction volume for Forestry and Land Use, followed by Africa (25 percent) and Asia (18 percent). This category saw credits traded from the greatest number of countries in 2023. While VCS remains the most popular standard for Forestry and Land Use credits at 85 percent of total transacted volume, this category included the greatest variety of standards for traded credits.

HOUSEHOLD/ COMMUNITY DEVICES

2023 EM data consist of:
78 projects 10 types 3 standards 29 countries

This category includes all projects that focus on reducing carbon emissions at the household or community level, rather than through land-use practices or large-scale industrial processes. Popular project types in this category include efficient cookstove and water purification device distribution, which mitigate greenhouse gas emissions caused by deforestation for fuel in rural areas; community energy efficiency projects; and biogas infrastructure for fossil-fuel free heating and cooking in rural communities. The volume of Household/Community Devices credits traded grew 10 percent from 2022, with an increase in transactions of clean cookstove credits responsible for almost all of this growth. The majority of Household/Community Devices projects took place in Africa (56 percent), followed by Asia (14 percent). Fifty-five percent of the volume of credits traded in this category in 2023 were from a Gold Standard project, followed by 40 percent from VCS projects.

RENEWABLE ENERGY

2023 EM data consist of:
225 projects 20 types 12 standards 32 countries

Renewable Energy projects were the second-largest category by transaction volume. These projects mitigate carbon emissions by using renewable energy to displace fossil fuel consumption. Project types include electricity and heat generation using wind, solar, hydropower, geothermal energy, biogas from the decomposition of organic waste, and renewable biomass. Renewable Energy credits

were traded from the widest variety of projects in 2023. Of those credits, 37 percent of the traded volume came from projects in Asia, followed by 11 percent from projects in Latin America and the Caribbean. VCS was the largest source for credits in this category, at 45 percent of transaction volume, followed by Gold Standard (33 percent) and CDM (20 percent).

TRANSPORTATION

2023 EM data consist of:

1 project **2 types** **2 standards** **1 country**

Transportation projects reduce emissions by increasing the efficiency of transportation systems, including by developing new systems, such as mass transit and electric vehicles. EM received trade data from Transportation projects from fewer than three Respondents in 2023, so EM cannot share category-specific information about transaction volume and average credit prices.

WASTE DISPOSAL

2023 EM data consist of:

15 projects **7 types** **9 standards** **6 countries**

Waste Disposal projects reduce greenhouse gas emissions by capturing and destroying methane from decaying organic material (except when this methane is used to generate heat or electricity; these project types are included in the Renewable Energy category), recycling old materials to avoid emissions associated with new manufacturing, and composting organic waste to prevent methane production. While the volume of Waste Disposal transactions fell from 2022, prices held steady year-on-year, unlike all other project categories, which may indicate an ongoing shift towards higher-quality Waste Disposal project methodologies. North America was host to the greatest share of projects with credits traded in 2023 (28 percent), followed by Latin America and the Caribbean (13 percent).

Nature-based and Engineered Credits

There was a notable reduction in transactions from nature-based credit projects in the VCM in 2023, with the proportion of nature-based credits falling from 46 percent in 2022 to 37 percent of credit transactions (this includes all transactions in the Agriculture and Forestry and Land Use categories). The price of nature-based credits also fell by 65 percent, leading to an overall 68 percent decline in the value of the nature-based segment of the VCM (Table 5). Despite the relative decrease in the value of these credits, nature-based credits still held a 91 percent price premium over credits from engineered project types (down slightly from a 107 percent premium in 2022). The reduced demand is likely due to a decrease in the liquidity of credits from nature-based projects in the wake of prominent criticism of the VCM, especially REDD+ project baseline calculations, which establish the number of credits available for developers to sell based on the emissions reductions and carbon removals achieved by each project.

Following a series of high-profile media coverage questioning the accuracy of estimated emissions reductions from REDD+ methodologies, there has been an overall shift away from nature-based projects towards credits from engineered methodologies, where the quantity of greenhouse gas reductions is more easily calculated. Verra, the organization responsible for maintaining the VCS standard that hosts

Table 5. VCM Transaction Volumes, Values, and Prices, Nature-based vs. Engineered, 2022-2023

	2022			2023		
	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume ($MtCO_2e$)	Value (USD)	Price (USD)
Nature-based	166.8	$1.2 B	$10.17	40.9	$381.5 M	$9.33
Engineered	137.0	$674.6 M	$4.92	70.0	$342.3 M	$4.89

the majority of REDD+ projects, released a new version of their consolidated REDD+ methodology in November 2023 that includes updated baseline calculations and uncertainty estimation procedures. Though the updated methodology arrived too late in the year to make a discernable impact on the volume of transactions in 2023, this development is expected to influence sales of REDD+ credits in 2024.

Reductions and Removals

Carbon credits can either represent 1) emissions reductions or 2) removals of carbon dioxide from the atmosphere. Reductions are achieved through energy efficiency, the substitution of renewable energy for fossil fuels, or avoided degradation or destruction of natural carbon sinks such as forests. Removals are generated through nature-based methodologies, including ARR, or engineered solutions, including direct air capture and biochar production.

In 2023, VCM buyers continued to place a premium on carbon credits from projects that generate removals over projects that only generate reductions. In 2023, the price premium for trades of removal credits versus reduction credits was 245 percent, which is up from an already impressive 152 percent premium in 2022. This indicates how much more buyers value removal credits over credits that represent emissions reductions only. While the volume of both reduction and removal credits declined in 2023 along with the overall volume of VCM transactions, the share of credits traded from carbon removal projects and projects that both remove carbon and reduce emissions grew from 31 percent in 2022 to 36 percent in 2023 (see "Removals" and "Both" in Table 6).

The average price of removal-specific credits increased 32 percent, but the average price of credits from projects that included both reductions and removals decreased 21 percent (these credits come from REDD+, IFM, regenerative agriculture projects, and other nature-based project types focused on landscape-scale carbon management). This decline in combined reduction and removal credit price can largely be attributed to the market's pullback from REDD+ projects following heavy criticism.

Project Standard

Transaction data reported to EM for 2023 showed some changes in market share by credit issuing standard (Table 7). VCS remained the largest standard by volume, while transaction volumes for VCS credits fell 64 percent year-over-year in the face of consistent media scrutiny. The volume of CDM credits also fell sharply by 82 percent from 2022 to 2023. With the decline in CDM credit volume, Gold Standard became the second-largest standard by reported transaction volume. American Carbon Registry (ACR) transaction volume increased 206 percent, ultimately making up nearly 10 percent of the total 2023 VCM transaction volume.

Average prices fell for credits from most standards in 2023, except the average price of CAR credits, CDM credits, and UK Woodland Carbon Code credits, which increased 63 percent, 36 percent, and 20 percent, respectively. The concurrent increase in ACR transaction volume and decline in price is due to a large increase in Chemical Processes/Industrial Manufacturing and Energy Efficiency/Fuel Switching credits sold from that standard (as opposed to mostly

Table 6. VCM Transaction Volumes, Values, and Prices, Reductions vs. Removals, 2022-2023

	2022			2023		
	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume ($MtCO_2e$)	Value (USD)	Price (USD)
Removals	13.6	$162.8 M	$12.01	4.2	$66.4 M	$15.91
Reductions	128.4	$611.8 M	$4.76	58.0	$267.3 M	$4.61
Both	66.0	$699.6 M	$10.60	35.2	$294.2 M	$8.36

Table 7. VCM Transaction Volumes, Values, and Prices, by Project Standard, 2022-2023

	2022			2023			Percent Change		
Standard	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume	Value	Price
VCS	158.0	$1.3 B	$8.07	56.2	$382.3 M	$6.81	-64%	-70%	-16%
Gold Standard	20.9	$159.0 M	$7.60	15.8	$99.8 M	$6.31	-24%	-37%	-17%
ACR	3.5	$59.5 M	$17.01	10.7	$60.7 M	$5.66	+206%	+2%	-67%
CDM	37.7	$73.0 M	$1.94	6.9	$18.0 M	$2.63	-82%	-75%	+36%
CAR	3.1	$14.2 M	$4.56	3.2	$24.0 M	$7.43	+4%	+70%	+63%
Plan Vivo	2.1	$27.5 M	$13.06	1.6	$18.7 M	$11.52	-23%	-32%	-12%
Ceracarbono	4.1	$23.5 M	$5.73	0.48	$1.9 M	$4.04	-88%	-92%	-29%
UK Woodland Carbon Code	0.21	$5.2 M	$24.41	0.16	$4.7 M	$29.17	-24%	-9%	+20%

Forestry and Land Use credits in 2022). For CDM, the decline in volume can be attributed to dwindling supply and uncertainty about the future of CDM project issuances given a pending transition to an Article 6-based transnational trading scheme. The increase in price and growth in the share of CDM project credit sales to intermediaries suggests that credit resellers are hunting for credits from the most high-quality CDM projects to market to end users.

Project Location

Reported transaction volumes declined for credits from all regions in 2023, except North America, where volume increased by 15 percent. The largest decline in volume occurred in Asia, Latin America, and the Caribbean, driven by a pullback from REDD+ projects, the majority of which are located in these regions.

Credit price fell the most in North America, due to a large influx of inexpensive industrial process emissions reduction credits. In other regions of the Global North, prices rose dramatically; in Oceania, the average credit price jumped 153 percent from 2022, and in Europe, average prices increased 78 percent. Some EM Respondents shared that many buyers in higher income countries are increasingly seeking credits from projects based in their home country or region. The average price of credits in Latin America and the Caribbean was largely unchanged (up 2 percent year-over-year).

Table 8. VCM Transaction Volumes, Values, and Prices, by Project Region, 2022-2023

	2022			2023			Percent Change		
Region	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume	Value	Price
Asia	102.7	$765.1 M	$7.45	23.0	$127.8 M	$5.55	-78%	-83%	-26%
Latin America & the Caribbean	72.0	$502.9 M	$6.98	19.9	$142.1 M	$7.13	-72%	-72%	+2%
Africa	18.3	$163.6 M	$8.93	17.1	$123.2 M	$7.19	-7%	-25%	-19%
North America	11.8	$136.7 M	$11.60	13.6	$77.2 M	$5.68	+15%	-44%	-51%
Europe	0.61	$8.4 M	$13.82	0.31	$7.5 M	$24.57	-49%	-10%	+78%
Oceania	0.20	$2.5 M	$12.73	0.06	$1.8 M	$32.17	-71%	-27%	+153%

Box 2: Implementation of Article 6 of the Paris Agreement

The Paris Agreement entered into force in 2016, but key provisions have not yet taken effect because international stakeholders are still negotiating certain implementation details. The outstanding key provision most relevant to the VCM is Article 6, which establishes a framework for international cooperation in achieving Nationally Determined Contributions (NDCs) through market and non-market mechanisms. At COP26 in 2021, country negotiators established three sub-articles to Article 6:

- **Article 6.2,** which permits two or more countries to cooperate to trade Article 6 units directly;
- **Article 6.4,** which allows for the creation of a Supervisory Body to succeed the Clean Development Mechanism (CDM), approve methodologies, and maintain a registry of projects for an international credit trading mechanism; and
- **Article 6.8,** which refers to non-market mechanisms and is therefore less relevant to the VCM.

In the two years since 2021, parties to the Paris Agreement have continued to establish reporting rules and governing bodies for Article 6, but have yet to fully operationalize the mechanisms defined by the sub-articles.

The major difference between credit trading under Article 6.2 and Article 6.4 is that the former governs direct trading of credits between governments, and the latter involves trading through a centralized mechanism similar to the legacy CDM system. National representatives did not come to a full agreement on all details of Article 6 implementation during COP28 in 2023. However, some Article 6.2 activities are moving forward as governments trade mitigation outcomes directly with one another in exchange for financial support, capacity building, or technology transfers. While several Article 6.2 pilot projects are underway, and one transfer of mitigation outcomes was completed in early 2024, the lack of normative procedures for trading mitigation outcomes has created a situation in which every Article 6.2 transaction brings reputational risk to host and buyer countries.

In host countries, governments must determine how to create national frameworks for carbon market activities, including which project types are allowed in Article 6 trading and considerations for how trading might affect their own NDCs. Host countries are also responsible for tracking the provenance of credits as part of Article 6.2 by including a "corresponding adjustment," which is an additional agreement that prevents host countries from "double-counting" traded credits against their own NDCs. Buyer countries are also exploring different strategies to implement Article 6.2, with some allowing a market-based approach, where individual businesses must purchase credits to meet national emissions reduction targets, while others opt for a centralized approach, where the government takes the lead in acquiring carbon credits to meet the country's NDCs.

Implementation of Article 6.4, on the other hand, has been completely stalled until parties to the Paris Agreement can agree on the provisions of the international mechanism that will replace the CDM. Until this is decided, hundreds of CDM projects remain in limbo, unable to issue new vintages of credits. Determining which methodologies will be included in the successor mechanism is the main issue to be resolved with Article 6.4. The CDM was at the vanguard of the development of carbon markets, but many CDM methodologies have been criticized for a lack of additionality, particularly renewable energy projects in low- and middle-income countries that may have occurred regardless of finance from carbon credits. Parties negotiating rules for Article 6.4 will also have to consider the role of nature-based credits, as the CDM only allowed methodologies for Afforestation-Reforestation and Revegetation (ARR) projects, which excluded more recently developed project types that have become prominent, such as Improved Forest Management (IFM), REDD+, and agricultural soil carbon sequestration projects.

For more information on the latest developments on Article 6 of the Paris Agreement, see The Nature Conservancy's Article 6 Explainer, which covers the ongoing negotiations in more depth.

Quality Indicators Affecting Volume, Value, and Price

Co-benefit and Sustainable Development Goals Certifications

EM Respondents and VCM market actors consistently shared that the market oriented more towards carbon credits that were perceived as coming from higher-quality projects in 2023. One way that projects can be judged as higher quality is by demonstrating "beyond carbon" environmental and social co-benefits, such as preserving and restoring biodiversity, contributing to water security, or supporting sustainable local economies. Carbon credit projects can establish the existence of co-benefits through certifications including Verra's Climate, Community, and Biodiversity and sustainable development-focused SD VISta programs and the independent Social Carbon Standard.[2]

Projects may also be certified as providing co-benefits related to the 17 UN Sustainable Development Goals (SDGs), which link global development and prosperity with improved health and education, reduced inequality, and resilient natural ecosystems. Some equity-focused standards expect projects to demonstrate that they accomplish several SDGs. Gold Standard, for example, requires projects to contribute to at least three SDGs (including SDG 13-Climate Action) and Plan Vivo requires that all approved projects contribute to at least six SDGs (including SDG 1-Poverty Alleviation, and SDG 8-Decent Work and Economic Growth).

In 2023, the share of VCM transactions from projects with co-benefit certifications grew to 28 percent, up from 22 percent in 2022 (Table 9). The share of transactions from projects with one or more SDG certification grew to 26 percent in 2023, compared to 18 percent in 2022 (Table 10). While the share of credits with co-benefits traded increased, the price of credits with co-benefit and SDG certifications fell more than the VCM as a whole, with the average price of credits with co-benefits declining by 23 percent and the average price of credits with SDGs dropping 31 percent. As a result, while credits with associated co-benefits still fetch a price premium, that premium fell to 37 percent in 2023, down from 63 percent in 2022. The premium for credits with associated SDGs also fell to 34 percent in 2023, compared to 79 percent in 2022. This decline in price relative to credits without co-benefits or SDGs appears to be due to an increased supply of credits from projects with co-benefits in 2023. In particular, the growth in transactions from Cookstove Distribution projects in the Household/Community Devices category is a key factor driving co-benefit premiums down.

Credit Vintage

Carbon credits are issued with a specific "vintage," representing the year in which verified emissions reduction activities took place. Due

[2] Although Social Carbon became its own credit issuing standard in 2022, this analysis focuses on projects that were certified by Social Carbon during the period when it acted as a separate co-benefit certification body that reviewed projects developed under other registries' methodologies.

Table 9. VCM Transaction Volumes, Values, and Prices, With vs. Without Co-benefits, 2022-2023

	2022			2023		
	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume ($MtCO_2e$)	Value (USD)	Price (USD)
Total VCM	253.8	$1.9 B	$7.37	110.8	$723.5 M	$6.53
Has Co-Benefits	56.4	$593.5 M	$10.51	31.1	$252.2 M	$8.11
No Co-Benefits	197.4	$1.3 B	$6.46	79.7	$471.5 M	$5.91

Note: In this context, co-benefits are defined on the basis of project certification through one of the following co-benefit certification schemes: Climate, Community, and Biodiversity Standards, SD VISta, or Social Carbon.

Table 10. VCM Transaction Volumes, Values, and Prices, With vs. Without SDGs, 2022-2023

	2022			2023		
	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume ($MtCO_2e$)	Value (USD)	Price (USD)
Total VCM	253.8	$1.9 B	$7.37	110.8	$723.5 M	$6.53
Has SDGs	44.7	$520.2 M	$11.64	28.8	$231.1 M	$8.03
No SDGs	209.1	$1.4 B	$6.49	82.1	$492.5 M	$6.00

to multi-stage validation and verification processes, credit standards may allow projects to issue all credits from a given vintage at once or may require a gradual release to satisfy buffer requirements that account for the risk of reversal for the carbon removal or reduction. As project methodologies continue to evolve in response to expert critique and market scrutiny, buyers have come to show a preference for credits from more recent vintages, which may reduce the risk that they buy credits from a project that will have its additionality called into question in the future.

In 2023, there was very little change in the price premium for credits from the last five years over older credits. The premium was 50 percent, down slightly from 54 percent in 2022 (Table 11). As project methodologies continue to mature, this recency premium may continue to decline if buyers become more confident in the supply of high-quality credits from more than five years ago. Conversely, if VCM demand (as measured by the rate of credit retirements) continues to grow, the remaining supply of acceptable older credits may dwindle to zero, contributing to an overall increase in VCM prices. EM Respondents stated that buyers continue to have a strong preference for newer credit vintages, although delays in credit issuances due to registry project validation and verification processes can affect the supply of credits from the very latest vintage.

Table 11. Year-over-year Comparison of VCM Transaction Price (USD), by Credit Vintage Status, 2022-2023

	2022	2023
Vintage	Price (USD)	Price (USD)
Older than 5 years	$5.56	$5.18
More recent than 5 years	$8.58	$7.77
Recency Premium	54%	50%

CORSIA Eligibility

The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) has been an important driver of demand during its 2021-2023 pilot phase. During this phase, airlines have been able to voluntarily buy eligible carbon credits from certain standards and project types to offset their carbon emissions from international flights. In the beginning of this period, especially before the introduction of the ICVCM Core Carbon Principles, CORSIA was partially seen as a de facto quality standard for the VCM. In the pilot phase, credits from 11 different standards were eligible for CORSIA, but most forestry projects from these standards were excluded, due to a higher risk of reversal.

Table 12. VCM Transaction Volumes, Values, and Prices, by Project CORSIA Eligibility, 2022-2023

	2022			2023		
	Volume ($MtCO_2e$)	Value (USD)	Price (USD)	Volume ($MtCO_2e$)	Value (USD)	Price (USD)
Total VCM	253.8	$1.9 B	$7.37	110.8	$723.5 M	$6.53
Corsia-eligible	11.9	$112.8 M	$9.46	5.1	$31.7 M	$6.19
Not Corsia eligible	241.9	$1.8 B	$7.27	105.7	$691.7 M	$6.54

Note: For the purposes of this analysis, CORSIA eligibility is defined at the project level. If credits from any vintage of a project are considered CORSIA-eligible, then the entire project is counted as CORSIA-eligible. CORSIA-eligibility is assessed only for transactions that are reported to EM with a corresponding Project ID that can be matched to the carbon credit standard registry where that project is registered, and the CORSIA tag can be derived directly from the registry data.

In 2022, Respondents reported a 30 percent premium for transactions of CORSIA-eligible credits to EM, but that premium no longer existed in 2023 (Table 12). The first implementation phase of CORSIA will begin in 2024, and as of this writing, only two project standards have been approved for offsetting. It remains to be seen which standards will be included in this phase of CORSIA and how project requirements may change from the pilot phase.

Box 3: The Impact of Integrity Initiatives and Ratings Agencies on Carbon Credit Sales

Both the Voluntary Carbon Markets Integrity Initiative (VCMI) and the Integrity Council for the Voluntary Carbon Market (ICVCM) launched key frameworks on carbon market integrity in the second half of 2023, each focusing on integrity in different parts of the carbon credit lifecycle.

ICVCM's Core Carbon Principles (CCPs) set a global standard and benchmark for high-integrity carbon projects. The CCPs are made up of ten fundamental, science-based principles for identifying high-quality carbon credits. Each CCP represents verifiable climate impact based on principles of good governance, transparency, additionality, sustainable development benefits, and five other principles. Using an Assessment Framework, the CCPs define high-quality and high-integrity credits for the issuing standard and standard-specific methodologies, guide projects and standards towards integrity, and provide information to buyers to inform their search for high-quality credits.

The VCMI Claims Code of Practice is demand-side guidance to help companies credibly use VCM credits as part of their net-zero decarbonization targets. Companies can make a "Carbon Integrity" claim, which is a climate achievement claim verified using VCMI's Monitoring, Reporting, and Assurance (MRA) Framework. The process of certifying a Carbon Integrity claim requires companies to disclose information on their corporate climate action practices including adherence to best practices, and key data on the carbon credits they are using to make their claims. All information disclosed must be verified by a third-party.

ICVCM and VCMI did not have a clear impact on the market in 2023 because their frameworks were not operationalized until mid- to late-2023. However, these initiatives began to gain traction in early 2024: ICVCM approved five standards as CCP-eligible, and Bain & Company made a VCMI Carbon Integrity Platinum Claim, which means they demonstrated progress on internal decarbonization and went above and beyond for their investment in high-integrity carbon credits.

It is also important to consider the potential role of the Science Based Target initiative (SBTi) for corporate buyers of carbon credits. SBTi's widely adopted net-zero standard helps corporations identify and set realistic, but ambitious, time-bound emissions reduction targets to achieve net-zero. To date, SBTi has not allowed the use of VCM credits to count against net-zero targets, but as of the writing of this report in mid-2024, the SBTi board has released a statement to say that they are considering a change of policy for use of credits in Scope 3 abatement. To date, SBTi is working with 8,511 companies to set science-based targets and 5,307 of those companies already have an approved target. If SBTi were to approve the use of VCM credits to offset some Scope 3 emissions, it could drive a major increase in the demand for VCM credits, given the high volume of emissions typically associated with Scope 3.

In addition to integrity initiatives, private carbon credit rating agencies like Sylvera, Calyx, and BeZero offer buyers information about the quality of carbon credit projects to help them make good purchasing decisions and ensure their claims are credible. These independent, third-party assessments of carbon project impacts have offered buyers some guidance on credit quality while they awaited guidance from integrity initiatives. However, the unregulated nature of these agencies led to some criticism and confusion, due to the various proprietary methodologies used to assess emissions reductions or removals, community safeguards, and other aspects of project quality. This has resulted in different agencies generating different ratings for the same project types. Rating project types is also a limited assessment, given the wide diversity of project activities within types.

EM Respondent Views on the VCM in 2023

EM surveyed 46 high-volume Respondents to collect their qualitative sentiments on the VCM in 2023. Respondents' views on the overall market trajectory illustrate how uneven performance in individual sectors of the VCM was in 2023. Seventeen Respondents said their sales volume decreased, 11 said it remained about the same, and 15 stated that their volume increased from 2022. Average sales price increased for 18 Respondents, remained about the same for 11, and decreased for 14 (Figure 6).

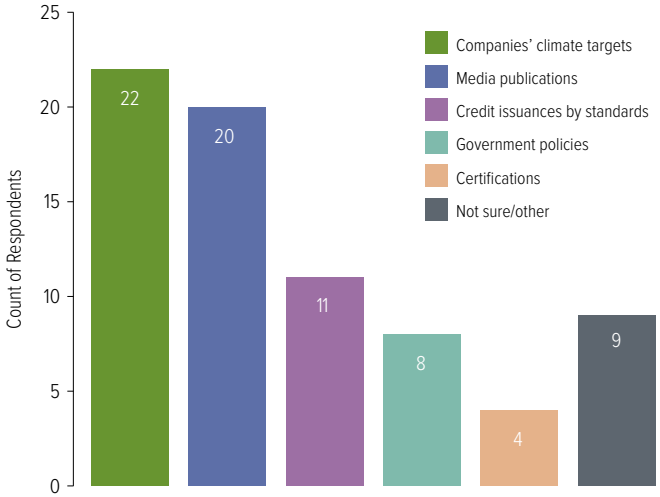
Respondents were vocal about the impact of media publications critical of the VCM, with 20 rating media as one of the most important factors influencing credit sales in 2023. However, company climate targets were seen as a slightly more relevant factor, with 22 Respondents noting their importance (Figure 7). These factors are interrelated since many companies pulled away from the VCM during a period of intense media scrutiny to avoid accusations of greenwashing their greenhouse gas emissions. The pace of credit issuances by standards was cited by 11 Respondents as an important influence on credit sales; a slowdown in issuances for some project types is also related to media scrutiny of the VCM.

When reflecting on the trajectory of the VCM in 2023 and beyond, many Respondents noted that 2023 felt like a transitional year for carbon markets, as both the supply and demand of carbon credits became increasingly sophisticated and delineated into specific segments. Respondents were optimistic about the potential impact of the ICVCM's Core Carbon Principles and the VCMI Claims Code, while noting that it will take time for buyers to fully parse the relevant requirements to make robust offsetting claims using these tools.

The focus on credits that deliver environmental and social co-benefits was even clearer in the qualitative responses that EM received than the quantitative transaction data was, indicating that co-benefits are top of mind and suggesting that credits from projects delivering these benefits could continue to grow in market share. Looking beyond the VCM, several respondents noted that, in some cases, biodiversity benefits were in some cases the primary reason for a credit purchase, suggesting potential demand for future biodiversity credit markets.

Figure 6. Respondent Perception of Sales Volume and Credit Price Trajectory, 2022 to 2023

Figure 7. Respondent Perception of the Most Important External Factors Influencing Credit Sales, 2023



Note: Respondents could select multiple factors as among the most important.

Conclusion

Despite a contraction within the VCM in 2023, we find ourselves in a transformational period as many segments of supply and demand continue to grow across global carbon markets. EM's transaction data illustrate how the Household/Community Devices category, led by Cookstove Distribution projects, has become an important source for credits that provide co-benefits beyond carbon emissions reductions. Transaction volumes for the Forestry and Land Use category dropped following high-profile scrutiny of REDD+ project methodologies, but increasing project registrations and credit retirements in this category indicate that long-term supply and demand for these credits is robust. At the same time, credits from the Renewable Energy and Transportation categories continue to lose market share as more up-to-date methodologies for Energy Efficiency and Chemical Processes/Industrial Manufacturing projects offer more attractive options for buyers searching for less expensive credits from higher-income countries.

EM analyses also suggest that credit standards have responded to shifts in the VCM in different ways. Gold Standard, ACR, and CAR credits all gained market share, while VCS and CDM credits made up smaller portions of the market. The decline in the volume of VCS credits traded in 2023 was related to Verra's overhaul of the VCS consolidated REDD+ methodology, while the supply of CDM credits has dwindled as its status remains in limbo pending transition to Article 6. A growing portion of traded credits associated with additional benefits indicated that co-benefits became more relevant across standards, even as the premium associated with these co-benefits dropped slightly as projects from the Household/Community Devices category contributed to the available supply.

Looking ahead at the future of the VCM, EM experts see many possible pathways for expansion in 2024. Carbon markets could shift in emphasis towards pure carbon removals or towards credits with robust co-benefits, or both types of credits could continue to find different use cases, as 2023 data indicate. Market integrity initiatives, such as VCMI and ICVCM, as well as independent ratings agencies are stepping in to guide buyers and project developers on high-integrity credits. New project types continue to be introduced and old methodologies are revised, bringing new sources of supply into the market and changing buyer perceptions of which credits can be used to credibly claim emissions offsets. Market actors continue to wait for clarity on both Article 6 trading mechanisms and SBTi's decision on how end users can claim carbon credits against their Scope 3 emissions reduction goals, both of which will likely increase total demand and constrain the supply of carbon credits.

One thing remains clear as we reflect on the trajectory of the carbon markets over the next few years: in the VCM, there is always nuance to the meaning of carbon accounting decisions, and tradeoffs to be made between easily measured greenhouse gas impacts and benefits and safeguards to local communities and environments. So far, it has been the work of thousands of project developers, credit issuing standards, providers of assurance and verification, investors, speculators, credit aggregators, and corporate credit buyers to make the VCM a meaningful market that can drive investment towards decarbonization and green economies. In 2023, the VCM has made meaningful strides towards maturity. We look forward to following and sharing emerging policies and trends as the VCM continues to evolve.

Appendices

Data and Methodology

Most of the data in this report come from self-reported transaction data from EM Respondents, typically project developers, investors, and intermediaries (i.e., sell-side market participants). Data on project registrations, credit issuances, and credit retirements are sourced from carbon standard registries.

Average carbon credit prices are volume-weighted, calculated from transactions with reported price and volume (the majority of transactions reported to EM). To calculate the total transaction value, this average price is multiplied by the total volume of transactions (including transactions without an associated price). In other words, the volume-weighted average price for transactions with price is assumed to extend to transactions reported without price.

For project registrations, only projects that had been approved by the relevant registry were included, whether or not credits were issued for projects. EM experts used the provided project registration date where available; for Gold Standard projects, the date of the first credit issuance for a project was used for the date of project registration. Any reserve or buffer volume from registry data on issued credits was removed, where provided data made that possible.

EM is the world's largest repository of VCM transaction data, however, the volumes presented throughout this report should not be considered to be a complete representation of market trading activity. EM works actively to engage with all market participants. As reporting to EM is voluntary, and many market actors are not yet reporting to EM, the actual volume of credits transacted in the voluntary market is likely higher than the amounts published here. See a list of current EM Respondents below.

EM Respondents, 2022-2023

- 3Degrees
- ACCIONA
- Across Forest AS/Across Nature AS
- AGL
- Agrocortex
- Agroempresa Forestal
- Akre
- ALLCOT
- American Forest Foundation
- Anew Climate
- Appalachian Mountain Club
- Arbor Day
- Beijing Qianyuhui International Environmental Investment Co., Ltd. (QYH)
- BioCarbon Partners
- Biofílica Ambipar Environment
- BIOFIX
- BOCS Foundation
- Bonneville Environmental Foundation
- Bosques Amazonicos
- BrasilMataViva
- BVRio
- Caledonian Climate
- Canopée
- Carbone boréal (Université du Québec à Chicoutimi)
- Carbon Expert
- Carbonext
- Carbonfund.org
- Carbon Green Investments / Africa
- Carbon Offsets To Alleviate Poverty (COTAP)
- CarbonReset

- CarbonStore - Tillhill
- Carbon Tanzania
- CBL Markets (Xpansiv)
- CIMA
- Clean Air Action Corporation (TIST Program)
- Climate Bridge Ltd.
- ClimatePartner GmbH
- ClimeCo
- CO2CERO
- CO2Logic
- Conservation International
- Cool Effect
- Cooperativa AMBIO Programa Scolel'te
- C-Quest Capital
- Credible Carbon
- Eco2librium
- ECOEYE
- Econegocios
- Ecopart Assessoria em Negocios Empresariais Ltda. (EQAO)
- Ecosecurities
- Ecosphere+
- EFM Investment & Advisory
- EKI-EnergyServices
- Emergent Ventures
- ENGIE
- Enviro-Mark Solutions Ltd (trading as Toitū Envirocare)
- Everland
- FairClimateFund (formerly Hivos Carbon Credits)
- Fondo Accion
- Forest Carbon (Indonesia)
- Forest Carbon Ltd (UK)
- FORLIANCE-CO2OL
- Fundação Carbon Offset Timor (FCOTI)
- Fundación para el Ecodesarrollo y la Conservación (FUNDAECO)
- Futuro Forestal
- Global Forest Partners
- Global-woods International AG
- Gould International
- Greenoxx
- Green Resources
- Grupo Ecologico Sierra Gorda
- Highland Carbon
- Hivos (now fairclimatefund)
- Infinite Solutions
- Inlandsis Fund
- Integrador de Comunidades Indígenas y Campesinas de Oaxaca AC (ICICO)
- King County, Washington
- Land Carbon Ltd
- Life Climate and Energy Limited (Life Enerji)
- Livelihoods Venture
- Louis Dreyfus Company
- MEXICO2
- Microsol
- Mongolian Society for Rangeland Management
- Nature Conservancy Canada
- NCX (formerly SilviaTerra)
- NedBank
- Nexus for Development
- Nordic Offset
- Nova Institute
- ONFInternational
- OstromClimate (formerly NatureBank)
- OurOffset
- Pachama
- PacificHydro
- PRIMAKLIMA
- Prosustentia
- Proyecto Mirador
- Quadriz
- Rabobank
- Radicle
- Redshaw Advisors Limited
- Respira International
- Rubicon Carbon
- Sanko Enerji
- Soluciones Proambientales
- South Pole
- STX Group (formerly Vertis-Strive)
- Sustainable Carbon
- Swiss Climate
- Taking Root
- Terra Global Capital
- The Climate Trust
- The Nakau Program
- The Nature Conservancy
- The Voluntary Climate Marketplace
- Timing Carbon Asset Management Co., Ltd.
- Trees for Life
- UPC Renewables
- UPM
- WayCarbon
- WeForest
- Wellington Management
- Worldview International Foundation
- ZeroMission

Glossary of Terms

Additionality: Additionality describes the basis for issuing carbon credits for project activities that would not occur without finance from the sale of credits. Carbon credits can only be issued if the reduction or removal of carbon emissions would not otherwise have taken place. For example, a solar energy installation that would be profitable to build without the sale of carbon credits is not considered additional, but a cookstove distribution project that reduces the burden of deforestation is additional, because deforestation would continue at a high rate if the cookstoves were not supplied to local communities. Different project methodologies have specific modules for calculating project additionality.

Afforestation-Reforesation and Revegetation (ARR): A group of Forestry and Land Use project types that establish new forests or restore deforested/degraded forests through tree planting and revegetation. ARR projects generate nature-based removal credits.

Article 6: An article of the 2016 Paris Agreement that covers collaboration between countries in pursuit of greenhouse gas emissions reduction targets. See Box 2, page 16 for details.

Blue Carbon: A group of Forestry and Land Use project types that reduce/remove carbon dioxide from marine and coastal environments by restoring, conserving, or managing ecosystems, including wetland, mangrove, and seagrass habitats.

Co-benefits: Social or environmental benefits provided by a project in addition to the greenhouse gas emission reductions/removals that generate carbon credits. For example, a project that restores natural ecosystems and has benefits for carbon storage, biodiversity, and local communities. Credit standards can indicate if a project provides certain co-benefits through independent certifications (e.g., Verra's Climate, Community, and Biodiversity certification for projects that contribute to biodiversity) or by indicating which UN Sustainable Development Goals (SDGs) that the projects contribute towards.

Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA): A compliance program for offsetting emissions from international aviation, operated by the International Civil Aviation Organization (ICAO). Only certain credits that meet ICAO's eligibility criteria – specific standards, methodologies, co-benefits, project locations, and vintages – can be used as offsets for CORSIA. CORSIA's pilot phase ran from 2021 to 2023, and its first implementation phase began in 2024.

Corresponding adjustment: An additional agreement required as part of Article 6 (see above) that prevents project host countries from counting credits they trade towards their own NDCs, which would result in the credits being "double-counted" by both the host country and the buying country.

Credits: The individual units of greenhouse gas emissions reducing/removing activities that are issued by carbon market standards, and then bought, sold, and retired by the various carbon market actors (project developers, intermediaries, end users, etc.). Each credit is denominated as one metric ton of CO_2 equivalent (tCO_2e) and corresponds to the estimated amount of greenhouse gas emissions that a project removes or reduces from the atmosphere.

End User/End Buyer: An entity (individual, company, organization, etc.) that purchases carbon credits, either directly from the project developer or from an intermediary, with the intention of retiring the credits to claim as offsets against emissions (see Retirements).

Engineered credits: Credits generated by projects that use technological solutions to reduce or remove greenhouse gas emissions. This includes projects in the following categories: Chemical

Processes/Industrial Manufacturing, Energy Efficiency/Fuel Switching, Household/Community Devices, Renewable Energy, Transportation, and Waste Disposal.

Greenhouse Gases (GHGs): Gases that trap heat in the atmosphere and lead to global warming. Carbon dioxide (CO_2), methane, and nitrous oxide are the primary greenhouse gases emitted into the atmosphere by human activities contributing to climate change.

Greenwashing: Misleading characterizations of corporate actions to address environmental issues that make company efforts seem more impactful than they are. Companies claiming emissions offsets using low-quality carbon credits face the risk of being accused of greenwashing.

Improved Forest Management (IFM): A group of Forestry and Land Use project types that implement forest management activities to increase carbon storage in forests, and/or reduce greenhouse gas emissions from forestry activities. This cluster does not include projects that fall under the REDD+ framework (see REDD+).

Intermediary: Organizations that purchase and take ownership of carbon credits but are not end users. This includes retailers and aggregators that take ownership of offsets from project developers and sell them to end users for a profit. EM does not include brokers that sell carbon credits on behalf of project developers but do not take ownership of credits in the category of intermediaries, including these market participants with end users.

Issuance: When a credit is made available for sale, following the issuing standard's requirements for verification by a third-party auditor. Each issued credit has a unique serial number and any ownership transfers or retirements must be reported to the issuing standard's registry.

Methodology: The technical documentation that describes the procedures and requirements for specific types of project activities, including procedures for quantifying the volume of greenhouse gas emissions reduced and/or removed by the project. Some projects will use multiple methodologies to cover different elements within a single project. Standards may develop their own methodology documentation and/or provide a list of methodologies from other standards that they will accept.

Nature-based credits: Credits generated by projects that achieve greenhouse gas emissions reductions or removals by conserving, restoring, and/or managing natural and agricultural ecosystems. All projects within EM's Agriculture and Forestry and Land Use categories are considered nature-based.

Net-Zero: An organization is considered to have achieved net zero emissions when it reduces at least 90 percent of initial emissions and compensates for the residual emissions through offsetting with carbon credits. Net-zero is a more stringent standard than the related term "carbon neutral," which does not require emissions abatement and can be accomplished through emissions offsets alone.

Project Category: Category is the broadest classification level that EM uses to group projects by the type of activities involved. EM has eight Project Categories: Agriculture, Chemical Processing / Industrial Manufacturing, Energy Efficiency and Fuel Switching, Forestry and Land Use, Household / Community Devices, Renewable Energy, Transportation, and Waste Disposal. Within each category, EM groups projects into more specific Project Clusters and the most specific Project Types.

Project registration: When a credit-issuing standard determines that a prospective project meets the necessary criteria established in a published methodology, including third-party validation and assurance, and gives official approval to list the project in that standard's registry. Once registered, a project can submit requests for credit issuances (see Issuances).

REDD+: Reduced Emissions from Deforestation and Degradation in Developing Countries. These Forestry and Land Use projects are developed based on the voluntary REDD+ framework, developed by the UNFCCC to encourage financing of forest conservation and management in lower income countries where forests are at risk of land-use change or reduced carbon storage.

Reduction credits: Credits generated by projects from the volume of greenhouse gas emissions that were reduced or avoided through project activities. For example, a project that improves building weatherization and thereby reduces the burden of emissions from heating or air conditioning. Some nature-based carbon projects both reduce and remove (see Removal credits) greenhouse gas emissions and credits from these projects are considered to include both reduction and removal credits.

Removal credits: Credits generated from the volume of greenhouse gas emissions that a project removed from the atmosphere or ocean through the creation of a carbon sink/pool. For example, an ARR project that increases vegetation to sequester carbon.

Registry: An inventory of the credits that are issued, retired, held, or transferred by a carbon credit issuing standard.

Retirement: When a uniquely serialized carbon credit is removed from circulation in the market and can no longer be transferred or sold. This occurs once the credit has been sold to its end user, but this may or may not happen immediately after the end user takes ownership of the credit. By retiring the credit, the end user can claim to have offset emissions from its carbon footprint against an emissions target.

Scope 3 emissions: Greenhouse gas emissions that are indirectly caused by a company through any activities other than the generation of purchased energy. A major source of Scope 3 emissions is a company's value chain, which includes emissions from both upstream (e.g., agricultural production) and downstream (e.g., use and disposal of products by consumers) supply chains. For some companies, such as those in consumer goods sectors that rely heavily on agricultural and forestry commodities, the vast majority of their carbon emissions are embedded in their value chains.

Standard: A set of project design, monitoring, and reporting criteria against which carbon offsetting activities and/or projects' environmental and social co-benefits can be certified or verified. Some standards certify/verify thousands of projects from a wide range of types and geographic locations, while others are specific to certain project types or geographic locations. For example, the UK Woodland Carbon Code specifically covers afforestation projects within the United Kingdom.

Vintage: The year in which project emissions reductions or removals were determined to have occurred (or estimated to occur in the future). This does not have to match the year that the credits were issued; there can be lags between the actual reductions/removals and the issuance of credits, and some standards issue credits for future estimated reductions/removals.

Supplementary Tables

Table S1. Number of Carbon Credit Project Registrations by Category, 2019-2023

Project Category	2019	2020	2021	2022	2023
Agriculture	11	23	5	20	28
Chemical Processes/ Industrial Manufacturing	9	25	19	85	53
Energy Efficiency/Fuel Switching	2	91	2	5	5
Forestry & Land Use	26	170	84	97	115
Household/Community Devices	71	126	113	181	329
Renewable Energy	119	825	94	130	145
Transportation	0	8	2	37	3
Waste Disposal	5	37	3	8	16
Total	243	1,305	322	563	694

Note: Includes data on project registrations from ACR, CAR, CDM, City Forest Credits, Global Carbon Council, Gold Standard, Plan Vivo, and VCS registries.

Table S2. Volume of Carbon Credit Issuances ($MtCO_2e$) by Category, 2019-2023

Project Category	2019	2020	2021	2022	2023
Agriculture	1.4	0.96	3.4	7.7	6.9
Chemical Processes/ Industrial Manufacturing	11.6	18.4	20.8	39.2	24.5
Energy Efficiency/Fuel Switching	3.9	9.5	16.0	22.8	11.0
Forestry & Land Use	79.5	64.3	122.7	77.8	67.5
Household/Community Devices	10.5	17.6	24.1	25.5	56.7
Renewable Energy	71.9	129.1	203.9	232.1	148.9
Transportation	1.4	0.23	0.10	0.03	0.35
Waste Disposal	12.3	12.1	12.7	12.3	8.4
Total	192.7	252.1	403.7	417.4	324.4

Note: Includes data on credit issuances from ACR, CAR, CDM, City Forest Credits, Global Carbon Council, Gold Standard, Plan Vivo, and VCS registries.

Table S3. Volume of Carbon Credit Retirements ($MtCO_2e$) by Category, 2019-2023

Project Category	2019	2020	2021	2022	2023
Agriculture	0.24	0.24	0.72	1.1	1.6
Chemical Processes/ Industrial Manufacturing	4.9	8.4	7.2	9.5	14.9
Energy Efficiency/Fuel Switching	3.9	2.9	7.2	12.0	6.0
Forestry & Land Use	20.5	32.2	60.9	36.7	57.1
Household/Community Devices	5.2	5.7	7.1	9.2	11.5
Renewable Energy	33.7	47.6	83.0	95.5	75.4
Transportation	0.10	0.06	0.30	0.03	0.03
Waste Disposal	3.7	4.0	4.6	3.5	3.4
Total	72.2	101.1	171.0	167.5	170.1

Note: Includes data on credit retirements from ACR, CAR, CDM, City Forest Credits, Global Carbon Council, Gold Standard, Plan Vivo, and VCS registries.

FOREST TRENDS

Pioneering Finance for Conservation

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 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 private capital for practices that reduce emissions from forests, agriculture, and other land uses

Supply Change

Tracking corporate commitments, implementation policies, and progress on reducing deforestation in commodity supply chains

Water Initiative

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

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